UNIVERSITY OF SOUTHAMPTON
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A mini-thesis submitted for transfer from MPhil to PhD

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Application of Link Integrity techniques from Hypermedia to the Semantic Web

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February 10, 2011

UNIVERSITY OF SOUTHAMPTON

ABSTRACT

FACULTY OF ENGINEERING AND APPLIED SCIENCE
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

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As the Web of Linked Data expands it will become increasingly important to preserve data and links such that the data remains available and usable. In this work I present a method for locating linked data to preserve which functions even when the URI the user wishes to preserve does not resolve (i.e. is broken/not RDF) and an application for monitoring and preserving the data. This work is based upon the principle of adapting ideas from hypermedia link integrity in order to apply them to the Semantic Web.

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Chapter 1

Introduction

Hypermedia is a technology which evolved from an idea first proposed by Vannevar Bush that 'the human mind does not work by alphabetical or numerical linking but through association of thoughts' Bush (1945). In his article he presented an idea for a device called the 'memex' which would allow a person to browse large collections of information and link items together and add annotations to items. From this concept the idea of hypermedia was born with its aim being to provide a mechanism to link together collections of accumulated knowledge in an interesting and useful way in order to improve access to them and express the relationships between information.

Thus there is an obvious problem in hypermedia with regards to what happens when links do not work as intended. Links are unfortunately susceptible to becoming 'broken' in a number of different ways and this has become an open research question, particularly since the 1990s and the advent of large scale hypermedia systems like the World Wide Web (Berners-Lee et al., 1992). This problem is known as Link Integrity and can be divided into two main problems *a*) the 'dangling-link' problem and *b*) the editing problem .

A limitation of hypermedia is that it tends to lead to a very document-centric interaction and navigation model as seen with the Web. As a result content is very much aimed at humans and information discovery often relies on users searching for topics they are interested in. The Semantic Web is an extension to the existing document web inspired by ideas voiced by Tim Berners-Lee (Berners-Lee, 1998) and aims to augment the existing web with machine-readable data. The value of this is that it allows machines to retrieve and process structured data from the Web without relying on complex and somewhat inaccurate data extraction techniques such as natural language processing.

The standard model for data on the Semantic Web is RDF which is a syntax independent abstract model specified by the W3C (Klyne and Carroll, 2004) which represents data in the form of graphs. Each relationship between two nodes in the graph is a triple

formed of a subject, predicate and object where the subject and objects are nodes representing some resource/value and the predicate represents the relationship between them. Resources and relationships are identified using URIs which means that on the semantic web every individual triple represents a link between two resources. As a result it becomes more important than ever to be able to maintain and preserve links and to be able to recover useful data in the event of failure.

Due to its nature the semantic web introduces a couple of additional link integrity problems that need to be dealt with. Since a URI can be minted (see Definition 1.1) by anyone and used to refer to any concept they want how do you determine what the meaning of a URI is? Additionally it is possible to say whether the concept identified by some URI A is the same as the concept identified by some URI B and what does it mean to actually say this? These two problems are known respectively as *a*) URI identity & meaning and *b*) co-reference.

Definition 1.1. Minting a URI is the act of establishing the association between the URI and the resource it denotes. A URI MUST only be minted by the URI's owner or delegate. Minting a URI from someone else's URI space is known as URI squatting (Booth, 2009)

The biggest segment of the semantic web at the current time is Linked Data[1] which is a project that started as a community movement aimed at bootstrapping the semantic web by getting large data sources out on the web in the form of RDF and making links between them. It started out by converting a number of large freely available data sources such as Wikipedia[2] into RDF and gradually many smaller datasets have grown up around these initial hubs as seen in Figures 1.1-1.4[3]. The Linked Data project is of particular interest since it provides a large amount of RDF data where the applications built upon it are heavily reliant on the interlinkings between different datasets. This provides a comprehensive selection of sources of real world data to test possible solutions against and is a domain where link integrity tools would benefit end users.

1.1 Hypothesis

My hypothesis in this research is that link integrity is an issue of great importance to the semantic web. As the semantic web becomes more mainstream and grows larger people will become more concerned about link integrity since fundamentally it is all about links so if they don't work and that existing techniques from hypermedia can be adapted to it.

[1] `http://linkeddata.org`

[2] `http://wikipedia.org`

[3] Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. `http://lod-cloud.net/`

The success criteria for this hypothesis that I am to demonstrate in this report are the following:

1. That existing approaches from hypermedia described in Chapter 2 can be adapted for use on the Semantic Web
2. That such approaches are scalable and therefore feasible for widespread deployment at web scale

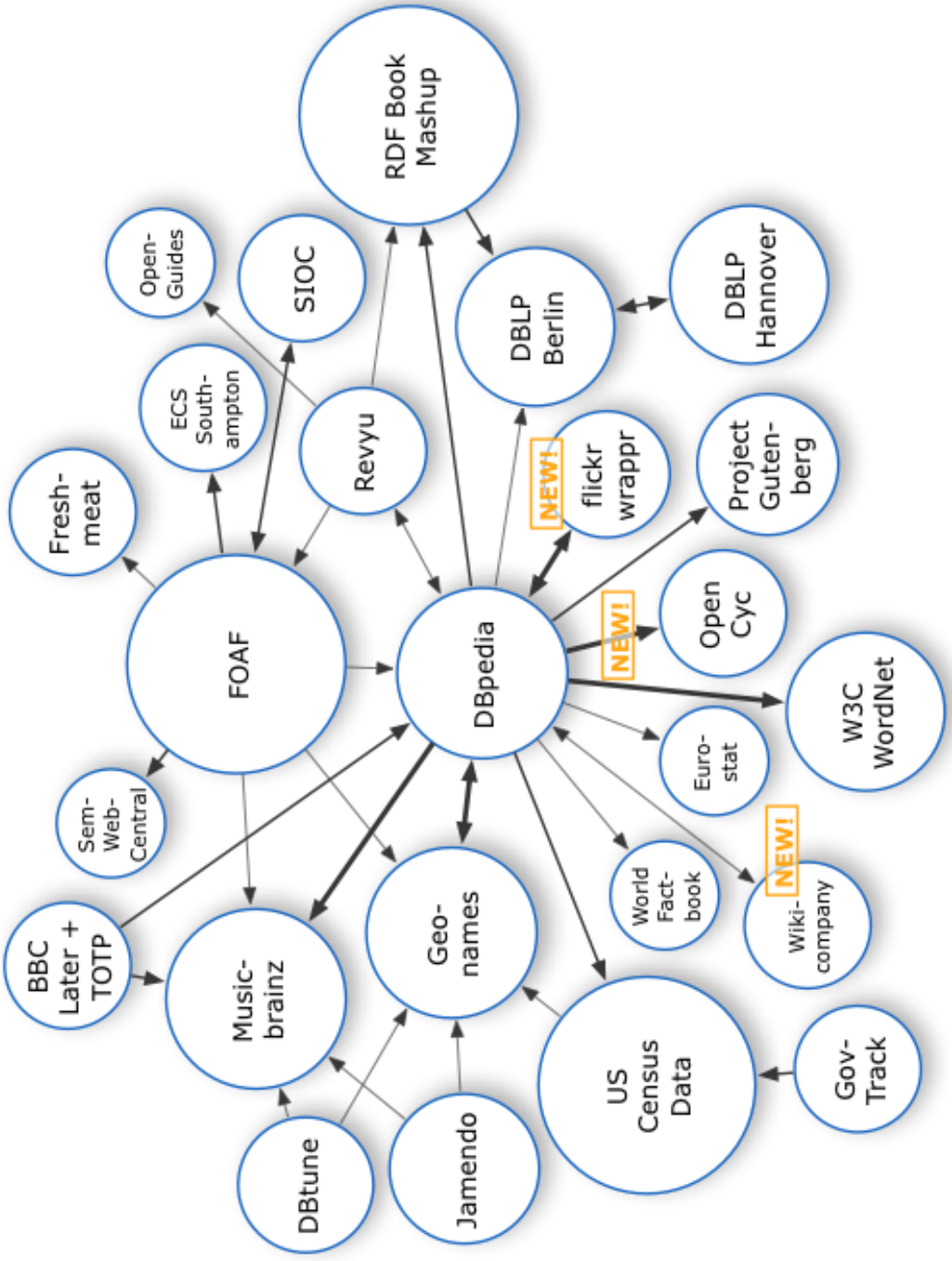

FIGURE 1.1: Linked Data Cloud October 2007

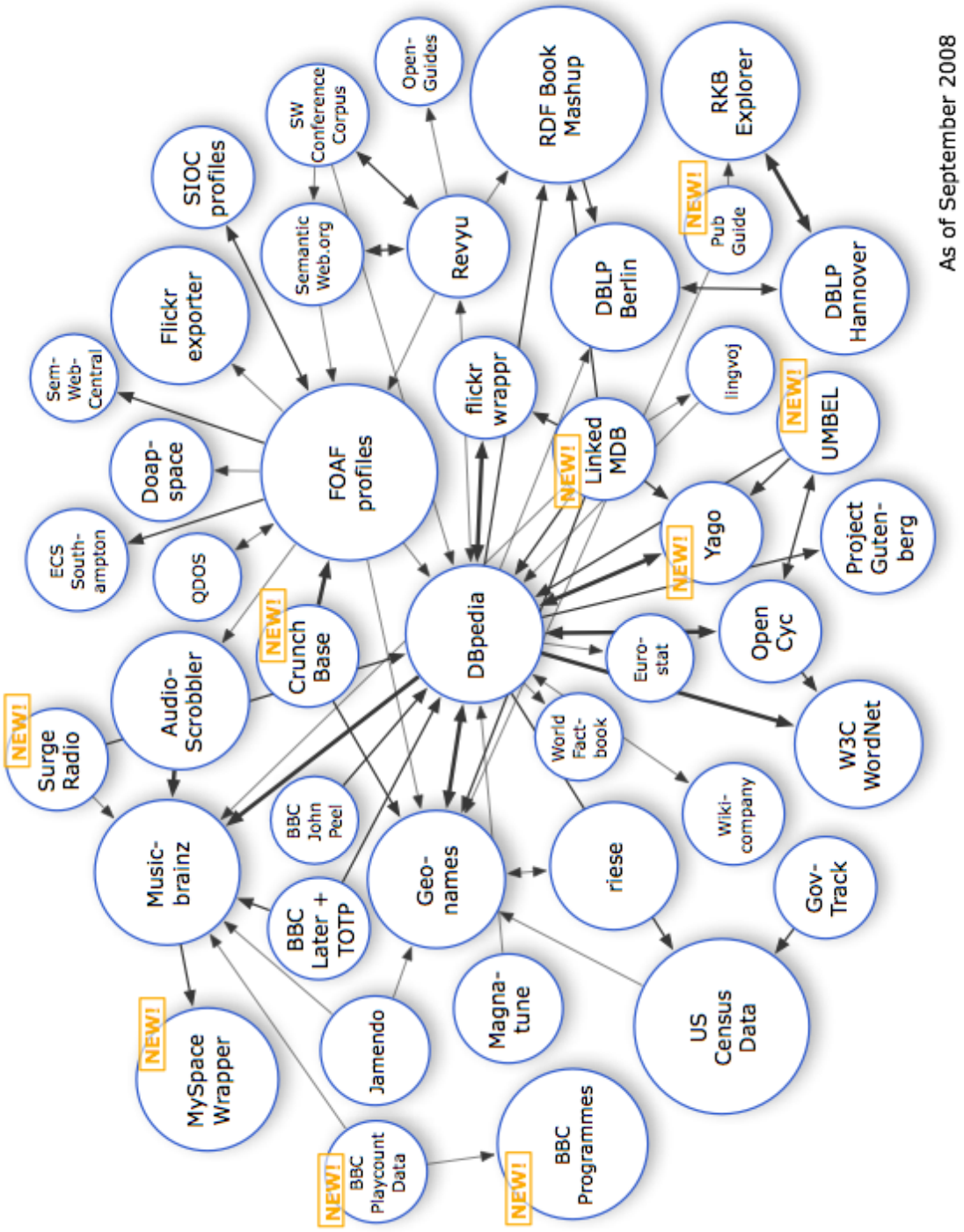

FIGURE 1.2: Linked Data Cloud September 2008

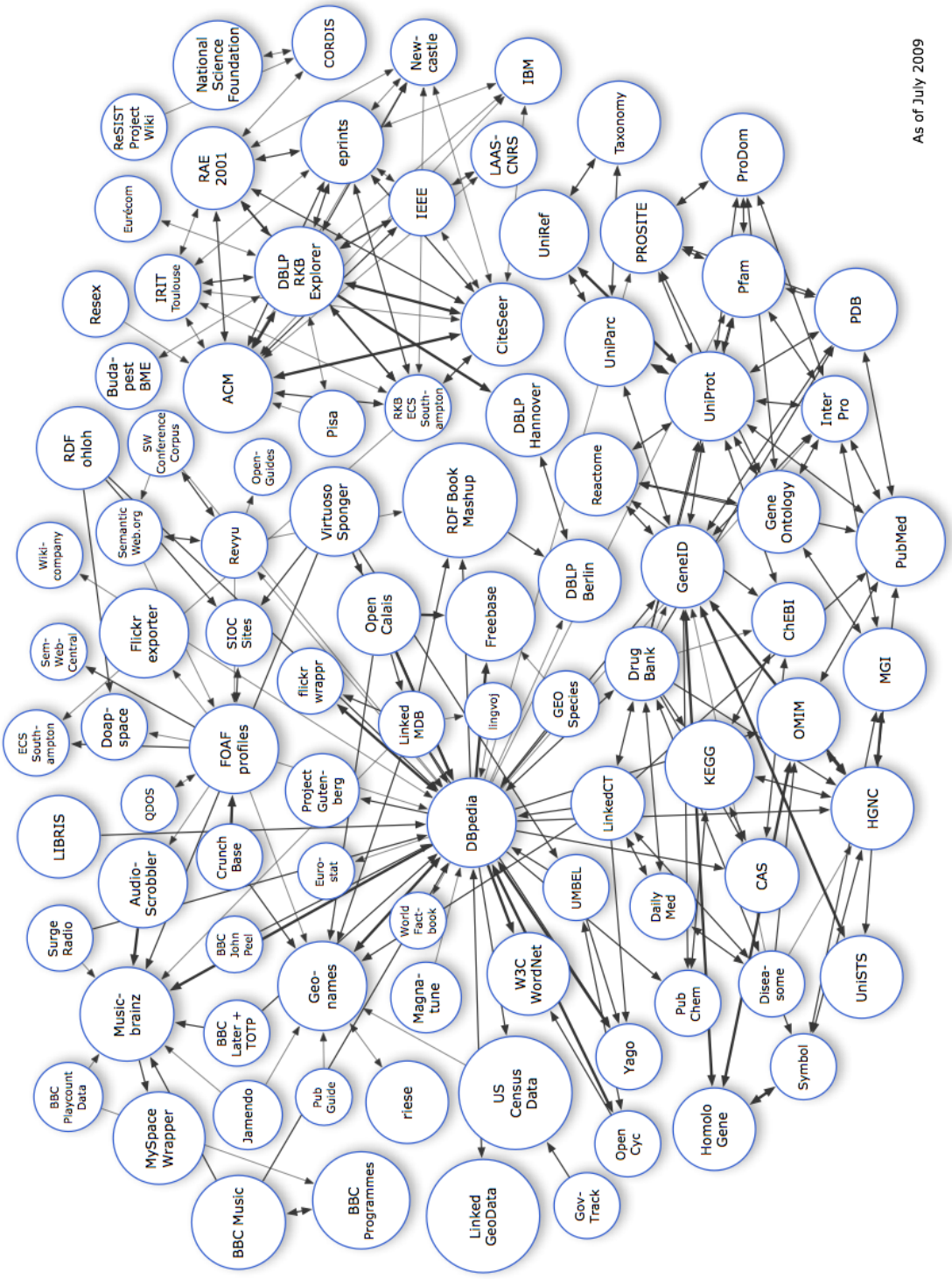

FIGURE 1.3: Linked Data Cloud July 2009

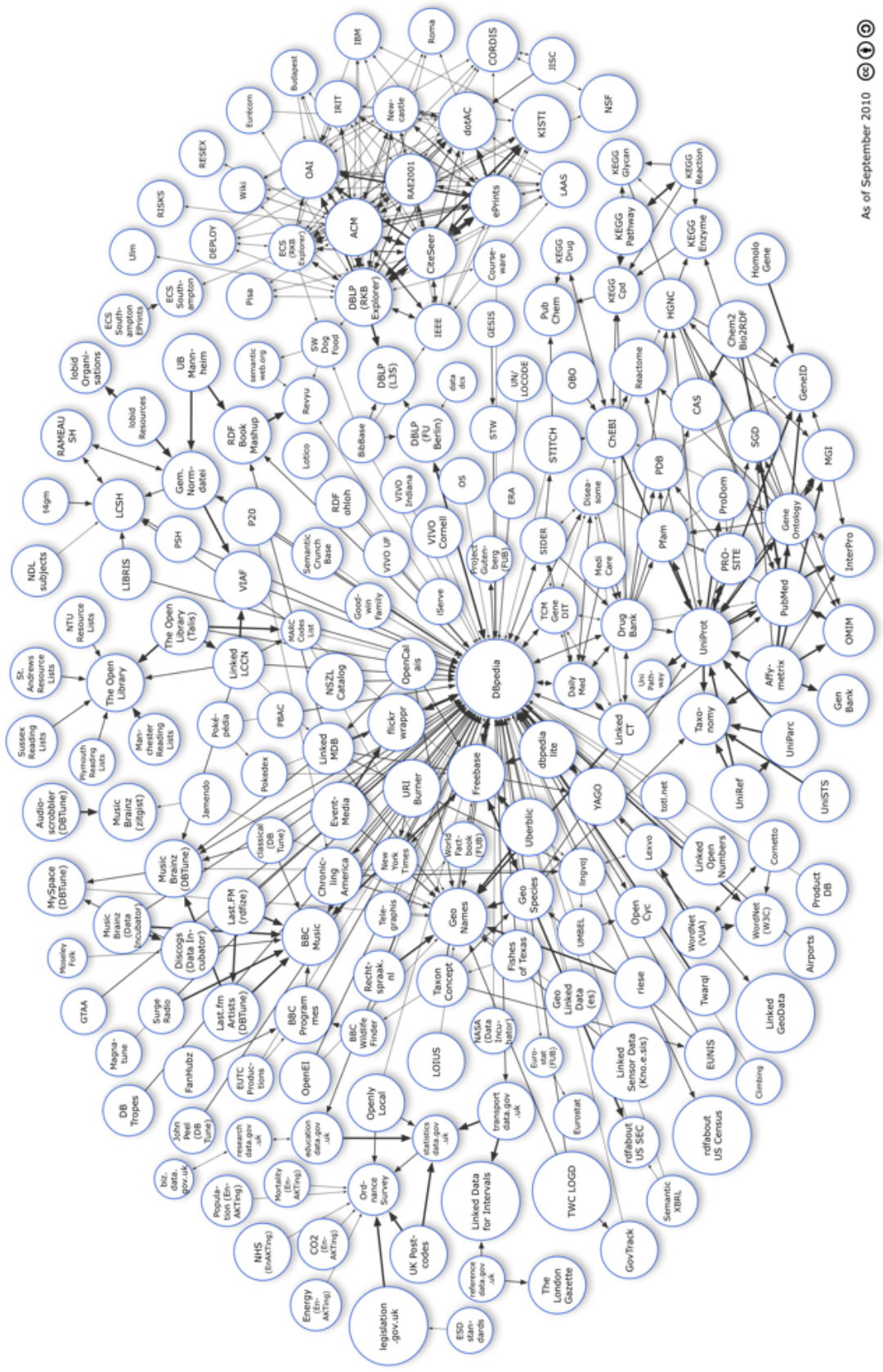

FIGURE 1.4: Linked Data Cloud September 2010

1.2 Report Overview

The rest of this mini-thesis is structured along the following lines, firstly Chapter 2 provides an overview of the development of hypermedia and the emergence of interest and research into link integrity problems. I then go onto discuss how early work now has a renewed relevance since much of how the semantic web is designed and built has striking similarities with the open hypermedia systems of the late 1980s and early 1990s. The literature review concludes by discussing existing and ongoing work by others in the area of link integrity for the semantic web and how my research fits in and complements this work.

In Chapter 3 I discuss the two approaches I have taken in attempting to develop solutions to link integrity for the semantic web including details of the prototype algorithms & systems which I have developed in the course of my research so far. In Chapter 4 I present results from experiments I have run using the prototypes presented in Chapter 3 and provide an initial analysis of the effectiveness of my proposed solutions. Finally in Chapter 5 I discuss my conclusions and future directions for my research with regards to what I intend to focus on going forward towards my thesis.

Chapter 2

Literature Review

2.1 Problems in Link Integrity

As discussed in review papers like Ashman (2000) and Davis (1999) there are two main issues in link integrity with regards to hypermedia systems which are 'dangling-links' and the editing problem. When it comes to the semantic web there have yet to be any review papers which give overviews of the specific problems but based on the research focuses of the community the main problems of concern are the co-reference and identity.

2.1.1 The 'Dangling-Link' Problem

The most commonly addressed issue in link integrity is the 'dangling-link' problem. This is when traversing a link results in the user's browser presenting a 404 Error (or more generally a 4xx Error) to them indicating the requested resource cannot be found, the link points to nowhere so it is considered to 'dangle'. Links can 'dangle' for several reasons but usually it is because the owner of the site where the target resource was located has renamed/moved/deleted the resource in question. Typically the owner will have no idea that they have caused links to 'dangle' by changing their site since it can be difficult to find out which sites link to your site. Unless the other sites are under your control you cannot physically change the site in question even if you knew their links were now wrong. In other cases a link may appear to 'dangle' either due to network problems or because a link has been made to a resource which the author had access to but is actually subject to access restrictions which the author was unaware of. Additional causes of 'dangling' links can include a change of server technologies meaning that file extensions in the URLs have changed or the change of domain/subdomain for a site. This is the type of problem which most research into link integrity attempts to solve since it is simpler to address than the editing problem.

2.1.2 The Editing Problem

The other (arguably) more minor issue is the editing problem (or content reference problem) which occurs when a resource is modified in such a way that although a link to the resource itself will work the resource itself has changed in such a way that the link is incorrect. This may either be that the link pointed to an embedded anchor in the resource which no longer exists or that the content of the resource is no longer relevant to the context from which the link came. For example consider the scenario in which you linked to the products page or a company that produced a product you were reviewing. Six months later the company may produce a completely new product and decides to remove the old product from their products page, your link will continue to work but it no longer references the correct content. This issue has been the focus of less research since it is a much harder problem to solve as it requires machines to understand both the semantics of links and the resources being linked. In terms of the semantic web this is an issue since if you link your data to some concept in someone else's data there is nothing to stop them changing the meaning of that concept and therefore indirectly change the meaning of your data.

Also on the semantic web using a specific URI may have unintended consequences especially when reasoning or inference is applied to your data. For example if you had some data in which you talked about London (as in the capital of the UK) and referred to it using the DBPedia identifier for London[1] this would be a sensible reuse of that identifier. But if you were to use your data combined with some other data sources you might find that someone else had stated in their data that what you meant as London should be considered the same as some other London (e.g. London, Minnesota, USA[2]) which suddenly changes the meaning of your data. Due to this problem the issues of trust and provenance with regards to data are open questions on the semantic web, this problem is outside the scope of my work but Golbeck provides an overview of this area in Golbeck (2006).

2.1.3 URI Identity & Meaning

The semantic web introduces an issue of URI identity & meaning since URIs are no longer referring simply to documents or other HTTP accessible resources but to potentially anything. As a result there has been considerable debate in the semantic web community about what the identity & meaning of a URI is. Does a URI identify only one thing or can it identify many things and what are the practical repercussions of this? Does a URI have a fixed meaning or is its meaning contextual, and perhaps more importantly to what extent does the meaning of a URI matter to a semantic web application? In the event that dereferencing a URI fails - it's a 'dangling-link' - then it would appear that

[1] `http://dbpedia.org/resource/London`
[2] `http://dbpedia.org/resource/London%2CMN`

we have missing meaning. Without a clearer idea of whether missing meaning matters it is hard to say what if anything we should be doing to prevent this situation arising. This issue is somewhat beyond the scope of my current work but Halpin (2009) provides a good overview of the issues.

2.1.4 The Coreference Problem

Co-reference is an issue in link integrity specific to the semantic web though it originates in established issues from the fields of natural language processing (Bagga, 1998) and databases. The basic issue is that on the semantic web everything is referred to using URIs and often you will end up with multiple URIs for the same thing since various different organisations will be creating URIs for their data in their own formats. This is somewhat inevitable since many organisations (especially businesses) want to control their data as much as possible even if they do publish it semantically. Unfortunately this makes it difficult for semantic web applications to find all the data that relates to a particular thing since that thing may have many URIs and there is not necessarily any source of information which will tell you this. Research into the co-reference problem looks at ways in which co-referent URIs can be determined and how this information can be conveyed to semantic web applications.

2.2 Hypermedia

2.2.1 Early Hypermedia

As stated in my introduction the basic ideas behind hypermedia were first voiced by Vannevar Bush in his 1945 article for Atlantic Monthly (Bush, 1945) which introduced the idea of the 'memex'. The ideas behind this device became the inspiration for the earliest hypertext systems which started to be developed in the 1960s and 70s by pioneers like Ted Nelson with his Xanadu system (discussed in his book Literary Machines (Nelson, 1993)) and Douglas Engelbert with his NLS system (Engelbart and English, 1968). It was Ted Nelson who first coined the terms hypertext and hypermedia (see again Literary Machines) to describe the new and novel software systems they were designing at that time. These early hypertext systems were primarily text based although Engelbert's NLS incorporated features like video-conferencing as seen in the so called 'mother of all demos' (**?**) [3]. While these early systems were somewhat limited by the capabilities of computers at that time they showed real potential for making Bush's fabled memex a reality.

[3] 'Mother of all Demos' on YouTube - `http://www.youtube.com/watch?v=JfIgzSoTMOs`

The first hypertext and hypermedia systems which were widely used began to appear in the late 1980s and were initially designed to function from a single machine e.g. NoteCards (Halasz et al., 1987), Neptune (Delisle and Schwartz, 1986) and Intermedia (Garrett et al., 1986) and are generally referred to in the literature as second generation systems. These systems generally focused on using proprietary file formats and viewer applications which allowed users to author and link together related information.

For example NoteCards focused on creating 'Cards' as you would with writing traditional paper note cards. These 'Cards' could be organised into 'Fileboxes' as you would with paper cards but with the advantage that each 'Card' could be linked to any number of other 'Cards'. Neptune is similar is style to NoteCards but was designed primarily for use with CAD applications to link together different aspects of the design. Intermedia and Neptune were somewhat more advanced than NoteCards in that they supported distributed working and therefore allowed users across a network to work on a common set of documents.

The key advantages of NoteCards and similar systems is that being non-distributed the link integrity problem was to a certain degree much simpler to address. While it was still possible for files to be deleted or moved on a single machine this can be detected with minimal effort i.e. checking for existence when attempting to access a file and then searching to relocate it (provided it's not been deleted). This means the 'dangling-link' problem is of minimal concern to such systems. More problematic still is the Editing problem since these systems cannot guarantee that the information at the end of a link is the correct information with regards to the source of the link and its intended purpose. As will be discussed later distributed systems such as Intermedia and Neptune are far more problematic and require much more complex systems to enforce link integrity.

2.2.1.1 Halasz's 7 Issues

NoteCards is of particular interest in the history of hypertext research since one of the creators Frank Halasz wrote a seminal critique of his own system in which he discussed 7 Issues for the next generation of hypertext (Halasz, 1988). The issues are of particular importance since later developments in hypertext research were often measured against these issues to gauge the state of the research and the maturity of the technology. The seven issues are as follows:

- *Search and Query*

  Most early hypertext systems only permitted the user to navigate either by looking at the organisational structure as a whole or by following links from the hypertext nodes. This proved to be insufficient for users since they could easily miss relevant information since it wasn't necessarily linked to related information correctly. The

ability for users to simply query the system for information on a given topic didn't exist in systems of the time.

- *Composition*

  Some early systems did not provide any mechanism for different forms of content to be composed into one object e.g. a document containing graphics and other multimedia. This issue has minimal bearing on link integrity and in general has been solved by all modern hypertext systems.

- *Virtual Structures*

  The ability to create dynamic structures at the time the user accesses a system was considered an important development. The modern web is now composed primarily of content which is all/partially of this type and this presents its own issues for link integrity particularly with regards to the Editing Problem since if you link to a dynamically generated page there is not necessarily any guarantee that the content at the end of the link is what you expect it to be.

- *Computation over Networks*

  Halasz believed it should be possible to perform computation over a hypermedia network in order to produce new information or modify existing information. Essentially this is the inference of implicit information from existing explicit information. Many modern systems now achieve this to some degree and it is one of the hot research topics in Semantic Web research and more generally the field of Web Science.

- *Versioning*

  Some researchers believed that in order to preserve linking between objects it should ideally be the case that all versions of an object in a hypermedia system are preserved so that a link can always be resolved to its intended destination.

- *Collaborative Work*

  Since early systems were not distributed they made any form of collaborative working difficult/impossible. While modern systems generally handle collaborative working well it can pose issues for link integrity since two users can make changes to a system independently that individually have no effect on link integrity but when combined may break link integrity.

- *Extensibility and Tailorability*

  The ability to extend and customise a system as desired was not really an option with early hypertext since most systems were proprietary and few people were allowed to work with the actual source of the systems (NoteCards itself was unusual in having a programmers API). Halasz believed that the very generic nature of hypertext systems posed a problem for them since they often were too broad

to serve the purposes to which users wished to put them. Modern systems now provide these features as standard with comprehensively documentation in order that users can specialise their systems as desired. Extensibility can potentially cause problems for link integrity if it changes the way in which the system handles linking or if it introduces forms of content which the system cannot control sufficiently to ensure the integrity of links to that form of content.

Note that most of these issues have to some degree been solved or mitigated by solutions developed for the Web e.g. Search and Query has been mostly solved by Search Engines (see Section 2.2.3.1).

2.2.2 Open Hypermedia

Open Hypermedia was a movement in the late 1980s and early 1990s around systems designed to link together arbitrary documents to create hypermedia systems. The prime examples of this are systems such as Microcosm (Fountain et al., 1990) and HyperG Kappe et al. (1994) which were designed around the time when the World-Wide Web was not yet the dominant hypermedia system it is today. These systems were somewhat similar to the early hypermedia systems discussed in the previous section but they were no longer reliant on proprietary formats. Unlike systems such as NoteCards which had a specific document format open hypermedia systems were designed to link any kind of document that a user had on their computer together. While some were initially intended only to be run on single machines (e.g. Microcosm) most eventually evolved to support some form of distributed system in an effort to compete with the Web. The open hypermedia movement produced some useful link integrity work which is discussed later in Section 2.3.1 but in terms of their place in the evolution of hypermedia they are interesting in that they resulted in the Dexter Model.

2.2.2.1 Dexter Model

As the number of different systems proliferated in the later 1980s the hypertext community felt there was a need to formalise the concepts of hypertext and so a meeting of the major US Research groups was held in order to formulate a standard model for hypertext. As a result the Dexter Hypertext Reference Model (Halasz and Schwartz, 1994) was created as a high level model of hypertext, in reality it was too high level and no system ever really became fully Dexter compliant. The interesting result of the Dexter model was the formalisation of the concept of Links which would influence the next few years of hypertext research.

In the Dexter model a link is as an entity which represents relationships between components (more commonly referred to as nodes/documents). The model defines a link

as being a *sequence of two or more "end-point specifications" each of which refers to (a part of) a component in the hypertext*, this means that a link connects 1 location to potentially many locations. Locations for links in Dexter are specified by anchors which are composed of a unique ID and some arbitrary value specifying in some way the region of interest, in the model the system need not understand the anchor value but leaves this to the relevant viewer. This means that a link is actually composed of a component ID specifying the node/document in question and an anchor ID specifying where in the node/document you're linking to/from. The directionality of links is important since the model allows for links to be 1 way/2 way - strictly speaking the definition of a link is a 2 way relationship between two objects but in practise most systems past & present only use 1 way links (which are therefore technically pointers and not links).

The problem with this notion of links is that it imposes a number of constraints which many hypertext systems regularly violate and which unnecessarily restrict the functionality of systems. Firstly the model requires that all links must resolve to a specific resource i.e. they cannot 'dangle' which raises two issues:

1. When authoring hypertext initially it is quite normal to link to a node/document which doesn't exist because you haven't produced it yet. According to the model you can't do this which will impose extra authorship effort on the hypertext author. Yet this is very common on the current Web, for example the MediaWiki[4] content management system which powers Wikipedia[5] and many other websites allows for you to create links to pages that don't yet exist and without this feature it would be very difficult to author these sites.

2. Dynamic links are not supported by the model since they don't resolve to a fixed resource and may not in fact resolve at all. These kind of links are essential for providing the navigation by querying discussed by Halasz in his Seven Issues (Halasz, 1988) and mentioned earlier in this review, see 2.2.1.1

Secondly the models use of the anchor concept means that it doesn't have the ability to express the use of embedded links since it requires links and anchors to be fully external to the nodes. While this may be desirable in some systems most will use some level of compromise with some/all of the data being embedded in the actual node. Thirdly leaving the processing of anchors entirely to the viewer applications and not doing it within the system is problematic. It's up to viewers to maintain the anchors when in fact they may be completely unaware of the hypertext system and unable to fulfil this function thus rendering anchors quickly useless as a document changes.

As already mentioned no systems ever met the Dexter model fully since in trying to express a broad model to accommodate most people it ended up being too high level to

[4] `http://www.mediawiki.org`
[5] `http://wikipedia.org`

be of real use. In particular the notion of links was not suitable for the actual systems people were building and wanted to build - especially the requirement that links must be resolvable. As I'll discuss later in Section 2.2.3 without the ability for links to fail the World-Wide Web likely wouldn't have been able to expand as quickly as it did or become the pre-eminent hypermedia system that it is today.

One interesting feature of the Dexter model is that it contained the concept of typed links which were generally ignored on the document Web until the recent push in certain parts of the hypertext authoring community to produce 'Plain Old Semantic HTML' (POSH)[6]. Yet in the context of the Semantic Web typed links are very relevant. As RDF is base upon linking information together and all links (i.e. predicates) have a URI they are implicitly typed it should be obvious that ultimately the semantic web is composed of typed links, there are no untyped links because predicates can only be URIs as defined by the RDF abstract syntax (Klyne and Carroll, 2004). Later in this report in Section 3.1.1.1 I show how typed links can be used to define domain specific ways of recovering linked data about a URI of interest.

2.2.3 The World Wide Web

The World-Wide Web (WWW) was a distributed hypermedia system designed at CERN by Berners-Lee et al. (1992) created originally as a means of collaboration between scientists but which quickly became a global phenomenon and ultimately the most widely used hypermedia system on the internet today. The advantage that the Web had over previous distributed systems was twofold: *1*) it was based on open standards; and *2*) it did not enforce link integrity Without these two advantages it is doubtful whether the Web would/could have grown to it's current size today.

Point 1 was important since unlike the open hypermedia systems discussed in the previous section all the data in the system was available in a standard open format - Hyper Text Markup Language (HTML) - addressable with a standardised addressing system - Uniform Resource Locators (URLs) - and accessible over a standard protocol - Hyper Text Transfer Protocol (HTTP). While initially these were only informally specified these quickly became formal standards defined in RFCs and published by the IETF - see : *1*) HTML (Berners-Lee, 1994); *2*) HTTP (Berners-Lee et al., 1996); and *3*) URLs (Berners-Lee et al., 1994a) . Having open standards meant that anyone who chose to could publish data in a format that anyone with a web browser could consume and anyone with the requisite technical expertise could write their own web browser/HTTP client to consume data.

Arguably the most important advantage of the WWW was point 2 - that link integrity was not enforced. Since the system was distributed it's designers saw that it would be

[6]See `http://en.wikipedia.org/wiki/Microformat#Plain_Old_Semantic_HTML_.28POSH.29` for a definition and technical overview of this

very difficult/impossible to enforce link integrity within the system and decided that it would be better if links were allowed to fail. So they introduced the HTTP 404 error which indicates that a resource is not found on a server, by adding this mechanism you permit publishers of data to link to content without needing to worry about whether that content is actually there (or whether it will be there in the future). The importance of this should not be underestimated since it allowed the web to expand exponentially since there were minimal restrictions on publishing content as all a person needed was knowledge of HTML and access to a server on which to publish their content.

2.2.3.1 Search Engine

As the system grew people found that the WWW was quite difficult to navigate since they encountered what is referred to as the Hypertext Navigation Problem. This is the observation based upon studies of usage of hypermedia systems that users often find that they get lost/disoriented in the system - either they are unable to find the information they were looking for or they are unable to retrace their steps to find previously viewed information. While the early web browsers (and indeed all modern browsers) addressed some of this with their provision of bookmarks/favourites and history functions this doesn't allow users to find brand new information and this is where search engines come in. In the early days search engines like Yahoo[7] started out as being the digital equivalent of phone books maintaining categorised and/or alphabetised hand curated directories of websites. The problem with these was that they relied on human curation of the dataset and as the WWW expanded exponentially this became infeasible in terms of cost and time. This resulted in a new breed of search engine which indexed the web automatically and provided keyword based search for finding web pages with perhaps the most well known of these today being Google[8].

Since users could now find content easily the hypertext navigation and link integrity problems fell somewhat by the wayside. When a user encountered a 404 error or didn't find the content they expected it was trivial for them to use a search engine to discover alternative sources of the content. This lack of interest in the problem is reflected in the level of research into link integrity which drops significantly in the late 1990s and early 2000s - researchers felt that it simply wasn't worth investigating the problem since creating a general solution appeared intractable given the scale of the Web and its continuing exponential growth.

[7] `http://www.yahoo.com`
[8] `http://www.google.com`

2.3 Link Integrity

Attempts to solve the problems in link integrity introduced earlier in this chapter can be characterised in various ways, those in which we are particularly interested are maintenance, preservation and recovery which are defined as follows:

Definition 2.1. Maintenance based approaches aim to ensure that links are always valid by maintaining them automatically, they are often coupled with Recovery approaches as a means to repair any links that are detected to be broken by the maintenance process.

Definition 2.2. Preservation approaches replicate the original data of interest such that if the data is no longer accessible at the expected location the preserved copie(s) can be used instead.

Definition 2.3. Recovery approaches are processes which are applied after a link fails, these attempt to find alternative sources of the data to which the link was referring and may additionally return similar/related data.

2.3.1 Link Integrity in Hypermedia

Link integrity in hypermedia first received serious attention in the late 1980s and early 1990s primarily from researchers in the open hypermedia community. Systems like Microcosm (Fountain et al., 1990) and HyperG Kappe et al. (1994) were among the first to consider the issue in depth, Davis's thesis (Davis, 1995) and Kappe's 1995 paper (Kappe, 1995) provide examples of link integrity in open hypermedia.

Open Hypermedia systems (as mentioned earlier in Section 2.2.2) were hypermedia systems designed to manage collections of arbitrary documents and provide support for interlinking between those documents separate from the documents themselves. This provides an advantage in that any type of data can be linked together without needing to modify the files themselves, at the time this was an important feature since unlike today most document formats were tied to proprietary software and there was no way to modify the files to insert link information. Additionally the separation of links and documents meant that documents could be created without any links and then linked to other documents as was necessary. Since links are stored externally to documents in a linkbase (see Definition 2.4) it is necessary to provide special software (or extensions to existing software) which allow the end users to actually see and follow the links attached to the documents. While this creates some additional technical challenges in providing the means for users to navigate their linked documents properly it makes it easier to maintain link integrity.

Definition 2.4. A Linkbase is a software component which allows for the storage and retrieval of links between documents

2.3.1.1 Microcosm - LinkEdit

An advantage of linkbases is that as all links are stored in one place it is much easier to check whether the links are valid using automated tooling since at a basic level the tools do not need to know anything about the document formats they just need to be able to confirm whether the documents being linked between exist. In practise things are somewhat more complex since open hypermedia systems often allowed for linking to specific parts of the document so where this is supported the tools need to be aware of the document formats and be able to confirm whether the place in the document the link points to is valid. In Davis (1995) one of the pieces of work he discusses is a tool called LinkEdit which does just this, it allows a user to view a particular linkbase and check whether they work as expected. Since some types of links can point to within documents (rather than just at documents) it has limited support for some document formats to verify that the link points to the intended place in the document.

There are two problems with such tooling, the first is that when you have links that point to specific parts of a document you need to understand the document formats and there will ultimately be far more document formats than you can realistically maintain support for. The second is that how does such a tool maintain links to external resources in a distributed system since the tool will typically have no control over the documents at other servers so automated fixes to links are often not possible.

2.3.1.2 HyperG - p-flood

While having linkbases does make some aspects of maintaining link integrity easier they also pose the problem that you may have many separate linkbases - especially in a distributed system - which you need to validate and maintain separately. The p-flood algorithm was designed by Kappe (1995) expressly for this purpose and implemented within the HyperG system (Kappe et al., 1994). In the p-flood architecture each server has its own linkbase which contains all the links both local to itself and those pointing to external resources. As he discusses in his paper the maintenance of local integrity is relatively easy and can be done using the techniques discussed earlier in this section whereas maintaining distributed integrity is more complex. In his algorithm documents which contain links to external servers and referred to as surface documents and the links referred to as surface links. Each server maintains a linkbase of surface links and the meta-data of the surface documents including those from external servers so that when a change occurs which affects the integrity of the links e.g. the deletion of a surface document other servers can be informed of this change.

Getting all the servers that are affected to coordinate in real-time is infeasible for various reasons as discussed in Kappe's analysis in Section 3.2 of his paper; in that section he discussed multi-server transactions as based on the work of Coulouris and Dollimore

(1988) on distributed systems and as a result of his analysis he instead proposed a weak-consistency approach (see Definition 2.5). The p-flood algorithm he presents is optimized for scalability since the amount of traffic generated is not dependent on the number of references to the altered object and the recipients are not required to be available at update time. The algorithm meets the weak-consistency requirement since it guarantees eventual delivery of every update message to every server, for example even if a server is unavailable for a considerable period when it becomes available again it will receive all messages sent during the period of downtime. To achieve this a probabilistic design to the algorithm is used to provide both the necessary scalability or update propagation and to be entirely automatic i.e. no need to configure manually how updates are distributes amongst the servers.

Definition 2.5. A weak-consistency approach accepts that the hyperweb being maintained may be inconsistent for a certain period of time but guarantees that it converges to a consistent state eventually.

The advantages of a weak-consistency approach are clear in that it provides for a system which is truly scalable since there is no need for all the servers affected by a change to be aware of it immediately. As long as users are willing to accept temporary broken links - which clearly they do since they encounter and accept permanently broken ones regularly on the web - then a weak-consistency approach is sufficient to solve the problem. The disadvantage of such a system is that it requires everyone to buy into it in that in order for the system to work the vast majority of servers in a system must participate or it will simply be ineffective. It is this disadvantage which meant that systems such as these have never been applied on true web-scales because getting them implemented and deployed sufficiently has not been feasible let alone possible.

2.3.2 Link Integrity on the World Wide Web

The widespread growth of the World Wide Web (Berners-Lee et al., 1994b) in the mid-1990s led to some new research but as search engines became effective and commonplace (see Section 2.2.3.1) towards the end of the decade research interest dwindled. It was perceived that users did not care sufficiently to warrant research into the problem as they could locate missing resources effectively using search engines, in addition the scale of the web by that time was simply too vast for many proposed solutions to handle. Davis's survey (Davis, 1999) provides a good overview of the state of this research as of the end of the 1990s. Another reason for the decline in research was that the fact that links could fail was one of the reasons the web was able to expand as fast as it did since it didn't matter if links failed and produced the familiar HTTP 404 error (see Section 2.2.3).

Ashman's 2000 paper (Ashman, 2000) which discusses link integrity with particular

reference to electronic document archives provides both a useful survey of existing work and describes a key motivation for ongoing research. As more document collections were translated into digital forms and placed onto intranets and later the internet people once again started to be concerned about link integrity. Users wanted assurances that links into the document archives would work consistently and ideally links out of the archives would work correctly as well since it may not be possible to alter the archived documents without invalidating the integrity of the archive.

2.3.2.1 Permanent Identifier Services

There have been multiple attempts to address the core problem highlighted in Ashman (2000) that links need to be persistent/permanent. The first approach to solving this problem focuses on creating new URI schemes where an identifier for the resource is encoded rather than its location such that resolver services can turn these identifiers into URLs at resolution time so always go to the correct location of the resource. The most well known scheme designed for this purpose is the Uniform Resource Name (URN) scheme (Moats, 1997) which provides a URI syntax for giving your resources names which are then resolved to URLs when necessary. URNs use namespaces to subdivide names into schemas such that formally registered schemas have formally registered resolver services so that a client that understands URNs can query the correct resolver to get an appropriate URL. URNs have the advantage that the owner of that URN can choose to move the resource to a different URL at any time provided they update the resolver service with the new URL for their URN but their obvious disadvantage is the need for a centralised resolver service which goes against the decentralised nature of the web. It is possible to reduce the centralisation requirement somewhat by having multiple resolvers at different servers for the same URN schema but this then introduces the need to keep the resolver services synchronised or aware of each other.

The second approach to the problem is simply to use a URL redirection service where you have a central service that provides you with URL(s) which you associate with the actual URL of the resource. This way you can use the redirection URL as the public URL for your resource and can move it freely between servers by simply updating the actual URL at your redirection service. In essence this gives the benefits of URNs i.e. permanent identifiers without the extra overhead since there is no need to discover which resolver service to use since that is directly encoded in your permanent URL. The most widely used service - particularly on the semantic web - which does this is the PURL (Permanent URL) service by the OCLC (OCLC, 1995). Again such services have the disadvantage that they rely on a centralised service and unlike URNs they cannot have multiple resolvers since the URLs implicitly encode a single resolver in them.

2.3.2.2 Replication & Versioning

An alternative to having persistent/permanent URLs is to replicate and version the content that you are interested in and modify your web browser such that it can use the replicated/versioned content whenever you desire. In Chapter 3 I discuss using approaches of this kind for the semantic web.

In this vein Veiga and Ferreira (2003, 2004) discuss the possibility of turning the web into an effective knowledge repository by using such an approach. Their work follows on from earlier work such as Moreau and Gray (1998) which proposed limited use of replication and versioning but had significant reliance on author and user involvement in the process. In Veiga & Ferreira's work there is no requirement for author involvement in the process, only the end user need use a browser plugin to indicate the content they wish to replicate and preserve. Their results showed that the user could preserve the sections of the web they were interested in with no perceivable performance impact - on average there was only a 12ms increase in retrieval time for resources. The advantage of such a system is that it does not place any onus on the publisher of content to provide this capability and instead provides it as the user level. Thus only users who want/need this capability need have the relevant software and there is no need for the architecture of the web to be changed/augmented. The disadvantage of such a system is that it still requires the user to know that they want/need to replicate/version a certain part of the web and they can't retroactively do this once the content they were interested in has been removed from the web.

An intesting new approach to this problem has recently been proposed in the form of the Memento project (Van de Sompel et al. (2009, 2010)) that advocates a HTTP based versioning mechanism. In their system servers that wish to participate replicate and version their content and then serve appropriate versions of the content depending on the HTTP Headers. Essentially it provides for content-negotiation by time with a HTTP server which means that unaware clients need not be aware of this feature and will always receive the latest version of the content while aware clients can use this to browse the version history of the data if they so desire. The advantages of such a system are clear in that it only requires those who want to participate to do so and that it does not require use of any special software/protocols in order to levarage it. Pretty much any HTTP client program and programming language with HTTP support has the ability to send arbitrary HTTP Headers with their HTTP requests so the entire HTTP ecosystem already has the ability to access this functionality when interacting with a server that provides it. The disadvantage of the approach is that the HTTP Headers are not yet recognised as standard headers and that some poorly written HTTP servers may choose to reject requests if they don't understand a particular HTTP Header.

2.3.2.3 Robust Hyperlinks

Phelps & Wilensky introduced the concept of lexical signatures for Web pages in their Robust Hyperlinks paper (Phelps and Wilensky, 2004). Their approach computes what they term the lexical signature of a page and appends it to all links to that page so that in the event of the link failing a browser plugin can use the signature to relocate the page using a search engine. This lexical signature is represented as a set of terms (their paper states that 5 terms is optimal) which characterise the resource sufficiently that when a search on those terms is performed across multiple search engines the consensus top result is the new location or a very close match to the originally intended document. The limitation is that this relies on the web page having been available on the web for a sufficient period of time to be crawled by search engines, and not being missing from the web for long enough to have been removed from the search engine caches. Despite this limitation their approach proved remarkably effective in their testing. The obvious flaw in their work was that it required rewriting all the links on the Web to use this robust hyperlinks approach which was never going to be practical or scalable.

Later research by Harrison & Nelson built on Phelps & Wilensky's concept and showed that these signatures need only be computed Just-in-Time (JIT) when a link fails (Harrison and Nelson, 2006). In their Opal system the signatures can be computed JIT by retrieving cached copies of the pages from a search engine cache, computing the signature and then using search engines to relocate the page. Opal used multiple redundant servers which provided a user interface to this automatic retrieval of the intended content rather than just redirecting users to what it believed to be the correct alternative source of the desired content. Instead it offered users multiple options for alternative sources of the content and allowed them to give feedback as to whether the alternative sources were correct. This meant that the system gained feedback from users which let it refine its suggestions in the future, the servers themselves were able to synchronise data between them so all servers learned from this user feedback. This approach has clear advantages over other approaches to link integrity in that it doesn't require the user/publisher to care about link integrity ahead of time but still provides a highly effective means to recover the desired content should it become unavailable for any reason. The main disadvantage of such an approach is that it requires the user (or at least their software) to be aware that there is such a system available and to make use of it when a 404 is encountered.

2.3.3 Link Integrity for the Semantic Web

Unlike the traditional document web it is often not possible for semantic search engines like Sindice Tummarello et al. (2007a) and Falcons Cheng et al. (2008) to fulfil the same role as document search engines because the users in the semantic web domain are

typically client applications rather than humans. When a human encounters a dead link they usually navigate to a search engine and enter an appropriate search phrase to find alternative sources of information. For a client application encountering a dead link they will typically have no concept or how/where to find alternative sources of information and URIs for linked data are not always ideal for searching upon compared to textual search for documents. It should be noted that as with the existing web if the web of linked data is to undergo a massive expansion in the same way things must be allowed to fail but this does not mean we shouldn't attempt to mitigate the problem as far as possible.

2.3.3.1 Replication & Versioning

In terms of the semantic web there has been research into the replication and versioning of RDF data which is relevant to aspects of my work such as RDFSync (Tummarello et al., 2007b) which is an algorithm for efficiently synchronising changes in RDF between multiple machines. RDFSync is an algorithm which can effectively synchronise RDF between servers and provided for multiple types of synchronisation beyond simply pushing changes from one document to another. Their work showed that change detection in RDF is non-trivial due to the inherent data isomorphism caused by the use of blank nodes but also shows that it can be achieved in an efficient manner. While this isomorphism can present problems algorithms for graph matching like the one described in Carroll (2002) show that it can be done effectively. Such algorithms can be easily reduced to algorithms for sub-graph matching which is useful for implementing isomorphism detection as part of change detection algorithms for RDF.

More recent research from Papavassiliou et al. (2009) has shown that using information about very basic changes in the RDF - such as that provided by systems like RDFSync or my own All About That (described later in Section 3.2) - can be used to build applications which provide useful information to end users. In the case of Papavassiliou's et al's paper they built a system which furnished users with high level descriptions of how RDFS vocabularies have changed in order to aid users in working with such vocabularies. This shows that there is an additional motivation for creating systems that replicate and version RDF data beyond just the link integrity use case which was the original motivation for my own work.

As already mentioned in Section 2.3.2 the proposed Memento system specifies a HTTP based versioning mechanism. Since the system is based entirely on HTTP it is just as applicable to the semantic web as the document web and as described in Van de Sompel et al. (2010) the researchers behind it have already demonstrated this capability by providing the Memento service for DBPedia[9]. This is important in that it shows such

[9] `http://dbpedia.org`

a system can work effectively on large semantic web datasets while as discussed earlier being completely transparent to non-aware clients.

2.3.3.2 The Co-Reference Problem

Regarding semantic web specific link integrity problems the research has largely focused on the co-reference problem. Since there are many organisations publishing similar data semantically (bibliographic databases being a prime example) there are frequently many URIs for a single entity such as an author. Co-reference research aims to develop ways to efficiently and accurately determine URI equivalences and refactor the data or republish this information to help other semantic web applications. There are several competing philosophies ranging from the Okkam approach described by Bouquet et al Bouquet et al. (2008) which advocates universally agreed URIs for each entity to the Co-reference Resolution Service (CRS) approach of Jaffri et al Jaffri et al. (2008) which determines co-referent URIs and republishes the information in dedicated triple stores. The CRS approach taken by the ReSIST project[10] within the RKB Explorer[11] application has potential for use in link integrity as the information provided by a CRS could be utilised in a JIT fashion as in Harrison & Nelson's work and I demonstrate how this can be done in Chapters 3 and 4. Note that there are already services available on the web such as SameAs.org[12] which provide co-reference data in RDF formats allowing applications that wish to do so to consume and use this information.

2.3.3.3 Link Maintenance

In terms of link maintenance for the semantic web there is an increasing focus on research into the problems in this area. One of the first efforts was the Silk framework by Volz et al. (2009a) which is a framework for computing links between different datasets. Their approach allows users to stipulate arbitrarily complex matching criteria to do entity matching between datasets, the links produced from this can then be published via a CRS style service or added to the relevant datasets. As proposed in their later paper (Volz et al., 2009b) this can be used as part of a link maintenance strategy and I shall discuss the possibility of combining this with my approach in Chapter 5.

In a similar vein Haslhofer and Popitsch's DSNotify system (Haslhofer and Popitsch, 2009; Popitsch and Haslhofer, 2010) is an enhancement of the Silk style approach which monitors linked resources continuously and informs the user (which may actually be a software application) when links are no longer valid using feature based similarity metrics like the Silk framework. This style of approach where the user sets up a system

[10] `http://www.resist-noe.org/`
[11] `http://www.rkbexplorer.com`
[12] `http://sameas.org`

to monitor the parts of the web they are interested in seems the most appropriate for the semantic web as it should be evident from the research already discussed that universally applicable solutions aren't feasible due to scalability whereas limited solutions are. This approach has similarities to my All About That (AAT) system which I discuss in Section 3.2.1.

2.3.3.4 Vocabularies

Since all the systems described in this section are tailored to the semantic web they typically want to make the information they extract available to other semantic web applications which has led to the development of a variety of vocabularies around the topics of replication, versioning, change management and provenance. One example of this is the Talis Platform[13] which is a cloud-based Semantic Web store that implements a versioning mechanism whereby updates can be made via a Changeset protocol Davis and Tunnicliffe (2007). As part of this protocol they utilise a useful lightweight Changeset vocabulary for publishing changes in RDF data as RDF which as will be discussed in Section 3.2.1.3 I reuse this vocabulary in my own system. Along similar lines but not an actual RDF vocabulary is the RDF-Transaction format[14] used in Sesame[15] and AllegroGraph[16] which is an XML format which achieves the same function as the Talis Changeset vocabulary.

A particular focus of existing research in this area has been into designing vocabularies for expressing versioning and provenance of semantic web data. Such vocabularies have potential applications in any system which attempts to preserve link integrity since if we are to preserve data then we need to know when and where it came from. The pre-eminent vocabularies in this area are the Provenance Vocabulary (PV) by Hartig and Zhao (2010) which was developed by semantic web researchers and the Open Provenance Model (OPM) by Moreau et al. (2007) which was developed by provenance researchers. The different approaches to provenance as seen by semantic web researchers and provenance researchers is evident in the fact that the two vocabularies express things quite differently and there is not yet a completely agreed mapping between the vocabularies since the OPM is far broader and more expressive than the PV. As we will later discuss in Section 3.2.1.1 I propose a much simpler vocabulary for use in my system primarily for the purposes of efficient implementation.

[13] `http://www.talis.com/platform`
[14] `http://www.franz.com/agraph/allegrograph/doc/new-http-server.html#rdftransaction`
[15] `http://www.openrdf.org`
[16] `http://www.franz.com/agraph/`

Chapter 3

Method

As we have discussed it is not realistic to maintain link integrity in a pre-emptive way since such solutions have been consistently shown not to scale to Web scale in previous work. Therefore the focus must be on recovery in the event of failure and preservation to guard against the loss of data which is considered interesting/useful to end users. As the amount of data in the web of linked data starts to expand massively - particularly with linked data being adopted by an increasing number of major organisations - we expect that as with the early document web there'll be an increasing amount of content published by both big companies and individuals. Just like the document web this explosion of content will most likely include much content that is poorly maintained and will lead to increasing numbers of broken links. I have two connected goals in this work in order to meet the success criteria laid down in my hypothesis (see Section 1.1):

1. to provide a means to retrieve resource descriptions in the form of linked data about a URI even when the the URI is non-functional and
2. to provide the means for an end user to preserve and version these descriptions.

In meeting these goals I will satisfy point 1 of my success criteria since I will be showing that link integrity techniques from hypermedia can be applied to the semantic web. To attempt to meet these goals I present an expansion algorithm for retrieving Linked Data about a URI even if that URI itself has failed in Section 3.1.1 and a preservation system built using this algorithm in Section 3.2. Note that by preserving linked data I mean that a system is provided which allows data to be preserved as per the definition of preservation given in Definition 2.2.

3.1 Recovery

As discussed in the Literature Review in Section 2.3.2.3 one possible solution which has obvious potential for application to the semantic web is just-in-time (JIT) based recovery of broken links as proposed in the work of Harrison and Nelson (2006) and based upon the earlier work of Phelps and Wilensky (2004). In this section I explain my proposal for a JIT based approach to recovery of data on the semantic web.

3.1.1 Expansion Algorithm

Since the goal of this work is to preserve linked data it was deemed essential that as far as possible it leveraged existing linked data technologies and services in order to effect this preservation. To this end I designed a relatively simple algorithm which uses simple crawling techniques which are directed by a user definable expansion profile (see Definition 3.1). The aim with this algorithm is to provide resource descriptions of a URI regardless of whether the URI itself is dereferenceable.

Even in the case where a URI is used only as an identifier in the description of another resource and is not itself dereferenceable it is likely that it can still retrieve some data about it. The fact that a URI is minted only as an identifier and that the person/organisation minting the URI does not provide the means to dereference the URI does not affect our ability to find data about it assuming that the identifier is used elsewhere i.e. it is reused as part of linked data.

The inspiration for this algorithm is the simple observation that the power of the semantic web lies in its interlinked nature which are both implicitly bi-directional due to the RDF data model and typed. Additionally in the case of the web of linked data the links are often explicitly bi-directional since the data sources at either end will both assert links to each other. As can be seen in Figures 1.1-1.3 the interlinked nature of the data is particularly evident on the web of linked data. Therefore the basic idea behind my algorithm is to exploit this high level of interlinking to recover linked data about some URI even when that URI itself is non-functional (whether temporarily/permanently) since we can easily find/discover other data sources that link to it and retrieve linked data about the URI from them. Consider the extract of the LOD Cloud shown in Figure 3.1[1] where DBPedia is shown as missing, even if it where to disappear from the web of linked data by utilising all the linkages from data sources around it we could still recover relevant linked data.

In the event that a URI is very poorly interlinked then it is likely that we will be able to recover minimal data about it but this is expected and unavoidable. Just like the Opal

[1]Figure is an extract taken from Figure 1.3 which is by Richard Cyganiak and taken from `http://richard.cyganiak.de/2007/10/lod/`

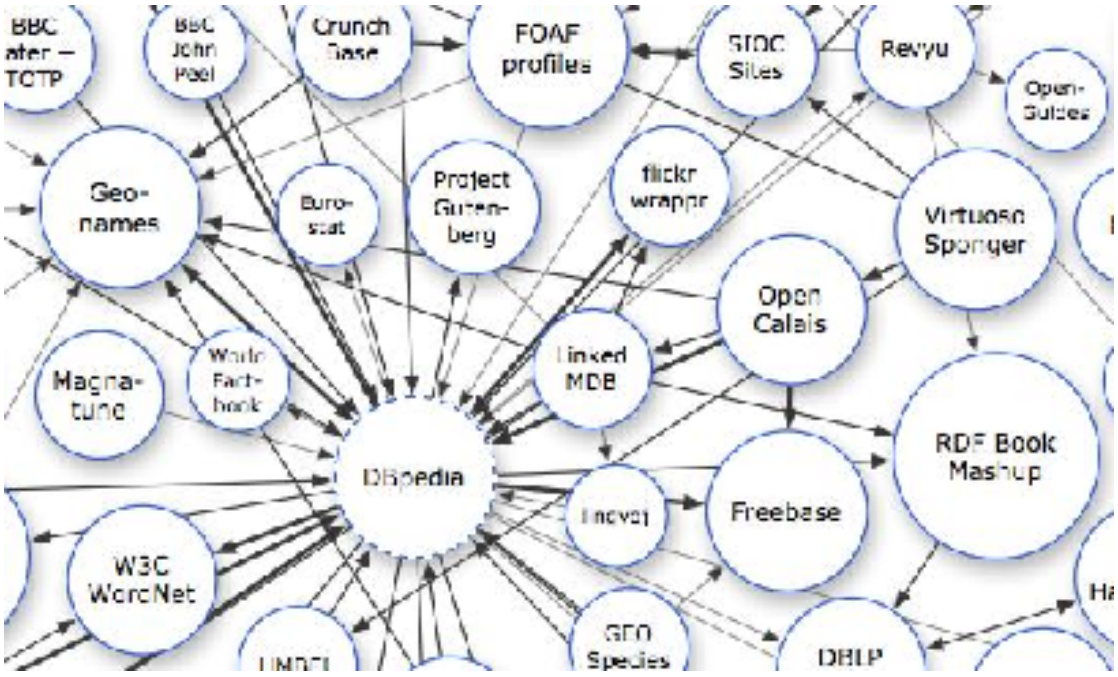

FIGURE 3.1: LOD Cloud extract - What if DBPedia were to disappear?

system (Harrison and Nelson, 2006) if the information you want to recover isn't available in the caches (or in our case data sources) you attempt to use to recover data about the URI of interest then you won't be able to recover it i.e. some data will disappear and become irretrievable just like web pages do on the existing web.

3.1.1.1 Expansion Profiles

Definition 3.1. An expansion profile is a Vocabulary of Interlinked Datasets (VoID) description of a set of datasets and linksets that should be used to locate linked data about the URI of interest. The VoID description may be optionally annotated with additional properties which affect the behaviour of the algorithm.

Drawing on ideas described in the Vocabulary of Interlinked Datasets (VoID) specification (Alexander et al., 2009) about the way it can be used to direct crawlers I decided to use VoID as the primary means of expressing an expansion profile. I introduce a couple of additional predicates since I require the means to allow end users to specify some basic characteristics of how the algorithm should behave and there is a type of service we need to express which is not contained in the VoID ontology. VoID has concepts of Datasets and Linksets, the former represent a set of data which may have SPARQL endpoint(s) and/or URI lookup endpoint(s) while the latter represent the types of interlinkings between datasets. What VoID does not have a means to express is the location of a service provided by a dataset which allows an application to retrieve URIs which are considered equivalent to a given URI - this we term a URI discovery endpoint (see 3.2).

A discovery endpoint differs from a lookup endpoint in that the latter is expected to return everything the dataset knows about the given URI as opposed to only returning equivalent URIs. Examples of existing discovery endpoints on the Semantic Web include RKBExplorer's CRSes (Jaffri et al., 2008) and SameAs.org[2]. Another key difference between a lookup and discovery endpoint is that links discovered from a discovery endpoint are considered to be on the same level of the crawl for the purposes of the algorithm i.e. they do not have increased depth relative to the URI that discovery is performed upon. By this we mean that the execution of the algorithm results in performing a breadth-first depth-limited linked data crawl starting from a given URI - in this tree structure a discovery endpoint introduces sibling nodes for a URI while a lookup endpoint introduces child nodes for a URI.

A useful feature of VoID is that it allows you to state which predicate(s) are used to link between datasets - in essence to state what the type of the links are. As discussed in my literature review in Section 2.2.2.1 the linking in the semantic web is composed entirely of typed links since there cannot be untyped links (the RDF abstract syntax prevents this). When we define an expansion profile to recover data for a specific domain we can define it so that we follow links of types that are relevant to our domain. There are certain general purpose link types that are widely used on the semantic web which we will always want to follow but by using VoID as the basis for the expansion profile vocabulary we allow for links of any type to be defined as links to follow.

This difference between a discovery and lookup endpoint can best be demonstrated by the diagrams shown in Figures 3.2 and 3.3. As can be seen with a discovery endpoint the discovery process adds new siblings nodes for the URI that discovery is performed upon. This is opposed to the lookup endpoint process which introduces new child nodes for the URI - in the context of a depth-limited search this distinction is quite important. For example with the default depth limit being only 1 doing this purely via lookup endpoints would result in many relevant URIs being ignored. If we do a lookup at a discovery endpoint style service we'd get a graph containing the equivalent URIs expressed as `owl:sameAs` links or similar and would then try to follow these but would be unable to do so because they would be above the depth limit of the crawl.

Definition 3.2. A URI discovery endpoint is an endpoint that when passed a URI returns a Graph containing equivalent URIs of the input URI typically in the form or `owl:sameAs` links.

My other extensions to VoID allow for individual datasets/linksets to be marked as ignored (the algorithm will not use them) and for the user to define to what depth the algorithm should crawl to (defaults to 1). These extensions are defined as part of the AAT schema detailed in Section 3.2.1.1.

[2] `http://www.sameas.org`

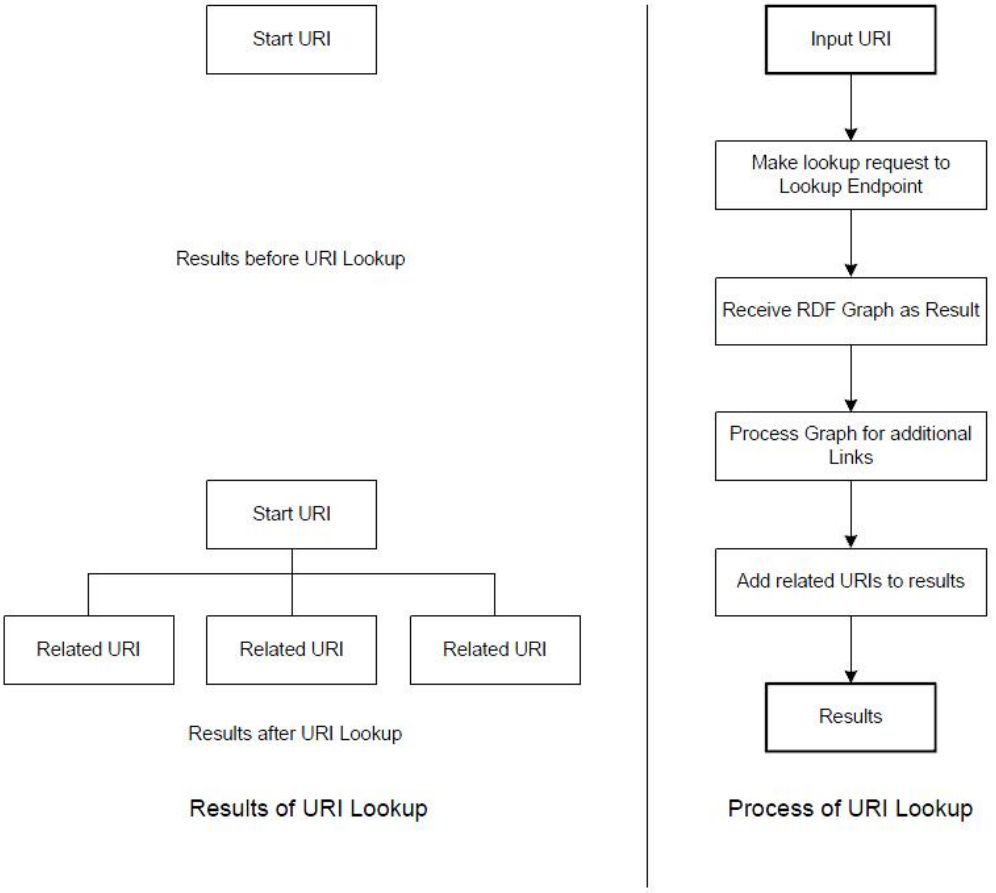

FIGURE 3.2: Lookup endpoint processing model

3.1.1.2 Algorithm Design

As already stated the actual algorithm is a simple crawler which uses the input expansion profile as a guide to which potential sources of linked data it should use to try and find data about the URI of interest - this procedure is detailed in Algorithm 1. Note that the algorithm does not terminate in the event of an error retrieving data from a particular URI/endpoint and simply continues, by doing this it is still possible to retrieve some data even if the starting URI does not return a valid response. The algorithm will continue and issue queries about the URI to the various endpoints described in the given expansion profile so unless the URI refers to a document that had very poor linkages or was not indexed by the semantic search services used some RDF will be returned. This approach has similarities to the JIT style approach of Harrison and Nelson (2006) in that there doesn't need to be any foreknowledge of the URIs you wish to recover data about when you discover they are broken since by utilising the caches and lookup services of relevant datasets it is still possible to recover data about the URI.

The basic behaviour of the algorithm is only to follow `owl:sameAs` and `rdfs:seeAlso` typed links but the end user can specify that any predicate be treated as a link type to follow by the specifying an appropriate VoID linkset in their expansion profile.

Algorithm 1 Expansion Algorithm

Require: URI, Expansion Profile

```
ToExpand as a set of pairs of URIs and Depths
while ToExpand ≠ ∅ do
    Remove first pair from ToExpand
    if Graph with URI is already in the Dataset then
        Continue
    end if
    if Depth >Max Depth then
        Continue
    end if
    Retrieve the Graph at the URI
    Add the Graph to the Dataset
    for all Triples in Graph do
        if Triple is a Link then
            Add a new pair to ToExpand
        end if
    end for
    for all Datasets in Expansion Profile do
        if Dataset has a SPARQL Endpoint then
            Issue a DESCRIBE for the URI against the Endpoint
            Add resulting Graph to the Dataset
            Process the Graph for additional Links
        end if
        if Dataset has a Lookup Endpoint then
            Issue a Lookup for the URI against the Endpoint
            Add resulting Graph to the Dataset
            Process the Graph for additional Links
        end if
        if Dataset has a Discovery Endpoint then
            Issue a Discovery for the URI against the Endpoint
            for all Equivalent URIs do
                Add a new pair to ToExpand
            end for
        end if
    end for
end while
return Dataset
```

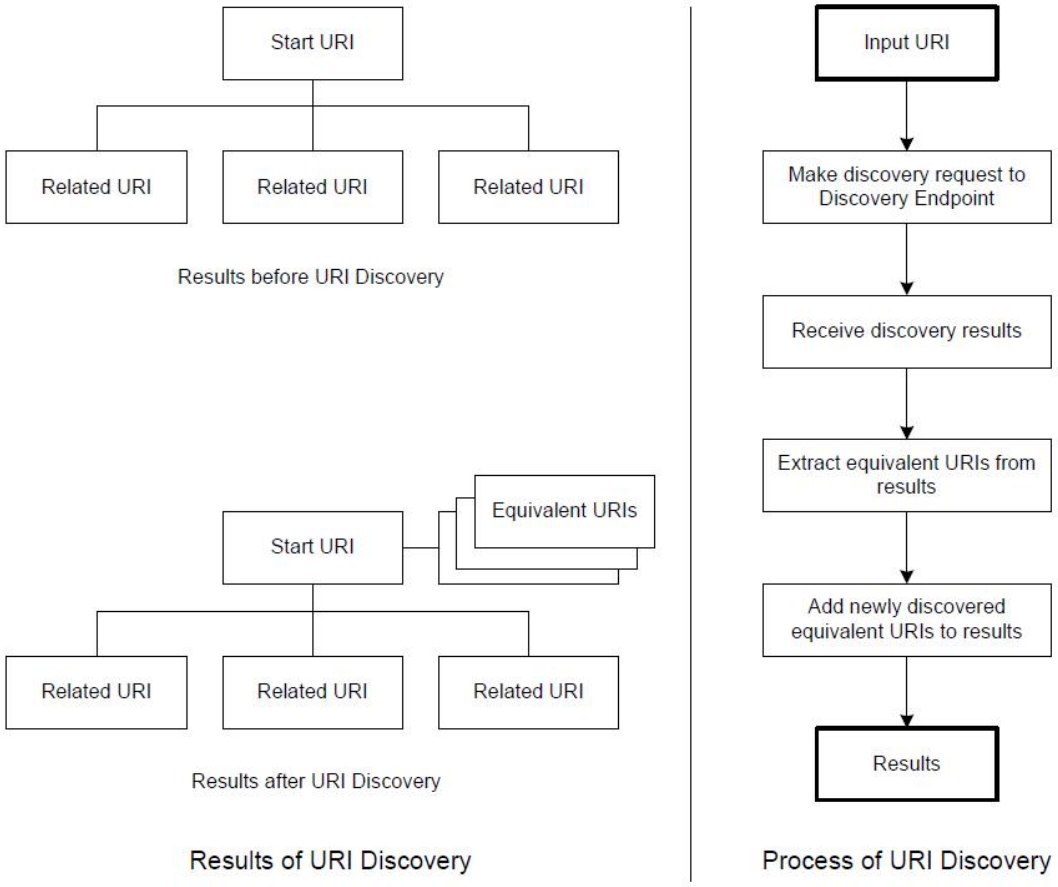

FIGURE 3.3: Discovery endpoint processing model

There are already some existing systems which work in a similar way to our algorithm such as the sponger middle ware used in Virtuoso's sponger (OPL, 2009). The main difference between our algorithm and algorithms such as those in the Virtuoso sponger is that our algorithm is only interested in linked data and it does not infer/create any additional data. Unlike the Virtuoso sponger it does not attempt to turn non-linked data into RDF and it does not do any inference over the data it returns, it is designed only to find and return (in the form of an RDF dataset) linked data about the URI of interest. Yet as expansion profiles may reference any datasets and associated endpoints they wish there is no reason why a user could not direct our algorithm to utilise a service like URIBurner[3] which uses the Virtuoso sponger in order to get the benefits of the additional inferred data.

3.1.1.3 Default Profile

Since the end user of such an algorithm may not always know where to look for linked data about the URI they are interested in the algorithm has a default expansion profile

[3] `http://www.uriburner.com`

which is used in the case when no profile is specified. This profile uses 3 data sources which are in our opinion important hubs of the Web of Linked Data:

- DBPedia[4] - The DBPedia SPARQL endpoint is used to lookup URIs
- Sindice[5] Cache - The Sindice Cache API[6] allows the retrieval of Sindice's cached copy of the RDF from a URI.[7]
- SameAs.org[8] - SameAs.org provides a URI discovery endpoint (see Section 3.1.1 and Definition 3.2) which can be used to find URIs which are equivalent to a given URI

The default profile[9] has a max expansion depth of 1 which means it only considers URIs which are immediate neighbours of the starting URI.

In the case where the end user does know which linked data sources will have useful information about the URI they can specify their own expansion profile which is used instead of the default profile. In this case the algorithm will use the datasets and linksets they define in the profile to discover linked data about the URI of interest, for example if attempting to recover data about a person it may be useful to follow `foaf:knows` links.

3.2 Preservation

As discussed in the Literature Review in Section 2.3.2.2 preservation has been one of the most common approaches to maintaining link integrity but has limitations in terms of its scalability. Despite these limitations such systems are useful in allowing end users to preserve data they are interested in and reuse it for their own purposes as they desire. In this section of the report I present the All About That (AAT) system which is a prototype implementation of such a system.

3.2.1 All About That

The preservation approach taken is to allow the end user to monitor and preserve a set of linked data that they are interested in. The data is preserved not at the data source but rather at a local level on the users server with the user able to republish this data as they desire. This is in line with the ideas of Veiga and Ferreira (2004) in that

[4] `http://dbpedia.org`
[5] `http://www.sindice.com`
[6] `http://www.sindice.com/developers/cacheapi`
[7] Due to changes in the Cache API I was forced to disable use of the API for the time-being as it no longer returns pure RDF
[8] `http://www.sameas.org`
[9] `http://www.dotnetrdf.org/expander/defaultProfile`

the end user specifies the parts of the web they want to preserve and then the software takes care of this. The data must be preserved in such a way that the original data can be efficiently extracted from it and sufficient information to provide versioning over the data is kept.

Since in the semantic web domain the objects of interest are URIs I propose that a profile of a URI be preserved (see Definition 3.3). Since the data being processed is RDF it is logically divided into triples which can be preserved and monitored individually. In order to store the required level of provenance data it is deemed necessary to store information pertaining to the temporality and provenance of each triple - when it was first seen, last updated, source URI(s) and whether it has changed or been retracted/deleted from the RDF.

Definition 3.3. A URIs profile is the transformed and annotated form of the linked data retrievable about a given URI such that the temporality and provenance of the triples contained therein are inferable from the profile

In terms of user interface the system should allow a user to view a profile both in the stored form and in its original form. The system must monitor the original data source over time updating the profiles as necessary such that it can provide a report of changes in the data to the user. Since a URI profile will contain versioning information the interface should allow a user to view a particular version of the profile.

3.2.1.1 Schema

As the first stage of implementation an RDF Schema for All About That[10] (AAT) was defined which embodies classes and properties which allow the description and annotation of triples in such a way that the required information as discussed in the preceding proposal can be stored for each triple. The schema defines a class for representing profiles called `aat:Profile` and uses the `rdf:Statement` class to represent triples. `rdf:Statement` is used as the basis of triple storage as it makes it possible for non-AAT aware tools to extract the original triples from the profile easily. A number of properties are defined which store meta data about the profile itself such as created & updated date, source URI and a locally unique identifier for the profile. Similar properties are defined for triples which allow the first and last asserted dates, source URI and change status of a triple to be indicated. A key distinction in the schema is between `aat:profileSource` and `aat:source`, despite storing equivalent data two predicates are created since the former expresses the URI which is the starting point for the profile while the latter expresses all the URIs at which a given triple is asserted.

While there were alternative schemas and vocabularies available that could have potentially been used to store the required data the motivation behind designing our own

[10]This schema is available at `http://www.dotnetrdf.org/AllAboutThat/`

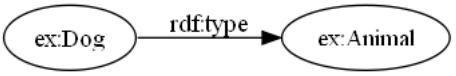

FIGURE 3.4: Original Triple

schema was to provide a lightweight schema that attached all data to a single subject for ease of processing. Alternatives such as the Provenance Vocabulary by Hartig and Zhao (2009) are far more expressive but they potentially require introducing multiple intermediate blank nodes which would significantly complicate the processing needed to implement many of the core features of AAT. Similarly the Open Provenance Model as described by Moreau et al. (2007) is highly expressive but like the Hartig & Zhao's vocabulary the RDF serialization is overly complex for use in AAT. As discussed in Chapter 5 there is no reason why the data contained in AAT could not be exposed in other provenance vocabularies but for AATs processing and storage a lightweight vocabulary is preferable.

The use of reification was chosen over the use of named graphs primarily due to the need to make annotations at the level of individual triples rather than at the graph level, usage is motivated by the fact that the mechanism provides a clear and obvious schema for encoding a triple and adding additional annotations to it. While reification may significantly increase the size of the data being stored initially over time this balances out compared to named graphs where it is necessary to either store many copies of the same graph or store multiple named graphs which represent a series of deltas to the original data. The other difficulty inherent in the named graphs approach is that the annotations typically would then be held separately in other named graphs which adds to the complexity of the data processing. Nevertheless named graphs are used within AAT since each profile naturally forms a named graph and AAT generates several related named graphs about each profile detailing change history and changesets as described in Section 3.2.1.3.

3.2.1.2 Profile Creation & Update

To create a URIs profile linked data about the URI is first retrieved using the expansion algorithm presented in Section 3.1.1; then using the AAT schema each triple can be transformed into a set of triples which represent an annotation of the original triple. For each triple in the original RDF a blank node is created which is then used as the subject of a set of triples which represent the required information about the original triple. Figure 3.4 shows an example triple and Figure 3.5 shows it transformed into the AAT form. A URIs profile consists of a set of transformed triples where each profile is a named graph in the underlying store.

Since the user needs to both browse the data they are preserving as well as potentially republish it, a web based interface was designed as the primary interaction mechanism.

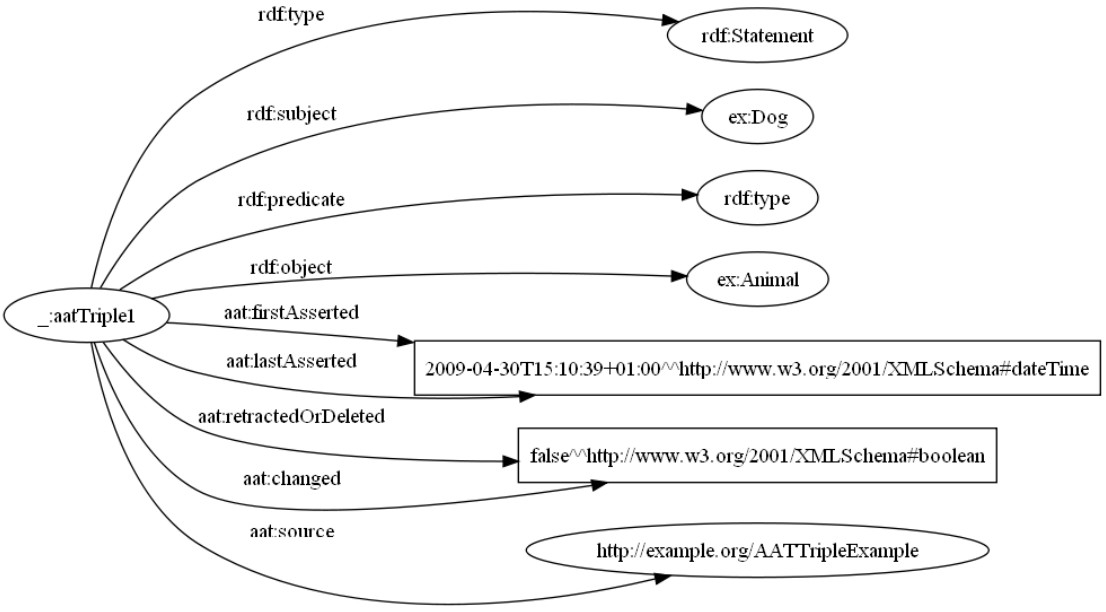

FIGURE 3.5: Triple transformed to AAT Annotated Form

The interface allows users to explore the data by first selecting a profile to view and then allowing them to view profile contents, export, versions and change reports. A user may also use the interface to add new URIs they wish to monitor to the system and to initiate updates to profiles (see Definition 3.4). Following linked data best practices Bizer et al. (2007) and to provide the ability for the user to republish their preserved data multiple dereferenceable URIs for each profile are created and accessible through the Web interface. These allow the retrieval of the profile contents which consists of all the triples ever retrieved from the profile URI in the transformed form, the export of the profile (see Definition 3.5) and various meta graphs about a profile e.g. change history, changesets. This means that the profile of a URI has a URI and thus can itself be profiled if it was desired.

Definition 3.4. An update of a profile occurs when AAT using the Expansion algorithm to retrieve RDF about the given URI. The triples contained are compared with the triples currently in the profile and the profile updated accordingly

Definition 3.5. The export of a profile is the recreation of the RDF in its original form based upon the current contents of the profile. An export represents the RDF as it was last seen by AAT

3.2.1.3 Change Reporting

A key feature of AAT is the ability to generate change reports about how the RDF at the profiled URI has changed over time. To do this a number of relatively simple computations over the annotated triples can be made based primarily on the first and last

asserted dates of the triples. In creating change reports four different types of changes in the RDF are looked for (see Definitions 3.6-3.9). A distinction is made between missing knowledge and retracted or deleted knowledge as it may be possible for triples to be perceived to be temporarily non-present in the RDF. For example in the event of a transient network issue making some/all of the relevant URIs unretrievable the updated date for the profile will still be updated leaving all the triples in the profile to appear missing. The length of time we require Triples to be missing before we consider them to be deleted is currently set to 7 days for our monitoring of the BBC dataset described in Section 4.2.1, this time period is a domain specific parameter that can be adjusted depending on the data that is being monitored.

Definition 3.6. New knowledge is any triple that is new to the RDF at the profiled URI

Definition 3.7. Changed knowledge is any triple where the object of the triple has changed. Only triples where the predicate has a cardinality of 1 can be considered to change

Definition 3.8. Missing knowledge is any triple no longer found in the RDF at the profiled URI but which was recently seen in the RDF

Definition 3.9. Retracted or deleted knowledge is any triple no longer found in the RDF at the profiled URI which has not been seen for a reasonable length of time

In regards to the concept of changed knowledge consider some arbitrary predicates `ex:one` and `ex:many` which have cardinalities of 1 and unrestricted respectively. Since `ex:one` has a cardinality of 1 it can be said whenever the object of that triple has changed it is changed knowledge. Yet it cannot be said for `ex:many` triples as the predicate has unrestricted cardinality, therefore each triple using this predicate must be treated as a unique entity i.e. one instance of a triple using this predicate cannot be considered to replace another. In the examples the fact that $< A >$ was related to $< C >$ via the predicate `ex:many` in Example 3.1 and now is instead related to $< E >$ in Example 3.2 doesn't mean they are related to $< E >$ instead of $< C >$, it just means they no longer consider themselves related to $< C >$. The fact that they are related to $< E >$ is new knowledge while the fact they related to $< C >$ is missing/deleted knowledge, but if the value of the `ex:one` relationship had changed then that would be considered changed knowledge.

Example 3.1 Original Graph

```
<A> ex:one <B> .
<A> ex:many <C> .
<A> ex:many <D> .
```

When a change report is computed is it itself serialized into an RDF Graph using the Talis Changeset ontology (Davis and Tunnicliffe, 2007) which is stored as a named graph

Example 3.2 Modified Graph

```
<A> ex:one <B> .
<A> ex:many <D> .
<A> ex:many <E> .
```

in the underlying store and republished via the web interface. Each changeset generated links back to the previous changeset (if one exists) such that a end user/client application consuming the data can follow the history of changes, a special URI which retrieves the most recent changeset is provided such that users have a starting point for this. Separate to changesets a named graph containing a history for each profile is also stored which links to all the relevant changesets for a profile.

3.2.1.4 Architecture & Scalability

AATs architecture is constructed as shown in Figure 3.6, and as can be seen it is decomposed into several components which then rely on some external standalone components: an RDF API and the expansion algorithm. AAT is theoretically agnostic of its underlying storage though in practise differences in implementation between triple stores mean only certain stores are currently viable for use as the backing store. In the early prototyping stage a RDBMS based store was used which was sufficient for initial prototyping but not scalable for real world testing so then the usage of production grade triple stores was adopted. Initially it was intended to use the open source release of Virtuoso[11] as the backing store but it was found that Virtuoso didn't correctly preserve boolean typed literals which created issues in the internal processing of data within AAT. 4store[12] was then used briefly but it was found that it was unable to handle the heavy volume of parallel read/writes which AAT uses during its data processing due to 4store's concurrency model. Currently AAT runs again AllegroGraph[13] since it has demonstrated in testing the ability to handle the high volumes of read/writes necessary for using AAT on the large dataset described in the preceding section.

In terms of general scalability the majority of algorithms in AAT need to run on a single thread for each profile but it is trivial to process multiple profiles in parallel and this is the approach taken currently. Since work can be divided over multiple threads it will also be possible to significantly increase the scalability by dividing the work over a cluster of machines which would allow much larger datasets to be monitored efficiently.

[11] http://www.openlinksw.com/virtuoso
[12] http://4store.org
[13] http://www.franz.com/agraph/allegrograph/

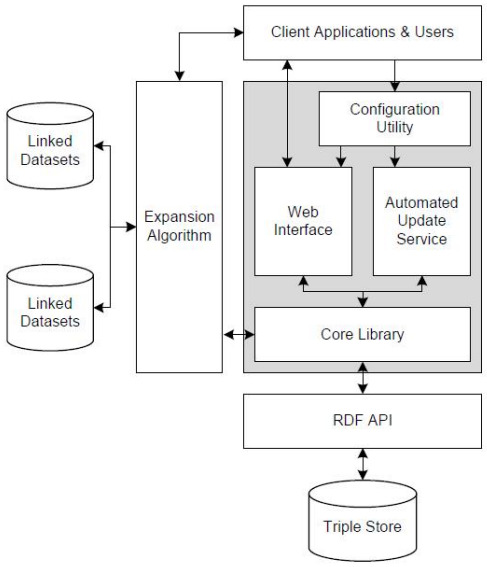

FIGURE 3.6: All About That Architecture

Chapter 4

Results

4.1 Expansion Algorithm

4.1.1 Initial Testing

For initial testing of the expansion algorithm we took a small sample or URIs which included the URIs of the authors, places associated with the authors of our workshop paper (Vesse et al., 2010) and TV programmes from the BBC (since we use the BBC programmes dataset for our preservation tests as described in Section 4.2). The results shown in Table 4.1 show that the amount of linked data that can be obtained using the default expansion profile described in Section 3.1.1.3 varies depending on the URI being profiled. Expanding the URI of a person potentially produces a large number of small graphs particularly if that person is a well published academic since many bibliographic databases are exposed as linked data and provide small amounts of data about people. As can be seen URIs for places return varying amounts of data which depends on the size and relative importance of the place. Conversely expanding the URIs of BBC programmes using the default profile produces very little linked data, we suspect that this is due to the type of data and the fact the linking it uses it mostly based on the BBCs ontologies.

One of the benefits of the algorithm is that as can be seen in the results in Table 4.1 the algorithm is trivially parallel. Increasing the number of threads used to process the discovered URIs shows a significant reduction in the time taken to retrieve the linked data. Experiments were conducted with higher number of threads but 8 threads was found to be optimal since beyond 8 threads erratic behaviour is observed due to two factors: 1. underlying limitations of the HTTP API used in terms of stable concurrent connections and 2. high volumes of concurrent access to a single site look like DoS attacks and lead to temporary bans on accessing those sites. Differences in the number of triples and graphs returned for URIs can be attributed to a couple of factors. In the

TABLE 4.1: Sample Expansion Algorithm Results

URI	Graphs	Triples	Time	Threads
Rob Vesse	4	115	13.8	1
http://id.ecs.soton.ac.uk/person/11471	4	115	1.8	2
	4	115	1.8	4
	4	115	2.1	8
Wendy Hall	691	4,068	786.3	1
http://id.ecs.soton.ac.uk/person/1650	692	4,070	383.8	2
	692	4,070	375.9	4
	692	4,070	359.6	8
Les Carr	368	2,694	438.9	1
http://id.ecs.soton.ac.uk/person/60	279	2,516	109.5	2
	238	2,434	75.9	4
	204	2,366	64.8	8
Ilkeston	6	444	19.1	1
http://dbpedia.org/resource/Ilkeston	5	393	13.5	2
	5	416	9.6	4
	5	393	5.3	8
Southampton	24	3,735	57.2	1
http://dbpedia.org/resource/Southampton	23	3,497	43.8	2
	23	3,497	27.3	4
	23	3,497	55.3	8
Nottingham	17	4,154	41.4	1
http://dbpedia.org/resource/Nottingham	16	4,048	39.5	2
	16	4,048	27.4	4
	16	4,048	25.9	8
London	13	53,886	142.4	1
http://dbpedia.org/resource/	13	53,870	211.9	2
	13	53,870	149.8	4
	14	280,424	385.8	8
Eastenders	2	612	1.8	1
http://www.bbc.co.uk/programmes/b006m86d	2	612	0.7	2
	2	612	0.6	4
	2	612	0.7	8
Panorama	2	174	1.4	1
http://www.bbc.co.uk/programmes/b006t14n	2	174	0.9	2
	2	174	0.7	4
	2	174	0.6	8

case of the London URI where the difference is dramatic - over 200,000 triples difference - this is because with a smaller number of threads connections seem more likely to time out though we are unsure why this is. In the other cases many of the graphs were from the same domain name and the API used to retrieve the RDF had a bug regarding connection management for multiple concurrent connections to the same domain which caused connections to fail unexpectedly which is why a reduction in the amount of data is observed as the number of threads increased.

4.1.2 Large-Scale Experiments

For further experiments I decided to try applying the expansion algorithm to a number of large datasets to see what results it would produce. The expected result was for each dataset that URIs for which more Graphs could be retrieved would result in more Triples being retrieved, in effect if there were more data sources making statements about a particular subject then there should be more data about that subject available which the Expansion Algorithm should be able to retrieve. With regards to assessing the precision and recall of this algorithm these experiments do not yet do this since as described in Section 5.2.1 I have yet to design a suitable baseline benchmark to effectively assess precision and recall against.

For this experiment I chose to use the BBC Programmes dataset since this is also used in my Preservation experiments, the list of countries from DBPedia and the list of people from ECS People RDF. The latter two datasets were chosen because both containing concepts - countries and people respectively - which are widely used and described in various existing linked cata datasets. The results of each experiment are presented in the subsequent sections, the SPARQL Queries used to retrieve the datasets and the tables of raw results can be found in Appendix 1.

4.1.2.1 BBC Programmes

As discussed later in Section 4.2.2 the BBC Programmes dataset structure changed between my initial testing and the experiments presented here. This meant that it was no longer possible to preserve the parts of the dataset which I was interested in just by retrieving the main URI for a programme. The dataset was now split over multiple files so an expansion profile was defined (see Appendix 1) to follow the appropriately typed links in the BBC Programmes Ontology[1] namely the `po:series` links since the details of episodes of a programme are now held in separate series files from the basic programme description.

In Table 1 you can see the results of running the algorithm with the default profile which does not follow domain specific links and in Table 2. Run with the default profile every URI produces exactly 15 triples since resolving the URI actually returns a HTML page which contains a limited number of Triples which can be extracted using an RDFa parser. Run with the domain-specific profile designed for this dataset we retrieve an average of 7 Graphs containing an average 391 Triples about each Programme URI and it takes 8.3 seconds on average. The maximums for these were 39 Graphs and 3,067 Triples and the minimums were 2 Graphs and 16 Triples. In Figure 4.1 it can be seen that there is an apparent correlation between the number of Graphs retrieved and the number of Triples retrieved. This correlation is statistically significant when analysed

[1] `http://purl.org/ontology/po/`

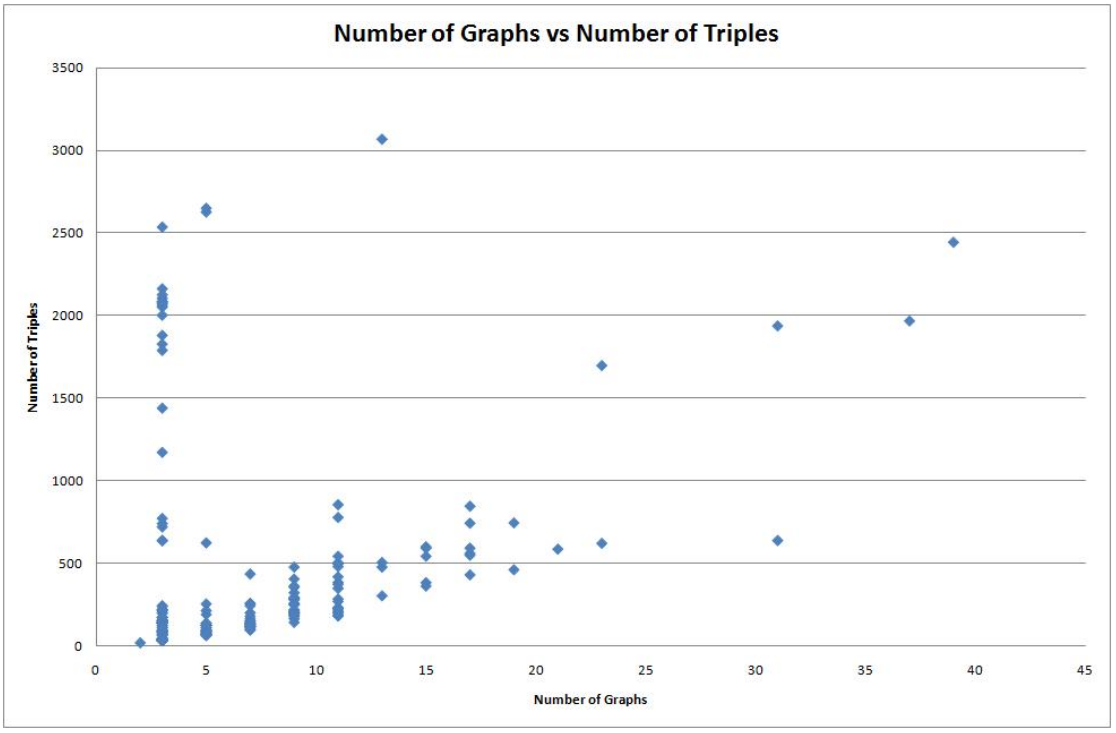

FIGURE 4.1: BBC 1 Programmes with Domain-specific Profile - Number of Graphs vs. Number of Triples

with 3 standard correlation tests - Pearson, Kendall's Tau and Spearman Rank - with correlations of 0.346, 0.434 and 0.496 respectively.

Note that there is a significant spike at the 3 Graphs mark which is outside the general trend and leads to relatively low correlation scores when compared with the same experiment on other datasets (for example see Section 4.1.2.2). This is due to the fact that some programs are not logically divisible into series such as News bulletins and so these have a single series graph created for them. This graph then lists all their episodes which for a program which is shown regularly leads to high numbers of triples but a low number of graphs.

The clear difference between the default profile and the domain specific profile shows that it in attempting to recover linked data it can be important to know something about the characteristics of the data you wish to recover. With the default profile the only data we can retrieve is the data from the initial URI itself, if these URIs were not accessible we would have retrieved no data and thus failed to recover anything whereas with our tailored domain specific profile it is likely we would still have recovered some data since.

4.1.2.2 DBPedia Countries

For my second large scale experiment I decided to use a set of topics from DBPedia that would likely be widely defined and used. This was the set of countries of the world, since these are concepts that are widely used it was reasoned that there would be a large amount of data about them available and that using the DBPedia identifiers as the starting point would result in significant amounts of retrievable data. As can be seen in Table 3 it is easily possible to retrieve several hundred thousands triples about a country using the default expansion profile defined in Section 3.1.1.3.

On average for each country 10 graphs containing around 37,000 triples describing that country and things related to that country are retrieved and this takes on average 25.9 seconds. The maximum amount of triples retrieved was 598,780 while the minimum was 0. This minimum of zero is due to the fact that while DBPedia defines URIs for many countries a proportion of these refer to countries that don't have any data since they represent defunct/short-lived countries which have no structured data in Wikipedia and therefore no data in DBPedia and other interlinked data sources. As can be seen in Figures 4.2 and 4.3 there appears to be a general correlation of increasing number of triples being retrieved as increasing numbers of graphs are retrieved. Due to large differences in the amount of data retrieved for different countries the two aforementioned graphs were produced to present it more clearly since there are no countries for which we retrieved between 30,000 and 500,000 Triples. This is fairly simply explained by the fact that the more data sources that publish information about/related to a URI the more data that can be retrieved. This correlation is statistically significant when analysed with 3 standard correlation tests - Pearson, Kendall's Tau and Spearman Rank - with correlations of 0.621, 0.770 and 0.905 respectively, note that this correlations are greater than those from the BBC Programmes experiments since the BBC programmes had a spike of data as discussed in Section 4.1.2.1.

4.1.2.3 ECS People

For the final large scale experiment I chose to use the ECS People dataset which is a set of descriptions about the research staff and publications of the Electronics and Computer Science department at the University of Southampton. Since at the time of the experiment ECS itself didn't directly provide a SPARQL endpoint (though it does so now) I obtained this data from the Southampton RKBExplorer[2] site which provides a mirror of the ECS data. This dataset was chosen because it is large and like the DBPedia Countries dataset describes a set of topics (in this case people) that are widely reused on the semantic web, in the case of this dataset the identifiers are often reused in various bibliographic datasets. This dataset was expanded using just the default

[2] `http://southampton.rkbexplorer.com`

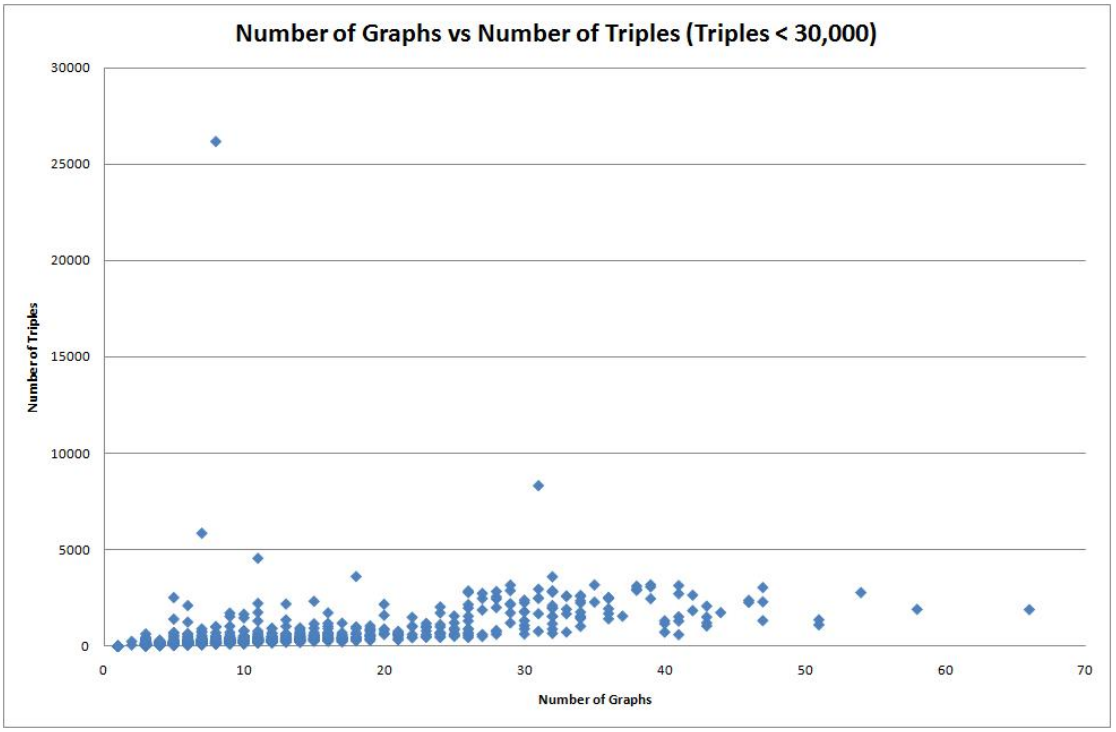

FIGURE 4.2: DBPedia Countries - Number of Graphs vs. Number of Triples (Triples $< 30{,}000$)

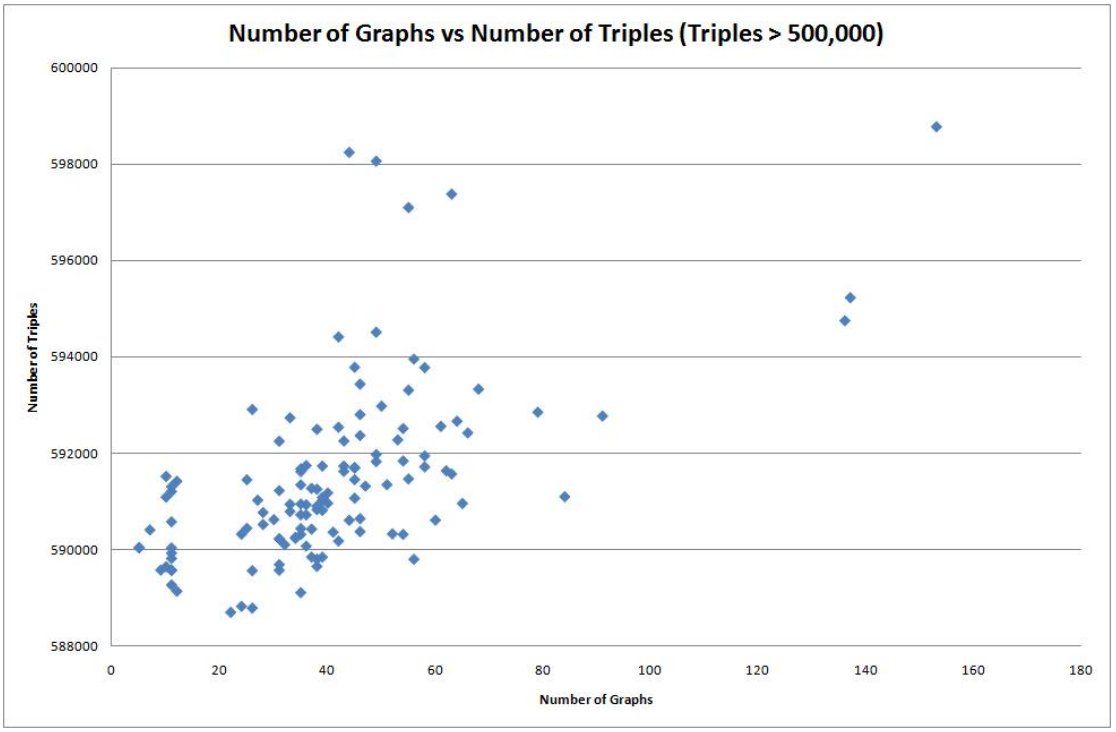

FIGURE 4.3: DBPedia Countries - Number of Graphs vs. Number of Triples (Triples $> 500{,}000$)

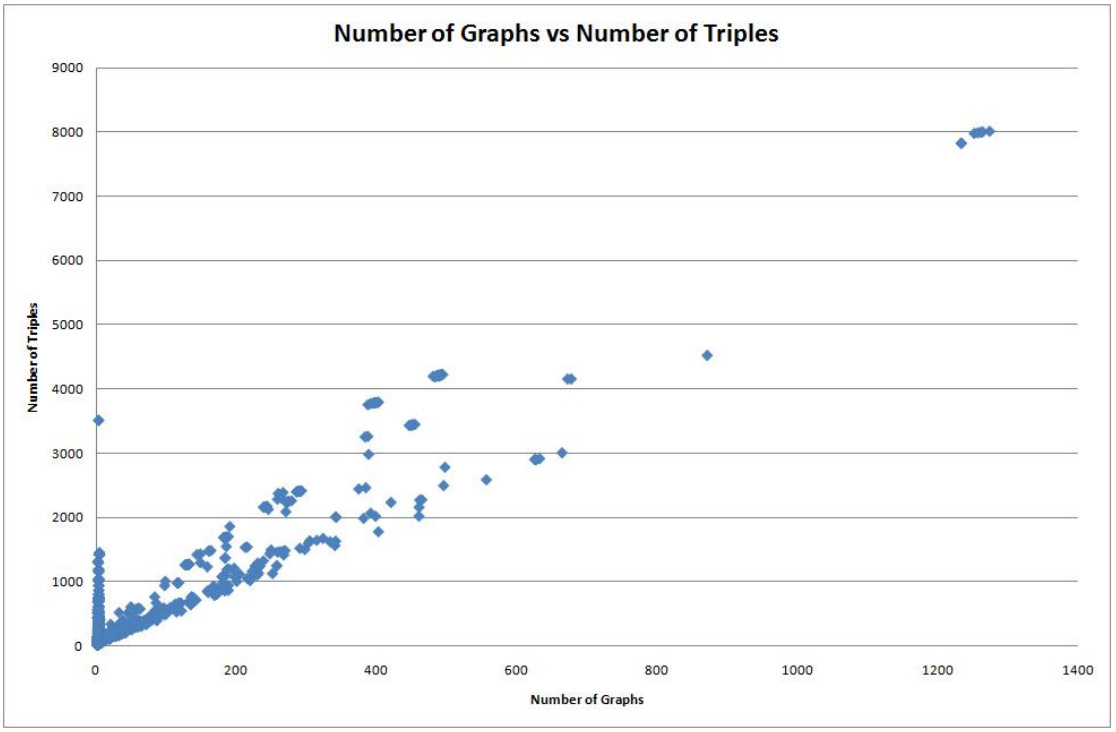

FIGURE 4.4: ECS People - Number of Graphs vs. Number of Triples

expansion profile described in Section 3.1.1.3 and gave the results found in Table 4.

In total 7,454 results were retrieved with an average of 13 graphs for each person containing 122 triples and took on average 7.7 seconds. The maximum amount of data retrieved was 1,275 graphs with 8,006 triples while the minimum was 2 Graphs with just 9 triples. As can be seen in Figure 4.4 there is again a clear correlation between the the number of graphs retrieved and the number of triples retrieved. This correlation is statistically significant when analysed with 3 standard correlation tests - Pearson, Kendall's Tau and Spearman Rank - with correlations of 0.928, 0.655 and 0.773 respectively.

Again there is a spike of data at the 1 graph mark which appears to be due to some identifiers not getting reused despite the person being identified having a reasonable number of triples about them. This spike is explained by two factors: 1. That many of the people identified in the dataset are students who have minimal publications so their identifiers are not reused; and that 2. due to co-reference issues some people appear in the dataset multiple times and only their canonical identifier actually gets reused elsewhere on the semantic web

4.2 Preservation

4.2.1 Initial Experiment - BBC Programmes

In order to perform initial tests on AAT it was used to monitor a subset of the BBC Programmes[3] dataset for a week. This is a large and constantly changing linked data set which allowed for both the testing of the scalability of AAT and for the verification that it's change detection algorithms worked as intended. These initial experimental results were published in a workshop paper (Vesse et al., 2010) and presented at LDOW 2010[4]. The subset of the dataset used was all the brands (i.e. programmes) associated with the service BBC1 (the BBCs main TV channel) since this includes many brands which change regularly such as soaps and news broadcasts. Table 4.2 demonstrates the average number of changes detected over just a short period.

As can be seen in Table 4.2 you can see that the BBC update their dataset on a daily basis, the initial high number of changes is due to starting from a base dataset that was a couple of months old due to architectural changes made to AAT to support the use of the expansion algorithm and improve the efficiency of the system. The average number of changes being 2 is due to the fact that the typical update we see the BBC make to their data is that they add a triple describing a newly broadcast episode of a programme and update the value of the `dc:modified` triple. The apparently high number of 25 for the maximum changes is due to one of the program URIs failing to resolve resulting in the contents of that profile being considered to missing so the change report for each day reports those triples as removed. The relatively high number of profiles changing each day is due to the fact that as already stated many of the programmes associated with BBC 1 are broadcast daily such as soaps and news bulletins and that the BBC publish data about programmes several days before the programmes are actually broadcast.

To demonstrate the reuse of the data being harvested we created a demonstration application which is a simple web based faceted browser which lets users browse through information about recently shown BBC shows. Facets can be used to filter by Genre and Channel and the user can view detailed information about both programmes and the individual episodes. This application was presented as part of an earlier prototype of AAT described in Vesse et al. (2009) and shown in Figure 4.5. Like previous work by Papavassiliou et al. (2009) it shows that simple information about basic triple level changes in RDF (additions, deletions etc) can be reprocessed into useful applications for end users.

[3] `http://www.bbc.co.uk/programmes/developers`
[4] http://events.linkeddata.org/ldow2010/

TABLE 4.2: BBC 1 Programmes Dataset - Changes over 1 week

Date and Time	Number of Changed Profiles	Average Changes per Profile	Max. Changes	Min. Changes
12/2/2010	163	43	311	1
13/2/2010	105	2	25	1
14/2/2010	90	2	25	1
15/2/2010	87	2	25	1
16/2/2010	90	2	25	1
17/2/2010	87	2	25	1
18/2/2010	86	2	25	1

4.2.2 Expanded Experiment - BBC Programmes

Further to the initial experiments presented in the previous section it was decided that a longer experiment should be carried out to test performance and change detection over a longer period - in this case an entire month. For this experiment it was also necessary to introduce full usage of the expansion algorithm (described in Section 3.1.1) as the structure of the BBC programmes dataset had been changed since the original experiments - as discussed in Section 4.1.2.1 - and I now needed to use a domain-specific expansion profile.

With an appropriate expansion profile created[5] and tested I imported the same subset of the dataset as used for the previous experiment which produced approximately 1.2 million Triples. I then began running AAT once a day as before for a period of a month which gave the results shown in Table 4.3.

The first things to note from these results is that as compared with the initial experiment the dataset is no longer always updated on a daily basis now as shown by the several periods where no changes are observed. This can be seen more easily in Figures 4.6 and 4.7, apart from the initial data import on 24th August and a period at the start of September typically only a small percentage of the dataset changes on any given day (if it changes at all). Over time we see that the average number of changes per profile is typically very small (see Figure 4.8) particularly if we consider the median and modal averages, the mean average tends to be higher as we often have a few profiles receiving large numbers of changes which skews this average considerably.

Examining the data in depth to see why we initially got large spikes in the number of changes this appears to be primarily due to an error in the expansion algorithm related to its caching of data. It seems that the writer that was used to cache data retrieved with the expansion algorithm may sometimes produce malformed data files which then fail to parse when loaded in by the expansion algorithm (instead of it retrieving a fresh copy) which then when compared with the existing data makes it appear as if all/some of the data has been deleted. This error was discovered and fixed partway through the experimental run hence why in the latter half of the experiment I didn't experience this issue but unfortunately due to time constraints I did not have time to restart the experiment.

If we compare the number of changes and the number of changed profiles we can clearly see that if a large number of profiles are observed to change then we obtain a larger number of changes (see Figure 4.9). This is most likely a feature of this particular dataset since one can easily envisage datasets where only a small number of profiled URIs might change but that these changes might be very large e.g. something like DBPedia[6] where new articles may be added but existing articles don't change drastically.

[5] The expansion profile is given in Appendix 1

[6] `http://dbpedia.org`

FIGURE 4.5: BBC Programmes Demonstration Application built on top of data from AAT

While this experiment shows that AAT does work well over longer periods of times it is still a relatively small dataset that the system was used to monitor. In the future we still need to conduct much larger scale experiments with datasets such as DBPedia to provide a more meaninfgul assesment of the performance and scalability of the system. One issue that was noticed continually through the experiment was that the underlying Triple Store used (AllegroGraph[7]) was very inefficient in terms of memory and even with this dataset would have maxed out the RAM (at around ∼3GB on a 4GB Quad Core Machine) by the end of the run whereas AAT itself is very efficient requiring only ∼70MB of RAM. For future experiments it will definitely be worth exploring a move to alternative Triple Stores though as discussed in Section 3.2.1.4 there are currently quirks in the implementation of other Triple Stores which have to date prevented this.

[7] `http://www.franz.com/agraph/`

Table 4.3: BBC 1 Programmes Dataset - Changes over 1 month

Date	Changed Profiles	Total Changes	Mean Changes	Median Changes	Modal Changes	Max Changes	Min Changes
24/08/2010	233	92099	395	152	32	3079	28
25/08/2010	0	0	0	0	0	0	0
26/08/2010	0	0	0	0	0	0	0
27/08/2010	0	0	0	0	0	0	0
28/08/2010	0	0	0	0	0	0	0
29/08/2010	0	0	0	0	0	0	0
30/08/2010	0	0	0	0	0	0	0
01/09/2010	78	901	11	6	2	55	1
02/09/2010	219	9680	44	28	14	388	2
03/09/2010	219	9006	41	28	14	270	2
04/09/2010	208	8489	40	28	14	266	2
05/09/2010	202	8550	42	28	14	270	2
06/09/2010	217	8996	41	28	14	266	2
07/09/2010	214	8988	42	28	14	270	11
08/09/2010	214	8981	41	28	14	270	11
09/09/2010	170	6130	36	28	14	210	1
10/09/2010	62	987	15	5	1	154	1
11/09/2010	42	748	17	2	1	154	1
12/09/2010	0	0	0	0	0	0	0
13/09/2010	0	0	0	0	0	0	0
14/09/2010	0	0	0	0	0	0	0

Continued on next page

Date	Changed Profiles	Total Changes	Mean Changes	Median Changes	Modal Changes	Max Changes	Min Changes
15/09/2010	56	931	16	7	1	154	1
16/09/2010	23	333	14	2	1	222	1
17/09/2010	23	101	4	2	1	32	1
18/09/2010	12	30	2	1	1	8	1
19/09/2010	4	7	1	1	1	4	1
20/09/2010	5	23	4	1	1	19	1
21/09/2010	1	3	3	3	3	3	3
22/09/2010	4	10	2	1	1	6	1
23/09/2010	1	6	6	6	6	6	6
24/09/2010	9	18	2	1	1	8	1
25/09/2010	2	2	1	1	1	1	1
26/09/2010	4	13	3	2	1	7	1

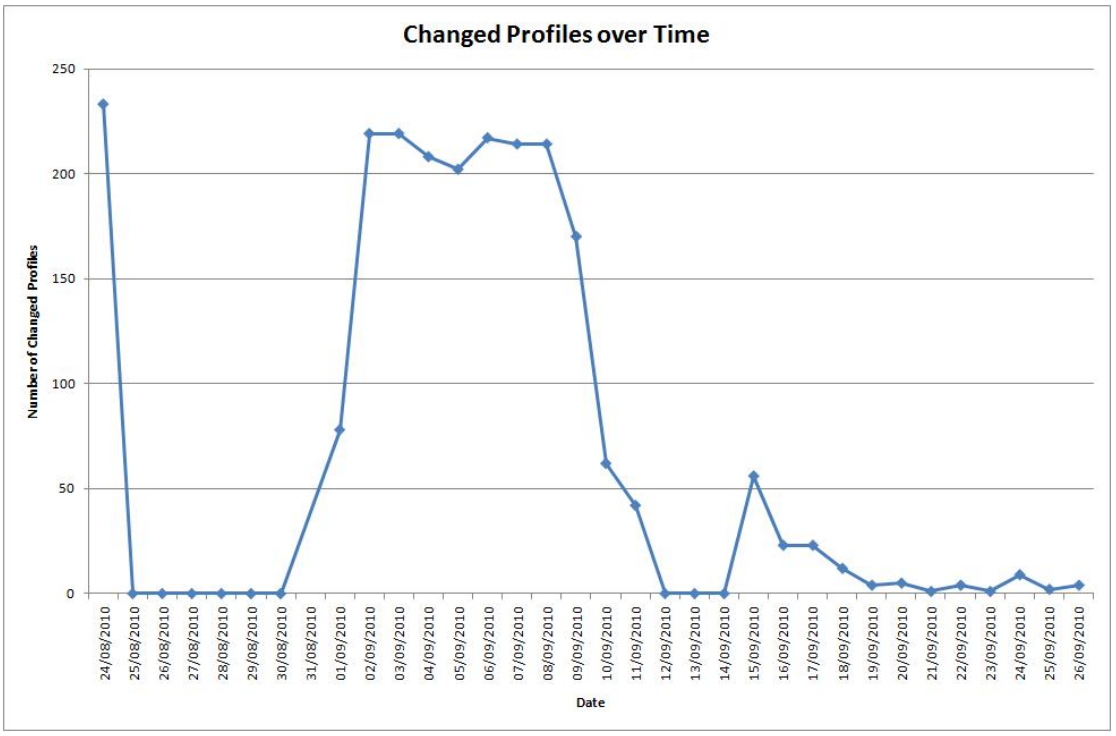

FIGURE 4.6: BBC 1 Programmes Dataset - Changed Profiles over Time

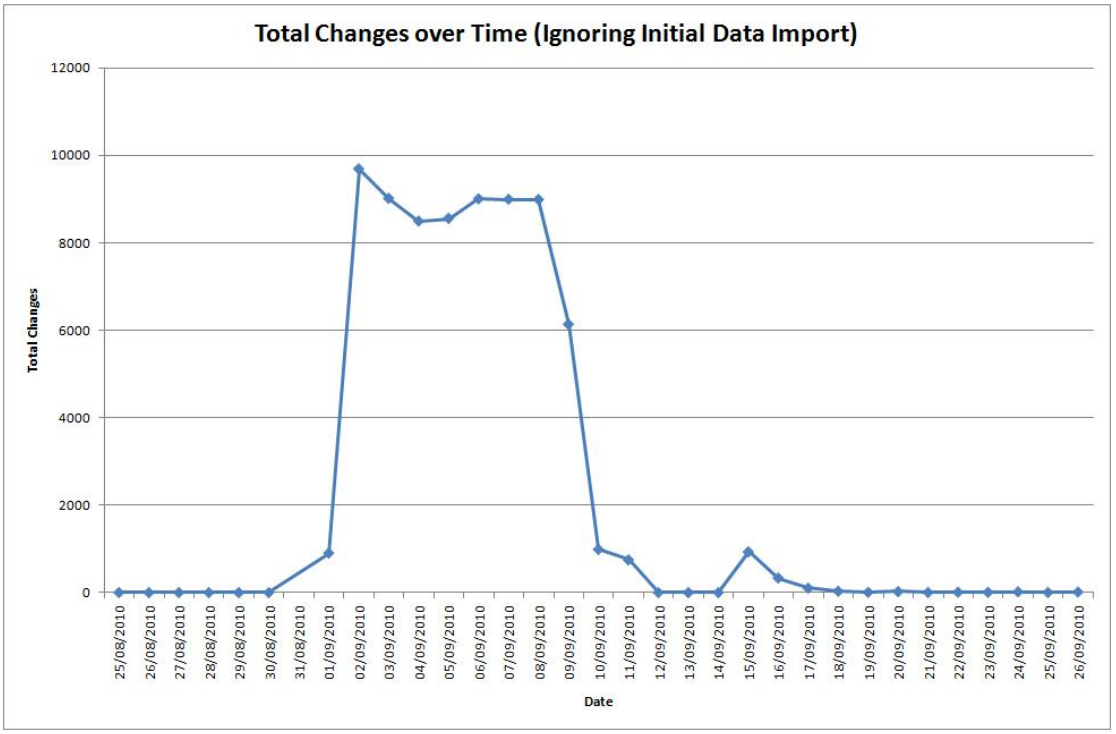

FIGURE 4.7: BBC 1 Programmes Dataset - Total Changes over Time

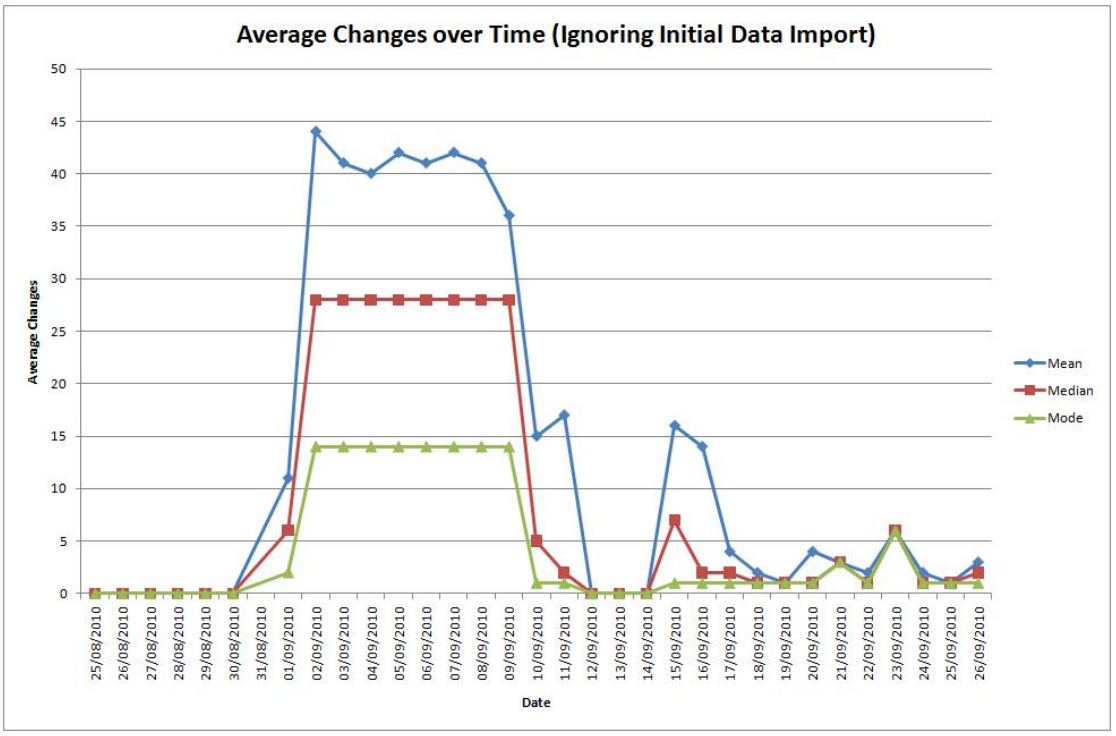

FIGURE 4.8: BBC 1 Programmes Dataset - Average Changes over Time

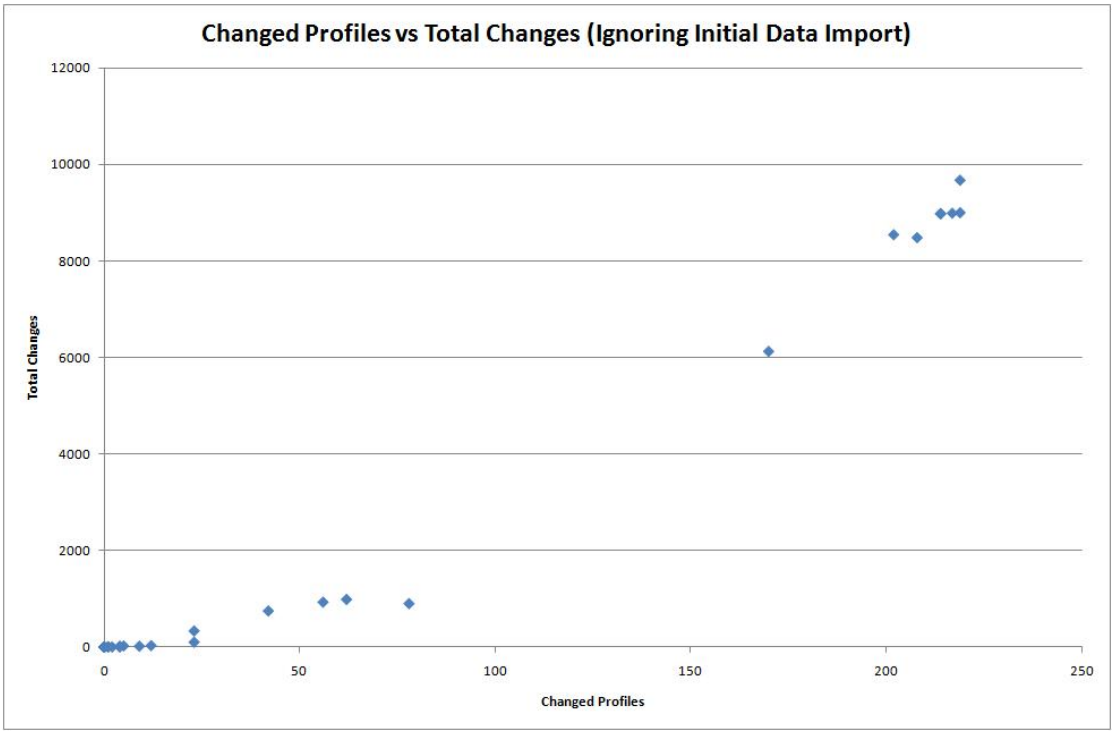

FIGURE 4.9: BBC 1 Programmes Dataset - Total Changes vs Changed Profiles

Chapter 5

Conclusions and Future Work

5.1 Conclusions

It is clear to me that given the recent increased interest in link integrity for the Semantic Web shown by the increasing number of papers around the subject (particularly at the World-Wide Web conference this year) that my hypothesis is correct in stating that link integrity is an important issue. There is a variety of ongoing work in this area - including my own - as well as other worj like DSNotify (Popitsch and Haslhofer, 2010) and Silk (Volz et al., 2009a) which shows that systems such as my own are considered necessary and feasible by the wider community.

Based on the work I have presented in Chapters 3 and 4 I feel that I have succeeded in meeting point 1 of the success criteria given in my hypothesis (see Section 1.1). In developing both the Expansion algorithm (see Section 3.1.1) and All About That (see Section 3.2.1) I have successfully adapted existing link integrity techniques from hypermedia and demonstrated that they can work on the Semantic Web and are scalable and as I discuss later in this chapter have the potential to be further scaled.

As mentioned in the results for the expansion algorithm presented in Section 4.1 while the data seems to be correct I have yet to fully evaluate the data returned against a benchmark. As discussed in Section 5.2.2 selecting an appropriate benchmark is a difficult problem so currently I cannot say that the expansion algorithm is a fully viable solution to the link integrity problem for the Semantic Web.

With regards to All About That (AAT) my results demonstrate that the system is viable and so I feel justified in saying that I have met point 2 of my success criteria from my hypothesis in that I have shown that the solution is feasible and scalable. However the results do suggest that AAT will probably be best suited to having individual instances set up to monitor specific datasets rather than having some central instance which

attempts to monitor large chunks of the Semantic Web. This is because the performance of AAT is fundamentally limited by 2 factors:

1. The performance and scalability of the underlying Triple Store
2. The number of profiles (see Definition 3.3) that can be updated in parallel by a single server without becoming unstable. This is to some degree limited by the programming languages HTTP library and also by the number of processor cores that the server has

5.2 Future Work

Up until this point I have been taking a two pronged approach to the problem looking at using both recovery and preservation in order to maintain link integrity for linked data. Going forward it seems sensible to focus more on just one of these topics since both address the problem slightly differently. There is already a variety of work going on in this area around preservation and versioning so my intention is to focus more on the recovery solution since I believe that such solutions are more viable long term and are capable of scaling much more gracefully to web scale. Also as discussed in Chapter 2 many pre-emptive solutions to maintaining link integrity have been attempted in the past (some being preservation based) and the evidence in the literature shows that no such solution has ever been truly effective at web scale. Conversely the literature suggests that Just In Time (JIT) strategies like the Opal system (Harrison and Nelson, 2006) and my own have the ability to scale successfully.

5.2.1 Refining the Expansion Algorithm

There are a number of things that could be done to improve the expansion algorithm outlined in Section 3.1.1 with regards to both making it more intelligent in how it retrieves linked data and in conducting a detailed analyses of the data returned. Manual inspection of the data shows that it does appear to be relevant to the URI of interest but it is proposed that a full IR analysis of this is conducted in order to statistically confirm this initial assessment. With a much wider variety of test URIs used against a variety of different expansion profiles it will be possible to gauge the precision and recall of the algorithm.

The main issue in conducting such an analysis is deciding what should be used as a benchmark to compare my algorithm against since there is not really an existing algorithm which is directly equivalent to my own. One possibility is to ask a selection of users who are well versed in semantic web technologies to manually collate sets of linked data which they consider to be about specific URIs and compare this with the

algorithms results. The difficulty with this is that doing so would limit the number of URIs that could be analysed and benchmarking the effects of different expansion profiles is not really addressable with this approach. An alternative would be to combine the top N results from a number of different semantic search engines and use this as a baseline. In my opinion finding a relevant and useful benchmark is probably the hardest part of actually conducting this analysis.

Additionally as was seen in Table 4.1 some types of URIs produced very little linked data using the default expansion profile, a broader analysis using domain specific profiles is necessary to ascertain whether those URIs have low levels of interlinking or if the interlinkings just use domain specific links rather than the generic `owl:sameAs` and `rdfs:seeAlso` links that are followed by default.

In terms of improving the intelligence of the algorithm at the moment it submits every URI to every SPARQL, lookup and discovery endpoint described in the expansion profile - it would improve the speed of the algorithm if it could use some decision making as to which endpoints a given URI should be submitted. Conversely though there is the possibility that this would impact the effectiveness of the algorithm so it would be necessary to conduct experiments to determine whether there is a trade off between speed and accuracy. It is also worth considering that searching on URIs is not the only viable mechanism for finding additional linked data about a URI of interest. Using terms extracted from the RDF such as the objects of `rdfs:label` or `dc:title` triples would provide a way to augment URI based lookup with term/text based search results from semantic search engines. There are already frameworks like Silk Volz et al. (2009a) which can be used to do this and it would be useful to integrate a technology like the Silk framework with the expansion algorithm.

Similar to the above idea there are technologies like Open Calais[1] from Thomson-Reuters and KIM[2] from Ontotext which can do free-text analysis and annotation. Such tools allow for additional linked data to be discovered from the literals that are found in linked data retrieved by the algorithm. Whether such data would add any value to the algorithm is questionable since it may be somewhat superfluous to the intended purpose of the algorithm which is to retrieve linked data about a specific URI not the free-text associated with that URI.

Another issue to investigate is to look at how the use of complex data sources affects the efficiency and speed of the algorithm. As previously mentioned in Section 3.1.1 it is easily possible to use complex services such as URIBurner[3] to retrieve linked data about a given URI. By complex service we mean any service which itself performs crawling or other data retrieval and processing in order to provide its answer as opposed to a service which just does a simple lookup on its local database/triple store. Such services

[1] `http://www.opencalais.com/`
[2] `http://www.ontotext.com/kim/index.html`
[3] `http://www.uriburner.com`

are potentially quite costly in terms of performance if they themselves take a while to process a request yet they may return much valuable information. Therefore I need to determine whether the additional processing time is justified by the value of the data retrieved through such a service.

In a similar vein it will be worth investigating how well the algorithm can be distributed by running multiple servers with the algorithm each using a different expansion profile and therefore different data sources. By doing this the work of discovering and retrieving the linked data can be divided up between multiple servers and potentially speed up the process and well as distributing the caching of data across multiple servers. While on paper this approach has the potential to speed up the time required to discover and retrieve the relevant linked data whether it actually does so in practise will need to be demonstrated with a real world deployment of the algorithm on servers in geographically distinct locations to ensure that network latency is properly factored into the experiments.

5.2.2 Improving AAT

As stated at the start of this chapter it is my intention to focus more on the recovery approach in the form of the proposed expansion algorithm (see Section 3.1.1) as opposed to the preservation approach since it seems a more scalable solution to the problem than the AAT system. The following are some issues to be addressed and ideas for extensions and improvements to AAT which could be done if the decision is made to also take this part of the work forward.

One limitation inherent in AAT is that currently is does not do any kind of special handling of blank nodes which means that if data contains blank nodes AAT will continuously think it has encountered new knowledge when most likely it has not. For the data we have worked with so far this is generally not an issue since the linked data community tends to avoid blank nodes but if we are to provide for preserving all kinds of RDF effectively then we need to handle blank nodes properly. Solving this problem may involve doing some sub-graph matching and isomorphism to see if the sections of the graph that contain blank nodes can be mapped to the previously seen sections of the graph as in Tummarello et al's RDFSync Tummarello et al. (2007b). The blank nodes themselves could either be left as-is or they could be translated to URIs as done by systems like the Talis[4] platform.

As mentioned in Section 3.2.1.1 a lightweight schema is used by AAT to annotate and store the data but there are alternative vocabularies that could have been used such as the provenance ontology (Hartig and Zhao, 2009) and the open provenance model (Moreau et al., 2007). It would be a fairly easy and potentially useful enhancement to

[4] `http://www.talis.com/platform`

map the AAT schema to these vocabularies such that the data could be retrieved in the desired form by users/client applications designed to work with those formats.

Another possible extension to AAT is to implement the Memento protocol (Van de Sompel et al., 2010) for the server which would allow Memento aware HTTP clients to access the past history of the versioned data without needing to be aware of the particular URIs that AAT uses. Since if the AAT web application could interpret the Memento HTTP Headers then it could simply redirect that request internally to the appropriate version of the data. This would be useful since it would be fairly trivial to implement but would then tie the system into an emerging standard for HTTP versioning.

5.2.3 Aims

The eventual aim of this research is to fulfil the hypothesis stated in Section 1.1 by providing tools/services that people can deploy/use on the semantic web to aid in the retrieval and preservation of Linked Data that is of use to them. The expansion algorithm detailed in Section 3.1.1 can be easily deployed as a RESTful web service that allows end users to retrieve linked data using either a service provider specified expansion profile or a user specified one. The ability to deploy this as a RESTful service means that multiple services can be deployed across the web allowing for both scalability and redundancy. Interestingly there is the potential that expansion services can theoretically be reused as a data source by another expansion service thereby allowing the work of retrieving linked data to be distributed across multiple services as discussed in Section 5.2.1. Similarly the All About That (AAT) system can be deployed as a web application on any server set up with an appropriate software stack and with access to an appropriate backing triple store.

As stated earlier in this chapter it is my intention to make refining and deploying the expansion algorithm as a recovery based solution for link integrity on the semantic web the primary focus of my research. While I may do some work on further improving my preservation approach I feel recovery based approaches are a more valuable contribution to the field and more feasible in the long term.

5.2.4 Potential Applications

Given that this work was inspired by traditional link integrity techniques from hypermedia it is interesting to note that it has the potential to be applied back to the document web since there is increasing cross-over between the document and data web primarily due to the increasing uptake of RDFa. As increasing numbers of documents embed structured data using RDFa it will become possible to preserve and monitor the structured information embedded in ordinary web pages in the same way as can be done

with linked data now, therefore we envisage this as having applications in automated monitoring and maintenance of document based websites.

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Raw Results

This Appendix contains the raw results which are analysed and presented in Chapter 4.

The results given in Table 1 are discussed in Section 4.1.2.1. The initial dataset of URIs was retrieved by making the query seen in Listing 1 against the BBC Programmes endpoint hosted by Talis[5].

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX po: <http://purl.org/ontology/po/>

SELECT * WHERE
{
        ?s rdf:type po:Brand ;
           dc:title ?title ;
           po:masterbrand <http://www.bbc.co.uk/bbcone#service>
}
ORDER BY ?title
```

Listing 1: SPARQL Query to retrieve BBC 1 Programmes Dataset

The results given in Table 3 are discussed in Section 4.1.2.2. The initial dataset of URIs was retrieved by making the query seen in Listing 2 against the DBPedia endpoint[6].

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

SELECT DISTINCT *
WHERE
{
        ?s a <http://dbpedia.org/ontology/Country> .
        OPTIONAL
        {
                ?s rdfs:label ?title .
                FILTER(LANG(?title) = "en")
        }
}
```

Listing 2: SPARQL Query to retrieve DBPedia Countries Dataset

The results given in Table 4 are discuused in Section 4.1.2.3. The initial dataset of URIs was retrieved by making the query seen in Listing 3 against the RKBExplorer

[5] http://api.talis.com/stores/bbc-backstage/services/sparql
[6] http://dbpedia.org/sparql

Southampton endpoint[7].

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX akt:  <http://www.aktors.org/ontology/portal#>

SELECT DISTINCT *
WHERE
{
        ?s a akt:Person ;
           rdfs:label ?label
}
```

Listing 3: SPARQL Query to retrieve ECS People

[7] http://southampton.rkbexplorer.com/sparql/

Table 1: Expansion Algorithm Results for BBC 1 Programmes with Default Profile

URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b006xyt3#programme	'Allo 'Allo!	2	15	00:00:00.0789854
http://www.bbc.co.uk/programmes/b00nz3b7#programme	A History of Scotland	2	15	00:00:00.0012353
http://www.bbc.co.uk/programmes/b007vkkt#programme	All Saints	2	15	00:00:00.0010511
http://www.bbc.co.uk/programmes/b009t1pg#programme	Anglo-Welsh Cup	2	15	00:00:00.0009311
http://www.bbc.co.uk/programmes/b006mj2y#programme	Antiques Roadshow	2	15	00:00:00.0010170
http://www.bbc.co.uk/programmes/b00jhp3l#programme	Ashes to Ashes	2	15	00:00:00.0010385
http://www.bbc.co.uk/programmes/b00crzfc#programme	Athletics	2	15	00:00:00.0010610
http://www.bbc.co.uk/programmes/b00cpbsj#programme	BBC Channel Islands News	2	15	00:00:00.0010583
http://www.bbc.co.uk/programmes/b006mj67#programme	BBC London News	2	15	00:00:00.0010257
http://www.bbc.co.uk/programmes/b009sdm6#programme	BBC News	2	15	00:00:00.0009550
http://www.bbc.co.uk/programmes/b009sdnj#programme	BBC News and Regional News	2	15	00:00:00.0010186
http://www.bbc.co.uk/programmes/b006mvxy#programme	BBC Newsline	2	15	00:00:00.0009646
http://www.bbc.co.uk/programmes/b00cpbqm#programme	BBC Oxford News	2	15	00:00:00.0009656
http://www.bbc.co.uk/programmes/b006pft9#programme	BBC Points West	2	15	00:00:00.0009300
http://www.bbc.co.uk/programmes/b006mj49#programme	BBC Wales Today	2	15	00:00:00.0010287
http://www.bbc.co.uk/programmes/b009m51q#programme	BBC Weekend News	2	15	00:00:00.0031823
http://www.bbc.co.uk/programmes/b006nb9z#programme	Bargain Hunt	2	15	00:00:00.0031238
http://www.bbc.co.uk/programmes/b00721bz#programme	Beechgrove Garden	2	15	00:00:00.0031082
http://www.bbc.co.uk/programmes/b00df5nm#programme	Between the Lines	2	15	00:00:00.0031697
http://www.bbc.co.uk/programmes/b00kj9xh#programme	Bikes!	2	15	00:00:01.8169351
http://www.bbc.co.uk/programmes/b007r5mm#programme	Blackpool Medics	2	15	00:00:01.1814878
http://www.bbc.co.uk/programmes/b006v5tb#programme	Breakfast	2	15	00:00:01.1319337
http://www.bbc.co.uk/programmes/b006v7rw#programme	Car Booty	2	15	00:00:01.2099847
http://www.bbc.co.uk/programmes/b006xzh7#programme	Car Wars	2	15	00:00:01.1307074
http://www.bbc.co.uk/programmes/b006v7ww#programme	Cash in the Attic	2	15	00:00:02.3950210
http://www.bbc.co.uk/programmes/b006z6fn#programme	Castaway	2	15	00:00:00.9649693
http://www.bbc.co.uk/programmes/b006m8wd#programme	Casualty	2	15	00:00:00.9977350
http://www.bbc.co.uk/programmes/b007mtf0#programme	Celebrity MasterChef	2	15	00:00:01.2441393
http://www.bbc.co.uk/programmes/b0072bk8#programme	Child of Our Time	2	15	00:00:00.7895692
http://www.bbc.co.uk/programmes/b008dk4b#programme	Children in Need	2	15	00:00:00.9065146
http://www.bbc.co.uk/programmes/b00lbrhm#programme	Coal House	2	15	00:00:00.8052814
http://www.bbc.co.uk/programmes/b006t0bv#programme	Countryfile	2	15	00:00:00.9344889
http://www.bbc.co.uk/programmes/b00ps1xh#programme	Cranford	2	15	00:00:01.1670710
http://www.bbc.co.uk/programmes/b006ppmq#programme	Crimewatch	2	15	00:00:01.0407461
http://www.bbc.co.uk/programmes/b00h4cr0#programme	Crimewatch Solved	2	15	00:00:01.6696483
http://www.bbc.co.uk/programmes/b009lfkt#programme	Crimewatch Special	2	15	00:00:01.4482065
http://www.bbc.co.uk/programmes/b008wllb#programme	Crimewatch Update	2	15	00:00:01.3377399
http://www.bbc.co.uk/programmes/b006pnjk#programme	DIY SOS	2	15	00:00:01.6681844
http://www.bbc.co.uk/programmes/b008q0fs#programme	Damages	2	15	00:00:01.1346558
http://www.bbc.co.uk/programmes/b007tlk3#programme	DanceX	2	15	00:00:01.3786724
http://www.bbc.co.uk/programmes/b006q2x0#programme	Doctor Who	2	15	00:00:01.3342940
http://www.bbc.co.uk/programmes/b00855q6#programme	Doctor Who Classic	2	15	00:00:01.3336889

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b006mh9v#programme	Doctors	2	15	00:00:00.9320229
http://www.bbc.co.uk/programmes/b00j5kr5#programme	Dom's on the Case	2	15	00:00:01.0593729
http://www.bbc.co.uk/programmes/b006mvzk#programme	Dragon's Eye	2	15	00:00:01.4009659
http://www.bbc.co.uk/programmes/b007tj48#programme	East Midlands Today	2	15	00:00:01.1673339
http://www.bbc.co.uk/programmes/b006m86d#programme	EastEnders	2	15	00:00:00.8774249
http://www.bbc.co.uk/programmes/b007sh7m#programme	EastEnders Omnibus	2	15	00:00:01.2113990
http://www.bbc.co.uk/programmes/b007tvw2#programme	Family Wanted	2	15	00:00:01.3649521
http://www.bbc.co.uk/programmes/b006szrz#programme	Final Score	2	15	00:00:01.4680193
http://www.bbc.co.uk/programmes/b00701hz#programme	Final Score from NI	2	15	00:00:01.6657962
http://www.bbc.co.uk/programmes/b006m8tc#programme	Football Focus	2	15	00:00:01.3286426
http://www.bbc.co.uk/programmes/b006m99d#programme	Friday Night with Jonathan Ross	2	15	00:00:01.4959654
http://www.bbc.co.uk/programmes/b0070mnh#programme	Frontline Scotland	2	15	00:00:01.1842393
http://www.bbc.co.uk/programmes/b007nf70#programme	Gavin and Stacey	2	15	00:00:00.8556720
http://www.bbc.co.uk/programmes/b006pq94#programme	Give My Head Peace	2	15	00:00:01.2599646
http://www.bbc.co.uk/programmes/b006y2ql#programme	Golf	2	15	00:00:01.1831292
http://www.bbc.co.uk/programmes/b00gwg53#programme	Great Edinburgh International Cross Country	2	15	00:00:01.1873865
http://www.bbc.co.uk/programmes/b006nkw3#programme	Have I Got News for You	2	15	00:00:01.0254980
http://www.bbc.co.uk/programmes/b007nms5#programme	Heir Hunters	2	15	00:00:01.0768460
http://www.bbc.co.uk/programmes/b0087g39#programme	Helicopter Heroes	2	15	00:00:01.4521382
http://www.bbc.co.uk/programmes/b00lt2yv#programme	Hogmanay Live	2	15	00:00:01.2146846
http://www.bbc.co.uk/programmes/b006mhd6#programme	Holby City	2	15	00:00:00.7915757
http://www.bbc.co.uk/programmes/b00n53t6#programme	Hole in the Wall	2	15	00:00:01.0838468
http://www.bbc.co.uk/programmes/b006v5kb#programme	Homes Under the Hammer	2	15	00:00:01.9907178
http://www.bbc.co.uk/programmes/b00pzfhn#programme	Hospital 24/7	2	15	00:00:00.9697233
http://www.bbc.co.uk/programmes/b006wym5#programme	Hotel Babylon	2	15	00:00:01.0662132
http://www.bbc.co.uk/programmes/b007gf9k#programme	Hustle	2	15	00:00:01.0201508
http://www.bbc.co.uk/programmes/b007ght1#programme	Imagine	2	15	00:00:01.9032916
http://www.bbc.co.uk/programmes/b00djb5g#programme	In Cold Blood	2	15	00:00:01.2838855
http://www.bbc.co.uk/programmes/b0071mjk#programme	Inside Out East	2	15	00:00:00.9901065
http://www.bbc.co.uk/programmes/b007tj7z#programme	Inside Out East Midlands	2	15	00:00:00.9376007
http://www.bbc.co.uk/programmes/b006mjm5#programme	Inside Out England	2	15	00:00:00.8510808
http://www.bbc.co.uk/programmes/b0071mkv#programme	Inside Out London	2	15	00:00:00.7883291
http://www.bbc.co.uk/programmes/b0071mnc#programme	Inside Out North East and Cumbria	2	15	00:00:01.0853063
http://www.bbc.co.uk/programmes/b0071mrm#programme	Inside Out North West	2	15	00:00:00.8812043
http://www.bbc.co.uk/programmes/b0071msn#programme	Inside Out South	2	15	00:00:00.8641514
http://www.bbc.co.uk/programmes/b0071ms1#programme	Inside Out South East	2	15	00:00:00.8653796
http://www.bbc.co.uk/programmes/b0071mt5#programme	Inside Out South West	2	15	00:00:00.9844494
http://www.bbc.co.uk/programmes/b00807r6#programme	Inside Out West	2	15	00:00:01.0038041
http://www.bbc.co.uk/programmes/b0071mv2#programme	Inside Out West Midlands	2	15	00:00:00.8345336
http://www.bbc.co.uk/programmes/b0071mqm#programme	Inside Out Yorkshire and Lincolnshire	2	15	00:00:00.8843288
http://www.bbc.co.uk/programmes/b007gylv#programme	Inside Sport	2	15	00:00:01.3620272
http://www.bbc.co.uk/programmes/b00clbwj#programme	Inspector George Gently	2	15	00:00:01.1990244
http://www.bbc.co.uk/programmes/b006ncn0#programme	Jam and Jerusalem	2	15	00:00:01.8128052
http://www.bbc.co.uk/programmes/b008jg9q#programme	Jonathan Creek	2	15	00:00:01.4253265

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b006t0y5#programme	Junior Mastermind	2	15	00:00:01.0459764
http://www.bbc.co.uk/programmes/b00gbbl0#programme	Lark Rise to Candleford	2	15	00:00:00.9579389
http://www.bbc.co.uk/programmes/b006q3h0#programme	Last of the Summer Wine	2	15	00:00:01.1343251
http://www.bbc.co.uk/programmes/b00qcpzh#programme	Late Kick Off East	2	15	00:00:00.9302075
http://www.bbc.co.uk/programmes/b00qcp1l#programme	Late Kick Off London and the South East	2	15	00:00:01.3367955
http://www.bbc.co.uk/programmes/b00qcpcv#programme	Late Kick Off Midlands	2	15	00:00:00.8069148
http://www.bbc.co.uk/programmes/b00qcpj5#programme	Late Kick Off North East and Cumbria	2	15	00:00:00.9152923
http://www.bbc.co.uk/programmes/b00qcnps#programme	Late Kick Off North West	2	15	00:00:01.2721884
http://www.bbc.co.uk/programmes/b00qcpsh#programme	Late Kick Off South, South West and West	2	15	00:00:00.7454474
http://www.bbc.co.uk/programmes/b00qcpnf#programme	Late Kick Off Yorkshire and Lincolnshire	2	15	00:00:00.9331398
http://www.bbc.co.uk/programmes/b006t85s#programme	Life on Mars	2	15	00:00:01.3018705
http://www.bbc.co.uk/programmes/b006nb6j#programme	Lifeline	2	15	00:00:01.2946306
http://www.bbc.co.uk/programmes/b00p012b#programme	Lifeline from Northern Ireland	2	15	00:00:02.9092627
http://www.bbc.co.uk/programmes/b008cnxn#programme	Live at the Apollo	2	15	00:00:01.2245185
http://www.bbc.co.uk/programmes/b00dk703#programme	Lobby Lives	2	15	00:00:01.3250555
http://www.bbc.co.uk/programmes/b006mj5w#programme	Look East - BBC News	2	15	00:00:00.6900752
http://www.bbc.co.uk/programmes/b007tp3n#programme	Look North (East Yorkshire and Lincolnshire)	2	15	00:00:00.7005242
http://www.bbc.co.uk/programmes/b0070g1d#programme	Look North (North East and Cumbria)	2	15	00:00:00.4753519
http://www.bbc.co.uk/programmes/b006mj5m#programme	Look North (Yorkshire)	2	15	00:00:01.2278769
http://www.bbc.co.uk/programmes/b007t9y1#programme	Match of the Day	2	15	00:00:01.6802740
http://www.bbc.co.uk/programmes/b006szt3#programme	Match of the Day Live	2	15	00:00:01.2737077
http://www.bbc.co.uk/programmes/b007t9yl#programme	Match of the Day Northern Ireland	2	15	00:00:01.3649546
http://www.bbc.co.uk/programmes/b00mjlxv#programme	Merlin	2	15	00:00:00.6992463
http://www.bbc.co.uk/programmes/b006mj57#programme	Midlands Today	2	15	00:00:00.7178806
http://www.bbc.co.uk/programmes/b00jd4s1#programme	Missing Live	2	15	00:00:01.4599925
http://www.bbc.co.uk/programmes/b00dtyvd#programme	Monitor	2	15	00:00:01.2565265
http://www.bbc.co.uk/programmes/b006znvd#programme	MotoGP	2	15	00:00:00.9984380
http://www.bbc.co.uk/programmes/b00cpbds#programme	Murdaidh	2	16	00:00:01.4134543
http://www.bbc.co.uk/programmes/b006xj32#programme	My Family	2	15	00:00:01.0778850
http://www.bbc.co.uk/programmes/b007v009#programme	National Lottery Jet Set 2012	2	15	00:00:01.2808931
http://www.bbc.co.uk/programmes/b0080qf4#programme	National Lottery: In It To Win It	2	15	00:00:01.3389629
http://www.bbc.co.uk/programmes/b006mbnv#programme	Neighbours	2	15	00:00:03.5047614
http://www.bbc.co.uk/programmes/b007v4yt#programme	News 24 Sunday	2	15	00:00:01.3645751
http://www.bbc.co.uk/programmes/b00721d7#programme	Nolan Live	2	15	00:00:01.0849517
http://www.bbc.co.uk/programmes/b00cpbm9#programme	North West Today	2	15	00:00:01.0210773
http://www.bbc.co.uk/programmes/b006pfjx#programme	North West Tonight	2	15	00:00:00.7532499
http://www.bbc.co.uk/programmes/b00cpq7n#programme	Olympic Breakfast	2	15	00:00:01.1887515
http://www.bbc.co.uk/programmes/b008s13b#programme	Only an Excuse	2	15	00:00:01.2577970
http://www.bbc.co.uk/programmes/b006t14n#programme	Panorama	2	15	00:00:03.4943604
http://www.bbc.co.uk/programmes/b00b5dpz#programme	Party Election Broadcasts: Christian Choice	2	15	00:00:00.9562086
http://www.bbc.co.uk/programmes/b00b2gg9#programme	Party Election Broadcasts: English Democrats	2	15	00:00:02.6168025
http://www.bbc.co.uk/programmes/b00b4pfd#programme	Party Election Broadcasts: Left List Party	2	15	00:00:01.2673687
http://www.bbc.co.uk/programmes/b009y35p#programme	Party Election Broadcasts: Liberal Democrats	2	15	00:00:01.3186022
http://www.bbc.co.uk/programmes/b00b2gpz#programme	Party Election Broadcasts: One London	2	15	00:00:01.2587147

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b00b1nt2#programme	Party Election Broadcasts: Welsh Liberal Democrats	2	15	00:00:01.2650673
http://www.bbc.co.uk/programmes/b00dqy9k#programme	Pipes and Drums	2	15	00:00:01.2146777
http://www.bbc.co.uk/programmes/b00cnhjw#programme	Play For Today	2	15	00:00:01.5417996
http://www.bbc.co.uk/programmes/b00d5cgl#programme	Play of the Week	2	15	00:00:01.2283357
http://www.bbc.co.uk/programmes/b006mysv#programme	Points of View	2	15	00:00:01.3290795
http://www.bbc.co.uk/programmes/b00dznhb#programme	Put Your Money Where Your Mouth Is	2	15	00:00:01.6110537
http://www.bbc.co.uk/programmes/b006ml0g#programme	QI	2	15	00:00:01.2489445
http://www.bbc.co.uk/programmes/b006t1q9#programme	Question Time	2	15	00:00:00.7487284
http://www.bbc.co.uk/programmes/b00b7f5c#programme	Real Rescues	2	15	00:00:01.1001703
http://www.bbc.co.uk/programmes/b006mj3s#programme	Reporting Scotland	2	15	00:00:01.2206800
http://www.bbc.co.uk/programmes/b006p2xl#programme	River City	2	16	00:00:01.1812967
http://www.bbc.co.uk/programmes/b007tsds#programme	River City Omnibus	2	15	00:00:02.8415096
http://www.bbc.co.uk/programmes/b006m8g7#programme	Robin Hood	2	15	00:00:01.1680777
http://www.bbc.co.uk/programmes/b007nlgd#programme	Rogue Traders	2	15	00:00:01.2884798
http://www.bbc.co.uk/programmes/b00ctby1#programme	Rugby League Raw	2	15	00:00:01.4852714
http://www.bbc.co.uk/programmes/b006v5y2#programme	Saturday Kitchen	2	15	00:00:01.1733112
http://www.bbc.co.uk/programmes/b007sczs#programme	School's Out	2	15	00:00:01.3176145
http://www.bbc.co.uk/programmes/b00j59py#programme	Scottish Conservative Party Conference	2	15	00:00:01.3764524
http://www.bbc.co.uk/programmes/b00cp5qk#programme	Secret Gardens	2	15	00:00:01.4012814
http://www.bbc.co.uk/programmes/b007y6k8#programme	Silent Witness	2	15	00:00:01.1994138
http://www.bbc.co.uk/programmes/b008klr8#programme	Skiing Weather	2	15	00:00:01.6426190
http://www.bbc.co.uk/programmes/b00dj086#programme	Sky Cops	2	15	00:00:01.3552274
http://www.bbc.co.uk/programmes/b006ttc5#programme	Songs of Praise	2	15	00:00:01.2696018
http://www.bbc.co.uk/programmes/b007rwpv#programme	Sons of Ulster	2	15	00:00:01.2761049
http://www.bbc.co.uk/programmes/b006pfp8#programme	South East Today	2	15	00:00:00.8232393
http://www.bbc.co.uk/programmes/b006pfl4#programme	South Today	2	15	00:00:00.5691707
http://www.bbc.co.uk/programmes/b00qljvy#programme	Sport Relief	2	15	00:00:01.2419484
http://www.bbc.co.uk/programmes/b006zrbv#programme	Sportscene	2	15	00:00:01.0433745
http://www.bbc.co.uk/programmes/b006pfr1#programme	Spotlight	2	15	00:00:00.6763048
http://www.bbc.co.uk/programmes/b006v04h#programme	Spotlight	2	15	00:00:01.3341298
http://www.bbc.co.uk/programmes/b009j5xn#programme	Steptoe and Son	2	15	00:00:01.4707803
http://www.bbc.co.uk/programmes/b006m8dq#programme	Strictly Come Dancing	2	17	00:00:01.3004374
http://www.bbc.co.uk/programmes/b00b34wy#programme	Sunday Life	2	15	00:00:02.0193188
http://www.bbc.co.uk/programmes/b00h0m3d#programme	Super 8 Stories	2	15	00:00:01.2685604
http://www.bbc.co.uk/programmes/b0071mmc#programme	Super League Show	2	15	00:00:01.4690769
http://www.bbc.co.uk/programmes/b00q3gk5#programme	Survivors	2	15	00:00:00.8711804
http://www.bbc.co.uk/programmes/b00cs208#programme	Sykes	2	15	00:00:01.6497772
http://www.bbc.co.uk/programmes/b00c3wz1#programme	Tennis: Artois Championship	2	15	00:00:01.2207252
http://www.bbc.co.uk/programmes/b00c22lv#programme	Tennis: French Open	2	15	00:00:01.3165083
http://www.bbc.co.uk/programmes/b007y6ms#programme	Test the Nation	2	15	00:00:01.1941574
http://www.bbc.co.uk/programmes/b0080bbs#programme	The Andrew Marr Show	2	15	00:00:01.1401776
http://www.bbc.co.uk/programmes/b0071b63#programme	The Apprentice	2	15	00:00:00.8533018
http://www.bbc.co.uk/programmes/b00ndrqv#programme	The Armstrong and Miller Show	2	15	00:00:01.5919408
http://www.bbc.co.uk/programmes/b007sdh2#programme	The Big Day	2	15	00:00:03.0225259

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b007zpll#programme	The Big Questions	2	15	00:00:01.7973319
http://www.bbc.co.uk/programmes/b006ycps#programme	The Big Welsh Challenge	2	15	00:00:01.5812717
http://www.bbc.co.uk/programmes/b006wjp1#programme	The British Academy Film Awards	2	15	00:00:01.4132450
http://www.bbc.co.uk/programmes/b00b7rn1#programme	The British Academy Television Awards	2	15	00:00:01.3700721
http://www.bbc.co.uk/programmes/b007nn5l#programme	The Chase	2	15	00:00:01.6253271
http://www.bbc.co.uk/programmes/b006p4sr#programme	The Folks on the Hill	2	15	00:00:01.5377050
http://www.bbc.co.uk/programmes/b00mfmt9#programme	The Football League Show	2	15	00:00:01.5178311
http://www.bbc.co.uk/programmes/b006xnzc#programme	The Graham Norton Show	2	15	00:00:01.8344337
http://www.bbc.co.uk/programmes/b0073l35#programme	The Green Green Grass	2	15	00:00:01.4396408
http://www.bbc.co.uk/programmes/b00938jr#programme	The National Lottery Euromillions Draw	2	15	00:00:03.8037860
http://www.bbc.co.uk/programmes/b007y5mv#programme	The National Lottery: 1 vs 100	2	15	00:00:01.2526755
http://www.bbc.co.uk/programmes/b00mqdmf#programme	The National Lottery: Big 7	2	15	00:00:01.2098910
http://www.bbc.co.uk/programmes/b006m8xv#programme	The National Lottery: Midweek Draws	2	15	00:00:01.4902592
http://www.bbc.co.uk/programmes/b006xz2p#programme	The National Lottery: Saturday Draws	2	15	00:00:01.1054866
http://www.bbc.co.uk/programmes/b00ckttl#programme	The National Lottery: This Time Tomorrow	2	15	00:00:01.2668080
http://www.bbc.co.uk/programmes/b00k53z6#programme	The Omid Djalili Show	2	15	00:00:01.2867928
http://www.bbc.co.uk/programmes/b007tcw7#programme	The One Show	2	15	00:00:01.1472830
http://www.bbc.co.uk/programmes/b006m98k#programme	The Politics Show	2	15	00:00:01.3029593
http://www.bbc.co.uk/programmes/b007tk0k#programme	The Politics Show East	2	15	00:00:01.2983336
http://www.bbc.co.uk/programmes/b007tjm6#programme	The Politics Show East Midlands	2	15	00:00:01.2198965
http://www.bbc.co.uk/programmes/b007tjvm#programme	The Politics Show East Yorkshire and Lincolnshire	2	15	00:00:02.0873516
http://www.bbc.co.uk/programmes/b007tjl5#programme	The Politics Show London	2	15	00:00:01.2771250
http://www.bbc.co.uk/programmes/b007tjq0#programme	The Politics Show North East and Cumbria	2	15	00:00:01.2986142
http://www.bbc.co.uk/programmes/b007tjmv#programme	The Politics Show North West	2	15	00:00:08.4345569
http://www.bbc.co.uk/programmes/b007tjx7#programme	The Politics Show Northern Ireland	2	15	00:00:01.2902260
http://www.bbc.co.uk/programmes/b007tjwq#programme	The Politics Show Scotland	2	15	00:00:01.3073838
http://www.bbc.co.uk/programmes/b007tjkl#programme	The Politics Show South	2	15	00:00:01.7641397
http://www.bbc.co.uk/programmes/b007tjw7#programme	The Politics Show South East	2	15	00:00:01.5500602
http://www.bbc.co.uk/programmes/b007tjjx#programme	The Politics Show South West	2	15	00:00:01.3499687
http://www.bbc.co.uk/programmes/b007tjxh#programme	The Politics Show Wales	2	15	00:00:01.1946117
http://www.bbc.co.uk/programmes/b007tjf8#programme	The Politics Show West	2	15	00:00:04.6558032
http://www.bbc.co.uk/programmes/b007tjlj#programme	The Politics Show West Midlands	2	15	00:00:01.2961177
http://www.bbc.co.uk/programmes/b008hq2s#programme	The Politics Show Yorkshire and Lincolnshire	2	15	00:00:01.2345156
http://www.bbc.co.uk/programmes/b006mbfy#programme	The Royle Family	2	15	00:00:01.4799350
http://www.bbc.co.uk/programmes/b006mk7h#programme	The Sky at Night	2	15	00:00:01.0423451
http://www.bbc.co.uk/programmes/b008cbds#programme	The Street	2	15	00:00:00.9567167
http://www.bbc.co.uk/programmes/b007thwx#programme	The Twelfth	2	15	00:00:01.4914024
http://www.bbc.co.uk/programmes/b006qgfj#programme	The Vicar of Dibley	2	15	00:00:01.2744227
http://www.bbc.co.uk/programmes/b006mvhd#programme	This Week	2	15	00:00:01.3060094
http://www.bbc.co.uk/programmes/b006mgw8#programme	To Buy Or Not To Buy	2	15	00:00:01.5722189
http://www.bbc.co.uk/programmes/b008nd1q#programme	To the Manor Born	2	15	00:00:01.2900258
http://www.bbc.co.uk/programmes/b00704hg#programme	Top of the Pops	2	15	00:00:01.4197952
http://www.bbc.co.uk/programmes/b006m8ln#programme	Torchwood	2	15	00:00:00.9566294
http://www.bbc.co.uk/programmes/b00lpnkd#programme	Total Wipeout	2	15	00:00:02.4909796

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b006zygp#programme	Traffic Cops	2	15	00:00:01.2661623
http://www.bbc.co.uk/programmes/b007r5jm#programme	Trooping the Colour	2	15	00:00:01.4938427
http://www.bbc.co.uk/programmes/b00j8hgw#programme	UK Indoor Grand Prix	2	15	00:00:01.1860019
http://www.bbc.co.uk/programmes/b00k1121#programme	Urbi et Orbi	2	15	00:00:01.2441398
http://www.bbc.co.uk/programmes/b006r9ys#programme	Waking the Dead	2	15	00:00:00.7416941
http://www.bbc.co.uk/programmes/b00719kd#programme	Wales on Saturday	2	15	00:00:01.2630003
http://www.bbc.co.uk/programmes/b00pxtct#programme	Wallander	2	15	00:00:02.0769850
http://www.bbc.co.uk/programmes/b006s5v8#programme	Wanted Down Under	2	15	00:00:01.3236029
http://www.bbc.co.uk/programmes/b006mg74#programme	Watchdog	2	15	00:00:00.9978764
http://www.bbc.co.uk/programmes/b006t1p7#programme	Waterloo Road	2	15	00:00:00.9038941
http://www.bbc.co.uk/programmes/b006mgvw#programme	Weakest Link	2	15	00:00:00.7271055
http://www.bbc.co.uk/programmes/b007hj4j#programme	Week In Week Out	2	15	00:00:01.1591635
http://www.bbc.co.uk/programmes/b00hw8w7#programme	Welsh Greats	2	15	00:00:01.2409078
http://www.bbc.co.uk/programmes/b007t575#programme	Who Do You Think You Are?	2	15	00:00:00.9402634
http://www.bbc.co.uk/programmes/b006sggm#programme	X-Ray	2	15	00:00:01.2957529

Table 2: Expansion Algorithm Results for BBC 1 Programmes with BBC Domain-specific Profile

URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b006xyt3#programme	'Allo 'Allo!	17	428	00:00:26.4218228
http://www.bbc.co.uk/programmes/b00nz3b7#programme	A History of Scotland	7	136	00:00:05.5826054
http://www.bbc.co.uk/programmes/b007vkkt#programme	All Saints	7	433	00:00:09.7028310
http://www.bbc.co.uk/programmes/b009t1pg#programme	Anglo-Welsh Cup	7	129	00:00:06.6772030
http://www.bbc.co.uk/programmes/b006mj2y#programme	Antiques Roadshow	15	598	00:00:08.6823063
http://www.bbc.co.uk/programmes/b00jhp3l#programme	Ashes to Ashes	9	291	00:00:07.0916573
http://www.bbc.co.uk/programmes/b00crzfc#programme	Athletics	9	206	00:00:08.5349843
http://www.bbc.co.uk/programmes/b00cpbsj#programme	BBC Channel Islands News	3	1826	00:00:03.1118934
http://www.bbc.co.uk/programmes/b006mj67#programme	BBC London News	3	2161	00:00:01.5686173
http://www.bbc.co.uk/programmes/b009sdm6#programme	BBC News	3	1438	00:00:03.2781391
http://www.bbc.co.uk/programmes/b009sdnj#programme	BBC News and Regional News	3	637	00:00:02.0481814
http://www.bbc.co.uk/programmes/b006mvxy#programme	BBC Newsline	5	2626	00:00:16.3933773
http://www.bbc.co.uk/programmes/b00cpbqm#programme	BBC Oxford News	3	1788	00:00:15.8231189
http://www.bbc.co.uk/programmes/b006pft9#programme	BBC Points West	3	2080	00:00:06.8735321
http://www.bbc.co.uk/programmes/b006mj49#programme	BBC Wales Today	5	2649	00:00:10.4917770
http://www.bbc.co.uk/programmes/b009m51q#programme	BBC Weekend News	3	718	00:00:07.2529416
http://www.bbc.co.uk/programmes/b006nb9z#programme	Bargain Hunt	37	1966	00:00:42.6684471
http://www.bbc.co.uk/programmes/b00721bz#programme	Beechgrove Garden	11	495	00:00:12.4632630
http://www.bbc.co.uk/programmes/b00df5nm#programme	Between the Lines	7	98	00:00:06.4836380
http://www.bbc.co.uk/programmes/b00kj9xh#programme	Bikes!	11	179	00:00:08.7500366
http://www.bbc.co.uk/programmes/b007r5mm#programme	Blackpool Medics	5	78	00:00:06.9203298
http://www.bbc.co.uk/programmes/b006v5tb#programme	Breakfast	3	1170	00:00:03.3335310
http://www.bbc.co.uk/programmes/b006v7rw#programme	Car Booty	19	743	00:00:11.3578630
http://www.bbc.co.uk/programmes/b006xzh7#programme	Car Wars	5	68	00:00:04.0415796

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b006v7ww#programme	Cash in the Attic	31	1936	00:00:29.6094720
http://www.bbc.co.uk/programmes/b006z6fn#programme	Castaway	9	288	00:00:04.7289021
http://www.bbc.co.uk/programmes/b006m8wd#programme	Casualty	11	776	00:00:09.3813924
http://www.bbc.co.uk/programmes/b007mtf0#programme	Celebrity MasterChef	11	382	00:00:09.2613953
http://www.bbc.co.uk/programmes/b0072bk8#programme	Child of Our Time	9	162	00:00:07.0349450
http://www.bbc.co.uk/programmes/b008dk4b#programme	Children in Need	9	249	00:00:06.0658789
http://www.bbc.co.uk/programmes/b00lbrhm#programme	Coal House	11	346	00:00:08.2767749
http://www.bbc.co.uk/programmes/b006t0bv#programme	Countryfile	3	195	00:00:01.5853128
http://www.bbc.co.uk/programmes/b00ps1xh#programme	Cranford	7	122	00:00:04.5872891
http://www.bbc.co.uk/programmes/b006ppmq#programme	Crimewatch	3	62	00:00:02.3985343
http://www.bbc.co.uk/programmes/b00h4cr0#programme	Crimewatch Solved	3	36	00:00:02.7078817
http://www.bbc.co.uk/programmes/b009lfkt#programme	Crimewatch Special	3	33	00:00:02.2792086
http://www.bbc.co.uk/programmes/b008wllb#programme	Crimewatch Update	3	64	00:00:01.4841187
http://www.bbc.co.uk/programmes/b006pnjk#programme	DIY SOS	15	381	00:00:10.4998373
http://www.bbc.co.uk/programmes/b008q0fs#programme	Damages	9	278	00:00:06.3408567
http://www.bbc.co.uk/programmes/b007tlk3#programme	DanceX	3	37	00:00:03.3642663
http://www.bbc.co.uk/programmes/b006q2x0#programme	Doctor Who	15	541	00:00:06.7241875
http://www.bbc.co.uk/programmes/b00855q6#programme	Doctor Who Classic	7	94	00:00:02.8633827
http://www.bbc.co.uk/programmes/b006mh9v#programme	Doctors	13	3067	00:00:10.1882187
http://www.bbc.co.uk/programmes/b00j5kr5#programme	Dom's on the Case	5	83	00:00:03.2613737
http://www.bbc.co.uk/programmes/b006mvzk#programme	Dragon's Eye	3	241	00:00:26.3983974
http://www.bbc.co.uk/programmes/b007tj48#programme	East Midlands Today	3	2050	00:00:04.3310561
http://www.bbc.co.uk/programmes/b006m86d#programme	EastEnders	3	739	00:00:11.3788151
http://www.bbc.co.uk/programmes/b007sh7m#programme	EastEnders Omnibus	3	210	00:00:03.6973690
http://www.bbc.co.uk/programmes/b007tvw2#programme	Family Wanted	3	32	00:00:05.8372823
http://www.bbc.co.uk/programmes/b006szrz#programme	Final Score	3	154	00:00:03.0020458
http://www.bbc.co.uk/programmes/b0070lhz#programme	Final Score from NI	3	121	00:00:02.7802221
http://www.bbc.co.uk/programmes/b006m8tc#programme	Football Focus	3	154	00:00:02.2034039
http://www.bbc.co.uk/programmes/b006m99d#programme	Friday Night with Jonathan Ross	17	741	00:00:09.5416117
http://www.bbc.co.uk/programmes/b0070mnh#programme	Frontline Scotland	3	33	00:00:03.5433965
http://www.bbc.co.uk/programmes/b007nf70#programme	Gavin and Stacey	9	201	00:00:04.6482791
http://www.bbc.co.uk/programmes/b006pq94#programme	Give My Head Peace	5	63	00:00:07.2131848
http://www.bbc.co.uk/programmes/b006y2ql#programme	Golf	11	230	00:00:21.4325973
http://www.bbc.co.uk/programmes/b00gwg53#programme	Great Edinburgh International Cross Country	3	32	00:00:12.9645110
http://www.bbc.co.uk/programmes/b006mkw3#programme	Have I Got News for You	23	619	00:00:42.3092874
http://www.bbc.co.uk/programmes/b007nms5#programme	Heir Hunters	11	478	00:00:10.9301173
http://www.bbc.co.uk/programmes/b0087g39#programme	Helicopter Heroes	11	371	00:00:15.8412891
http://www.bbc.co.uk/programmes/b00h2yvv#programme	Hogmanay Live	3	33	00:00:03.3349728
http://www.bbc.co.uk/programmes/b006mhd6#programme	Holby City	11	853	00:00:07.6392091
http://www.bbc.co.uk/programmes/b00n53t6#programme	Hole in the Wall	7	177	00:00:11.0114570
http://www.bbc.co.uk/programmes/b006v5kb#programme	Homes Under the Hammer	39	2443	00:00:30.2108248
http://www.bbc.co.uk/programmes/b00pzfhn#programme	Hospital 24/7	7	128	00:00:04.9901598
http://www.bbc.co.uk/programmes/b006wym5#programme	Hotel Babylon	9	217	00:00:06.7196003
http://www.bbc.co.uk/programmes/b007gf9k#programme	Hustle	9	192	00:00:06.9377680

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b007ght1#programme	Imagine	13	301	00:00:10.3760101
http://www.bbc.co.uk/programmes/b00djb5g#programme	In Cold Blood	5	86	00:00:08.2225550
http://www.bbc.co.uk/programmes/b0071mjk#programme	Inside Out East	3	87	00:00:05.4350211
http://www.bbc.co.uk/programmes/b007tj7z#programme	Inside Out East Midlands	3	86	00:00:03.7173899
http://www.bbc.co.uk/programmes/b006mjm5#programme	Inside Out England	3	37	00:00:07.1194324
http://www.bbc.co.uk/programmes/b0071mkv#programme	Inside Out London	3	84	00:00:01.5712828
http://www.bbc.co.uk/programmes/b0071mnc#programme	Inside Out North East and Cumbria	3	89	00:00:01.1940867
http://www.bbc.co.uk/programmes/b0071mrm#programme	Inside Out North West	3	88	00:00:14.2090878
http://www.bbc.co.uk/programmes/b0071msn#programme	Inside Out South	3	86	00:00:02.8098525
http://www.bbc.co.uk/programmes/b0071ms1#programme	Inside Out South East	3	86	00:00:08.2561443
http://www.bbc.co.uk/programmes/b0071mt5#programme	Inside Out South West	3	86	00:00:06.1064674
http://www.bbc.co.uk/programmes/b00807r6#programme	Inside Out West	3	84	00:00:06.7388827
http://www.bbc.co.uk/programmes/b0071mv2#programme	Inside Out West Midlands	3	86	00:00:07.1855459
http://www.bbc.co.uk/programmes/b0071nqm#programme	Inside Out Yorkshire and Lincolnshire	3	88	00:00:04.9998859
http://www.bbc.co.uk/programmes/b007gylv#programme	Inside Sport	3	106	00:00:04.7356735
http://www.bbc.co.uk/programmes/b00clbwj#programme	Inspector George Gently	7	116	00:00:03.7918772
http://www.bbc.co.uk/programmes/b006ncn0#programme	Jam and Jerusalem	9	183	00:00:11.5166065
http://www.bbc.co.uk/programmes/b008jg9q#programme	Jonathan Creek	5	65	00:00:07.1449034
http://www.bbc.co.uk/programmes/b006t0y5#programme	Junior Mastermind	5	81	00:00:04.3987097
http://www.bbc.co.uk/programmes/b00gbbl0#programme	Lark Rise to Candleford	9	256	00:00:21.1028904
http://www.bbc.co.uk/programmes/b006q3h0#programme	Last of the Summer Wine	15	360	00:00:13.1743151
http://www.bbc.co.uk/programmes/b00qcpzh#programme	Late Kick Off East	5	123	00:00:03.7054189
http://www.bbc.co.uk/programmes/b00qcp11#programme	Late Kick Off London and the South East	5	123	00:00:06.1352090
http://www.bbc.co.uk/programmes/b00qcpcv#programme	Late Kick Off Midlands	5	123	00:00:01.6314366
http://www.bbc.co.uk/programmes/b00qcpj5#programme	Late Kick Off North East and Cumbria	5	123	00:00:12.0698516
http://www.bbc.co.uk/programmes/b00qcnps#programme	Late Kick Off North West	5	123	00:00:07.8331526
http://www.bbc.co.uk/programmes/b00qcpsh#programme	Late Kick Off South, South West and West	5	123	00:00:02.5489533
http://www.bbc.co.uk/programmes/b00qcpnf#programme	Late Kick Off Yorkshire and Lincolnshire	5	123	00:00:02.4927991
http://www.bbc.co.uk/programmes/b006t85s#programme	Life on Mars	7	161	00:00:04.5298655
http://www.bbc.co.uk/programmes/b006nb6j#programme	Lifeline	3	75	00:00:02.7651916
http://www.bbc.co.uk/programmes/b00p012b#programme	Lifeline from Northern Ireland	3	38	00:00:03.4257321
http://www.bbc.co.uk/programmes/b008cnxn#programme	Live at the Apollo	9	199	00:00:24.1000259
http://www.bbc.co.uk/programmes/b00dk703#programme	Lobby Lives	5	108	00:00:04.8350494
http://www.bbc.co.uk/programmes/b006mj5w#programme	Look East - BBC News	3	2103	00:00:01.9675242
http://www.bbc.co.uk/programmes/b007tp3n#programme	Look North (East Yorkshire and Lincolnshire)	3	1879	00:00:16.0145929
http://www.bbc.co.uk/programmes/b0070g1d#programme	Look North (North East and Cumbria)	3	2125	00:00:15.7976049
http://www.bbc.co.uk/programmes/b006mj5m#programme	Look North (Yorkshire)	3	2001	00:00:04.4805096
http://www.bbc.co.uk/programmes/b007t9y1#programme	Match of the Day	17	844	00:00:17.1845374
http://www.bbc.co.uk/programmes/b006szt3#programme	Match of the Day Live	17	558	00:00:16.6748417
http://www.bbc.co.uk/programmes/b007t9y1#programme	Match of the Day Northern Ireland	7	112	00:00:12.8794063
http://www.bbc.co.uk/programmes/b00mjlxv#programme	Merlin	7	198	00:00:03.2561729
http://www.bbc.co.uk/programmes/b006mj57#programme	Midlands Today	3	2060	00:00:10.3442748
http://www.bbc.co.uk/programmes/b00jd4s1#programme	Missing Live	9	320	00:00:15.4602353
http://www.bbc.co.uk/programmes/b00dtyvd#programme	Monitor	3	36	00:00:02.1718228

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b006znvd#programme	MotoGP	11	416	00:00:16.1992128
http://www.bbc.co.uk/programmes/b00cpbds#programme	Murdaidh	9	212	00:00:06.3537376
http://www.bbc.co.uk/programmes/b006xj32#programme	My Family	21	584	00:00:22.3202888
http://www.bbc.co.uk/programmes/b007v009#programme	National Lottery Jet Set 2012	3	33	00:00:02.0351753
http://www.bbc.co.uk/programmes/b0080qf4#programme	National Lottery: In It To Win It	5	120	00:00:05.6090692
http://www.bbc.co.uk/programmes/b006mbnv#programme	Neighbours	5	252	00:00:09.3397317
http://www.bbc.co.uk/programmes/b007v4yt#programme	News 24 Sunday	3	38	00:00:04.4368082
http://www.bbc.co.uk/programmes/b00721d7#programme	Nolan Live	3	45	00:00:02.7699280
http://www.bbc.co.uk/programmes/b00cpbm9#programme	North West Today	3	634	00:00:14.9639587
http://www.bbc.co.uk/programmes/b006pfjx#programme	North West Tonight	2	16	00:00:15.9068861
http://www.bbc.co.uk/programmes/b00cpq7n#programme	Olympic Breakfast	5	94	00:00:10.8374305
http://www.bbc.co.uk/programmes/b008s13b#programme	Only an Excuse	3	32	00:00:28.8677081
http://www.bbc.co.uk/programmes/b006t14n#programme	Panorama	3	215	00:00:02.5588006
http://www.bbc.co.uk/programmes/b00b5dpz#programme	Party Election Broadcasts: Christian Choice	3	30	00:00:03.6589022
http://www.bbc.co.uk/programmes/b00b2gg9#programme	Party Election Broadcasts: English Democrats	3	34	00:00:06.1401920
http://www.bbc.co.uk/programmes/b00b4pfd#programme	Party Election Broadcasts: Left List Party	3	30	00:00:03.0999650
http://www.bbc.co.uk/programmes/b009y35p#programme	Party Election Broadcasts: Liberal Democrats	3	41	00:00:20.2144565
http://www.bbc.co.uk/programmes/b00b2gpz#programme	Party Election Broadcasts: One London	3	30	00:00:09.0223629
http://www.bbc.co.uk/programmes/b00b1nt2#programme	Party Election Broadcasts: Welsh Liberal Democrats	3	41	00:00:01.7809595
http://www.bbc.co.uk/programmes/b00dqy9k#programme	Pipes and Drums	7	111	00:00:03.7415707
http://www.bbc.co.uk/programmes/b00cnhjw#programme	Play For Today	5	64	00:00:13.0468896
http://www.bbc.co.uk/programmes/b00d5cgl#programme	Play of the Week	3	29	00:00:02.4839503
http://www.bbc.co.uk/programmes/b006mysv#programme	Points of View	5	188	00:00:05.2480227
http://www.bbc.co.uk/programmes/b00dznhb#programme	Put Your Money Where Your Mouth Is	9	353	00:00:29.8894093
http://www.bbc.co.uk/programmes/b006ml0g#programme	QI	17	590	00:00:21.5735423
http://www.bbc.co.uk/programmes/b006t1q9#programme	Question Time	3	171	00:00:15.8686912
http://www.bbc.co.uk/programmes/b00b7f5c#programme	Real Rescues	15	590	00:00:36.6404773
http://www.bbc.co.uk/programmes/b006mj3s#programme	Reporting Scotland	3	2535	00:00:20.0304061
http://www.bbc.co.uk/programmes/b006p2xl#programme	River City	3	238	00:00:03.0210256
http://www.bbc.co.uk/programmes/b007tsds#programme	River City Omnibus	3	64	00:00:12.0907857
http://www.bbc.co.uk/programmes/b006m8g7#programme	Robin Hood	9	280	00:00:17.0114194
http://www.bbc.co.uk/programmes/b007nlgd#programme	Rogue Traders	11	208	00:00:16.8318094
http://www.bbc.co.uk/programmes/b00ctby1#programme	Rugby League Raw	5	62	00:00:03.7647360
http://www.bbc.co.uk/programmes/b006v5y2#programme	Saturday Kitchen	5	211	00:00:05.1649783
http://www.bbc.co.uk/programmes/b007sczs#programme	School's Out	5	89	00:00:07.7150767
http://www.bbc.co.uk/programmes/b00j59py#programme	Scottish Conservative Party Conference	9	140	00:00:08.9373332
http://www.bbc.co.uk/programmes/b00cp5qk#programme	Secret Gardens	3	216	00:00:05.8873572
http://www.bbc.co.uk/programmes/b007y6k8#programme	Silent Witness	11	223	00:00:08.4535835
http://www.bbc.co.uk/programmes/b008klr8#programme	Skiing Weather	3	35	00:00:01.4140392
http://www.bbc.co.uk/programmes/b00dj086#programme	Sky Cops	9	195	00:00:11.5780997
http://www.bbc.co.uk/programmes/b006ttc5#programme	Songs of Praise	3	200	00:00:07.8389282
http://www.bbc.co.uk/programmes/b007rwpv#programme	Sons of Ulster	3	33	00:00:02.8853815
http://www.bbc.co.uk/programmes/b006pfp8#programme	South East Today	3	2071	00:00:03.0026977
http://www.bbc.co.uk/programmes/b006pfl4#programme	South Today	3	2084	00:00:06.9391868

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b00qljvy#programme	Sport Relief	7	255	00:00:06.4182822
http://www.bbc.co.uk/programmes/b006zrbv#programme	Sportscene	3	219	00:00:09.7202765
http://www.bbc.co.uk/programmes/b006pfr1#programme	Spotlight	3	2082	00:00:09.4870337
http://www.bbc.co.uk/programmes/b006v04h#programme	Spotlight	7	255	00:00:04.6546362
http://www.bbc.co.uk/programmes/b009j5xn#programme	Steptoe and Son	7	117	00:00:09.0668137
http://www.bbc.co.uk/programmes/b006m8dq#programme	Strictly Come Dancing	11	502	00:00:12.2549412
http://www.bbc.co.uk/programmes/b00b34wy#programme	Sunday Life	5	94	00:00:03.6982848
http://www.bbc.co.uk/programmes/b00h0m3d#programme	Super 8 Stories	7	120	00:00:06.4959974
http://www.bbc.co.uk/programmes/b0071mmc#programme	Super League Show	11	541	00:00:13.9835648
http://www.bbc.co.uk/programmes/b00q3gk5#programme	Survivors	7	148	00:00:05.9813782
http://www.bbc.co.uk/programmes/b00cs208#programme	Sykes	5	63	00:00:05.2168203
http://www.bbc.co.uk/programmes/b00c3wz1#programme	Tennis: Artois Championship	5	92	00:00:06.1001813
http://www.bbc.co.uk/programmes/b00c22lv#programme	Tennis: French Open	11	197	00:00:07.4768900
http://www.bbc.co.uk/programmes/b007y6ms#programme	Test the Nation	3	29	00:00:06.4136874
http://www.bbc.co.uk/programmes/b0080bbs#programme	The Andrew Marr Show	3	171	00:00:03.9368361
http://www.bbc.co.uk/programmes/b0071b63#programme	The Apprentice	9	284	00:00:09.5906338
http://www.bbc.co.uk/programmes/b00ndrqv#programme	The Armstrong and Miller Show	7	148	00:00:10.3100647
http://www.bbc.co.uk/programmes/b007sdh2#programme	The Big Day	5	76	00:00:06.3295217
http://www.bbc.co.uk/programmes/b007zpll#programme	The Big Questions	9	475	00:00:06.8965180
http://www.bbc.co.uk/programmes/b006ycps#programme	The Big Welsh Challenge	5	75	00:00:08.1332526
http://www.bbc.co.uk/programmes/b006wjp1#programme	The British Academy Film Awards	11	183	00:00:07.3924299
http://www.bbc.co.uk/programmes/b00b7rn1#programme	The British Academy Television Awards	3	33	00:00:02.2405934
http://www.bbc.co.uk/programmes/b007nn5l#programme	The Chase	5	106	00:00:04.1859964
http://www.bbc.co.uk/programmes/b006p4sr#programme	The Folks on the Hill	11	282	00:00:08.2230397
http://www.bbc.co.uk/programmes/b00mfmt9#programme	The Football League Show	7	241	00:00:09.3647346
http://www.bbc.co.uk/programmes/b006xnzc#programme	The Graham Norton Show	17	547	00:00:12.7939738
http://www.bbc.co.uk/programmes/b0073l35#programme	The Green Green Grass	11	267	00:00:16.2767913
http://www.bbc.co.uk/programmes/b00938jr#programme	The National Lottery Euromillions Draw	3	148	00:00:02.1082296
http://www.bbc.co.uk/programmes/b007y5mv#programme	The National Lottery: 1 vs 100	9	197	00:00:08.0418215
http://www.bbc.co.uk/programmes/b00mqdmf#programme	The National Lottery: Big 7	3	35	00:00:02.6947203
http://www.bbc.co.uk/programmes/b006m8xv#programme	The National Lottery: Midweek Draws	9	403	00:00:07.0838327
http://www.bbc.co.uk/programmes/b006xz2p#programme	The National Lottery: Saturday Draws	5	136	00:00:03.9686553
http://www.bbc.co.uk/programmes/b00ckttl#programme	The National Lottery: This Time Tomorrow	3	37	00:00:04.2532666
http://www.bbc.co.uk/programmes/b00k53z6#programme	The Omid Djalili Show	7	139	00:00:09.9139872
http://www.bbc.co.uk/programmes/b007tcw7#programme	The One Show	3	770	00:00:03.2146192
http://www.bbc.co.uk/programmes/b006m98k#programme	The Politics Show	31	636	00:00:32.5346553
http://www.bbc.co.uk/programmes/b007tk0k#programme	The Politics Show East	3	138	00:00:03.7185185
http://www.bbc.co.uk/programmes/b007tjm6#programme	The Politics Show East Midlands	3	138	00:00:06.6651381
http://www.bbc.co.uk/programmes/b007tjvm#programme	The Politics Show East Yorkshire and Lincolnshire	3	33	00:00:02.2605787
http://www.bbc.co.uk/programmes/b007tjl5#programme	The Politics Show London	3	139	00:00:02.7984750
http://www.bbc.co.uk/programmes/b007tjq0#programme	The Politics Show North East and Cumbria	3	139	00:00:02.4410674
http://www.bbc.co.uk/programmes/b007tjmv#programme	The Politics Show North West	3	137	00:00:05.2710672
http://www.bbc.co.uk/programmes/b007tjx7#programme	The Politics Show Northern Ireland	3	151	00:00:03.3510770
http://www.bbc.co.uk/programmes/b007tjwq#programme	The Politics Show Scotland	3	144	00:00:03.1177195

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URI	Program Name	Graphs	Triples	Time
http://www.bbc.co.uk/programmes/b007tjkl#programme	The Politics Show South	3	139	00:00:08.3639645
http://www.bbc.co.uk/programmes/b007tjw7#programme	The Politics Show South East	3	138	00:00:03.1526862
http://www.bbc.co.uk/programmes/b007tjjx#programme	The Politics Show South West	3	137	00:00:02.7464227
http://www.bbc.co.uk/programmes/b007tjxh#programme	The Politics Show Wales	3	139	00:00:01.7799538
http://www.bbc.co.uk/programmes/b007tjf8#programme	The Politics Show West	3	139	00:00:02.6429972
http://www.bbc.co.uk/programmes/b007tjlj#programme	The Politics Show West Midlands	3	138	00:00:02.5146770
http://www.bbc.co.uk/programmes/b008hq2s#programme	The Politics Show Yorkshire and Lincolnshire	3	141	00:00:01.6169099
http://www.bbc.co.uk/programmes/b006mbfy#programme	The Royle Family	5	66	00:00:09.5242474
http://www.bbc.co.uk/programmes/b006mk7h#programme	The Sky at Night	3	123	00:00:02.8697924
http://www.bbc.co.uk/programmes/b008cbds#programme	The Street	7	137	00:00:05.7653217
http://www.bbc.co.uk/programmes/b007thwx#programme	The Twelfth	3	35	00:00:05.2414037
http://www.bbc.co.uk/programmes/b006qgfj#programme	The Vicar of Dibley	11	198	00:00:10.0694057
http://www.bbc.co.uk/programmes/b006mvhd#programme	This Week	3	169	00:00:03.8292245
http://www.bbc.co.uk/programmes/b006mgw8#programme	To Buy Or Not To Buy	23	1696	00:00:19.1912646
http://www.bbc.co.uk/programmes/b008nd1q#programme	To the Manor Born	3	30	00:00:01.9865878
http://www.bbc.co.uk/programmes/b00704hg#programme	Top of the Pops	3	39	00:00:01.6039880
http://www.bbc.co.uk/programmes/b006m8ln#programme	Torchwood	9	251	00:00:06.3085931
http://www.bbc.co.uk/programmes/b00lpnkd#programme	Total Wipeout	9	247	00:00:07.8413132
http://www.bbc.co.uk/programmes/b006zygp#programme	Traffic Cops	3	72	00:00:01.3726829
http://www.bbc.co.uk/programmes/b007r5jm#programme	Trooping the Colour	3	38	00:00:04.8125242
http://www.bbc.co.uk/programmes/b00j8hgw#programme	UK Indoor Grand Prix	7	97	00:00:05.6188064
http://www.bbc.co.uk/programmes/b00k1121#programme	Urbi et Orbi	3	33	00:00:03.9663696
http://www.bbc.co.uk/programmes/b006r9ys#programme	Waking the Dead	11	223	00:00:07.0814030
http://www.bbc.co.uk/programmes/b00719kd#programme	Wales on Saturday	3	95	00:00:03.0562280
http://www.bbc.co.uk/programmes/b00pxtct#programme	Wallander	7	116	00:00:06.3237593
http://www.bbc.co.uk/programmes/b006s5v8#programme	Wanted Down Under	13	475	00:00:09.3255742
http://www.bbc.co.uk/programmes/b006mg74#programme	Watchdog	3	111	00:00:03.8143992
http://www.bbc.co.uk/programmes/b006t1p7#programme	Waterloo Road	9	360	00:00:02.2300234
http://www.bbc.co.uk/programmes/b006mgvw#programme	Weakest Link	5	622	00:00:06.9086251
http://www.bbc.co.uk/programmes/b007hj4j#programme	Week In Week Out	5	133	00:00:04.6550087
http://www.bbc.co.uk/programmes/b00hw8w7#programme	Welsh Greats	9	176	00:00:12.4910985
http://www.bbc.co.uk/programmes/b007t575#programme	Who Do You Think You Are?	19	459	00:00:16.3018707
http://www.bbc.co.uk/programmes/b006sggm#programme	X-Ray	13	503	00:00:07.3485174

TABLE 3: Expansion Algorithm Results for DBPedia Countries

Country	Graphs	Triples	Time
Bahaman	29	2162	00:19.2
The Bahamas	29	2204	00:18.4
Aztec	25	847	00:03.1
Vermont Republic	26	889	00:05.1
Nauru	32	1963	00:21.3
Philippines	1	0	00:15.0
Philippino	61	592554	03:28.1
Syria	39	591015	10:43.1
Aruba	26	1558	00:18.0
Akkadian Empire	19	497	00:04.1
Almoravid dynasty	26	652	00:06.5
Durrani Empire	11	573	00:02.6
Benin	30	2391	00:19.8
Bosnia and Herzegovina	26	2862	00:18.0
Burkina Faso	36	2468	00:21.2
British Empire	30	1077	00:06.5
Czech Republic	64	592661	03:17.0
Czechoslovakia	45	591699	06:43.7
Chad	34	2632	00:21.6
Chile	33	592731	02:45.8
Confederate States of America	35	3178	00:17.4
Fiji	39	2464	00:23.5
French Southern and Antarctic Lands	32	1164	00:23.3
Guam	29	1729	00:23.2
Gabon	28	2449	00:20.0
Ghana	35	591672	02:53.6
German Empire	29	2886	00:20.9
Haiti	25	590436	02:56.6
Italy	44	598247	11:57.6
Iran	49	594510	16:53.4
Japan	63	597381	07:28.8
Juan Fernndez Islands	3	213	00:06.5
Korea	137	595228	02:28.4
Libya	45	591687	06:40.9
Laos	1	0	00:15.3
Liechtenstein	1	0	00:15.0
League of Nations	1	0	00:15.0
Macau	60	590604	03:08.7
Mali	32	2869	00:07.9
Malta	31	591219	03:03.2
Burma	38	591247	10:33.4
Nazi Germany	11	4556	00:46.9
Niue	22	1500	00:46.0
New Caledonia	44	1744	00:30.8
Niger	31	2498	00:47.6
Norfolk Island	32	1552	00:25.4
Oman	35	591337	03:08.1
Palau	42	1849	00:32.7
Palestinian National Authority	25	1216	00:17.9
Roman Kingdom	19	529	00:18.4
Spain	49	598066	03:08.0
Samoa	1	0	00:15.0
Togo	1	0	00:15.0
Tonga	36	2535	00:44.7
Tristan da Cunha	16	700	00:20.9
United States Virgin Islands	24	2039	00:21.0
Vatican City	54	2782	00:48.5
Zaire	16	917	00:04.4
World	15	1165	00:26.3
Macedonia (ancient kingdom)	3	460	00:05.7
Xia Dynasty	12	383	00:12.2
New Netherland	11	419	00:16.8
Han Dynasty	11	791	00:15.0
Danish West Indies	15	378	00:13.5
Union of South Africa	58	593775	03:03.8
Duchy of Schleswig	14	332	00:23.9
Lower Canada	9	427	00:30.7
Organisation of African Unity	16	580	00:10.1
Umayyad Caliphate	43	1056	00:17.9
Abbasid Caliphate	31	777	00:20.2
Straits Settlements	7	210	00:02.3
United Kingdom of the Netherlands	10	444	00:08.0

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Country	Graphs	Triples	Time
Central Tibetan Administration	25	928	00:16.3
Fatimid Caliphate	22	606	00:12.1
Liu Song Dynasty	13	361	00:12.3
Neutral Moresnet	9	385	00:06.5
Grand Duchy of Baden	8	354	00:09.8
Sahrawi Arab Democratic Republic	33	731	00:19.2
Bourbon Restoration	23	792	00:12.9
Viceroyalty of New Spain	14	524	00:17.2
Herm	12	662	00:22.7
Wales	31	8322	00:33.1
Duchy of Carinthia	11	387	00:29.8
Kamakura shogunate	10	308	00:09.0
Ashikaga shogunate	15	393	00:14.6
Sark	18	701	00:29.8
Cayor	7	192	00:05.6
Medes	24	706	00:15.1
Carriacou and Petite Martinique	13	445	00:33.3
Thorn (Netherlands)	5	173	00:22.6
Ravenstein & Netherlands	5	125	00:16.3
Annam (French protectorate)	3	121	00:01.5
Royal Prussia	10	366	00:07.2
Reuss (state)	3	194	00:02.2
Malacca Sultanate	12	387	00:09.2
History of the Khitans	4	173	00:06.2
Bophuthatswana	9	371	00:10.1
Lordship of Ireland	12	501	00:10.6
Peru	35	591613	03:24.8
Nepal	36	590924	12:59.3
Sukhothai Kingdom	14	561	00:13.0
Baden	17	617	00:09.0
Transjordan	4	227	00:16.8
Ifni	10	442	00:47.5
Khanate of Sibir	14	383	00:34.2
County of Mark	13	374	00:17.6
Kara-Khitan Khanate	23	484	00:14.5
Kenya	25	591444	03:14.8
Alawite State	14	330	00:08.4
Massachusetts Bay Colony	17	397	00:13.9
British Guiana	7	247	00:12.9
Lanna	9	302	00:11.6
Alsace-Lorraine	14	804	00:17.7
West Indies Federation	9	415	00:05.8
New Hebrides	9	340	00:06.2
Portuguese Empire	17	529	00:12.2
Swedish Livonia	7	424	00:07.5
County of lvsborg	3	134	00:05.0
Mongol Empire	18	924	00:15.8
State of Palestine	6	247	00:27.9
Khmer Republic	7	252	00:15.9
Chinese Soviet Republic	14	387	00:03.1
Archdiocese of Bremen	17	458	00:22.7
Archbishopric of Magdeburg	15	558	00:07.7
Kalinga-Apayao	11	411	00:08.1
Argentine Confederation	5	186	00:03.7
Northern Rhodesia	7	334	00:06.0
Southern Rhodesia	6	494	00:05.7
Great Moravia	15	539	00:22.8
Saba	14	953	00:27.3
Hyderabad State	15	584	00:28.4
League of God's House	4	136	00:22.2
Malayan Union	4	154	00:15.1
French Second Republic	6	307	00:13.6
Hephthalite	23	484	00:31.6
Kingdom of Thessalonica	9	317	00:11.5
American Samoa	32	1548	00:26.7
Rouran Khaganate	14	368	00:15.3
Italian Social Republic	19	545	00:10.2
Silla	19	634	00:36.4
Joseon Dynasty	32	886	00:30.4
Mongolian People's Republic	4	179	00:01.7
French Fourth Republic	7	234	00:08.1
Federated Malay States	5	204	00:05.1
General Government	14	417	00:23.4
State of Jin	6	198	00:02.8

Continued on next page

Country	Graphs	Triples	Time
Zempln County	3	107	00:01.7
Hont County	5	163	00:13.4
Maratha Empire	13	536	00:15.4
County of Hrnsand	3	91	00:20.2
Republic of Central Lithuania	6	323	00:31.2
Reichskommissariat Ostland	7	308	00:17.5
Qin (state)	5	199	00:05.4
County of Nyland and Tavastehus	11	210	00:12.1
Grand Duchy of Posen	11	357	00:29.1
Icelandic Commonwealth	7	407	00:31.9
oma Voivodeship	3	103	00:15.5
Oldenburg (state)	5	177	00:05.8
Venda	7	330	00:08.8
Moche	10	309	00:07.0
Protectorate of Bohemia and Moravia	13	440	00:22.6
Russian Provisional Government	11	608	00:31.9
New East Prussia	6	169	00:30.8
Liang Dynasty	9	344	00:34.9
Chen Dynasty	9	301	00:31.3
Later Liang	6	206	00:14.5
Nevada Territory	6	184	00:31.1
Wyoming Territory	6	165	00:13.9
Carpatho-Ukraine	8	271	00:07.2
Montana Territory	6	173	00:10.9
Territory of Orleans	6	173	00:10.5
District of Louisiana	5	129	00:31.2
Tahirid Dynasty	12	302	00:22.2
Southwestern Somalia	5	231	00:07.7
Bouvet Island	29	1209	00:27.4
Republic of the Congo	26	2784	00:39.6
Cuba	27	591019	03:25.3
Egypt	42	592535	04:22.9
Falkland Islands	26	589554	03:54.7
Province of New Jersey	13	2189	00:05.3
Colony of Rhode Island and Providence Plantations	14	900	00:13.4
Saffarid Dynasty	10	268	00:07.1
Territory of Alabama	7	211	00:05.1
Bihar County	8	539	00:07.4
Confederation of the Rhine	10	413	00:07.7
Italian Somaliland	10	428	00:11.7
Prince-Bishopric of Warmia	9	367	00:05.7
Saxe-Altenburg	8	354	00:07.8
Saxe-Meiningen	11	357	00:06.8
Grande Comore	17	586	00:08.8
Iraq	26	592905	03:23.3
Republic of Macedonia	15	2330	00:40.8
Second Mexican Empire	5	214	00:22.9
Volga German Autonomous Soviet Socialist Republic	9	385	00:31.9
Khanate of Kazan	11	700	00:08.4
Kingdom of Poland (19161918)	3	168	00:02.2
United Provinces of Agra and Oudh	5	176	00:05.0
Kingdom of GaliciaVolhynia	3	312	00:01.5
Duke of Swabia	13	411	00:04.1
Ubangi-Shari	15	324	00:11.5
Portuguese Guinea	8	397	00:09.6
Territory of Hawaii	12	447	00:03.0
Duchy of Pomerania	13	424	00:17.4
Basque Country (greater region)	3	148	00:01.9
Dominion of Newfoundland	8	473	00:08.5
Ukrainian State	7	316	00:07.9
First Spanish Republic	7	281	00:09.0
Swedish Estonia	6	261	00:05.6
First Saudi State	8	351	00:06.5
Sennar (sultanate)	5	195	00:06.6
Baltic governorates	8	175	00:07.2
Qatar	33	2590	00:34.0
So Tom and Prncipe	5	710	00:05.9
Hungarian Soviet Republic	16	608	00:08.9
Southeast Asia Treaty Organization	15	389	00:28.1
Griqualand East	5	197	00:05.2
Novgorod Republic	8	383	00:32.7
Nizam	26	551	00:16.2
Sopron County	7	243	00:14.0
Bcs-Bodrog County	3	93	00:01.9

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Country	Graphs	Triples	Time
Heves County (former)	3	77	00:01.5
Trencsn County	3	113	00:03.4
Bereg County	6	154	00:06.7
Hajd County	3	72	00:01.6
Arad County (former)	3	82	00:06.6
Csand County	3	84	00:02.2
Hromszk County	3	116	00:01.2
Fogaras County	6	131	00:04.2
Nagy-Kkll County	3	85	00:01.4
Kolozs County	6	146	00:03.1
Szeben County	6	133	00:08.0
Bjelovar-Krievci County	3	110	00:02.2
Szolnok-Doboka County	6	141	00:04.3
Lika-Krbava County	7	155	00:14.3
Poega County (former)	3	89	00:04.4
Srijem County	5	140	00:05.8
Danish Colonial Empire	8	196	00:06.3
Chu (state)	5	165	00:02.4
Crimean Khanate	13	406	00:09.7
Anglo-Egyptian Sudan	6	240	00:08.9
Astrakhan Khanate	9	412	00:08.2
Nagorno-Karabakh Republic	12	506	00:20.5
Republic of Madawaska	6	207	00:16.6
French Mandate of Lebanon	14	488	00:16.4
Zand dynasty	11	322	00:16.1
Longshan culture	11	296	00:06.2
Early Modern France	9	720	00:19.4
Rif Republic	10	312	00:05.8
Lokot Autonomy	7	189	00:04.7
Pala Empire	11	313	00:03.8
United Arab States	5	173	00:06.8
Duchy of Brunswick	25	564	00:12.5
Spanish West Africa	7	260	00:08.4
Sandomierz Voivodeship	6	183	00:11.6
Podolian Voivodeship	12	267	00:11.8
Trakai Voivodeship	18	480	00:15.8
Azerbaijan People's Government	4	107	00:03.4
Danishmends	13	344	00:15.6
Republic of West Papua	7	201	00:08.5
Province of Upper Silesia	9	258	00:06.1
Moldavian Democratic Republic	7	171	00:04.8
Ty Sn Dynasty	3	170	00:03.6
Vistula Land	12	232	00:22.7
Kuban-Black Sea Soviet Republic	6	175	00:31.1
Kuban Soviet Republic	4	96	00:31.0
Slovak Soviet Republic	10	320	00:27.5
Reuss Younger Line	21	465	00:17.7
Crimean Autonomous Soviet Socialist Republic	9	250	00:21.8
Satavahana dynasty	13	267	00:24.1
Bishopric of Wrzburg	3	186	00:02.1
Adil Shahi dynasty	15	276	00:13.5
Wuyue	7	137	00:02.8
First East Turkestan Republic	10	266	00:07.2
Lodi dynasty	7	156	00:06.5
Rhine Province	9	206	00:19.4
Duchy of Massa and Carrara	10	184	00:20.9
Wang Jingwei regime	16	353	00:25.2
Dadao government (Shanghai 19371940)	3	66	00:01.7
Waldburg-Wurzach	6	105	00:09.8
Waldburg-Waldsee	6	105	00:05.5
Solms-Wildenfels	5	84	00:13.4
Solms-Rdelheim-Assenheim	3	72	00:03.6
Solms-Laubach	5	92	00:04.3
Salm-Reifferscheid-Dyck	6	115	00:04.8
Iudaea Province	13	488	00:12.8
Wied-Neuwied (state)	5	68	00:04.8
Stolberg-Rossla	5	94	00:03.5
Golden Ambrosian Republic	8	190	00:06.3
East Africa Protectorate	6	113	00:10.6
Wied	7	145	00:14.6
Louisiana (New France)	5	127	00:06.6
Trn Dynasty	3	104	00:07.0
Sayn	5	118	00:06.3
Sponheim-Sayn	5	76	00:05.8

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Country	Graphs	Triples	Time
Abbey of Saint Peter in the Black Forest	10	193	00:04.9
Aceh Sultanate	7	162	00:08.4
Alash Autonomy	6	164	00:03.2
Albania under Italy	13	312	00:08.9
Albanian Kingdom	5	137	00:05.5
Japanese occupation of Hong Kong	12	255	00:16.2
Republic of the Rio Grande	7	225	00:31.1
Frstenberg (state)	3	62	00:16.2
Caliphate of Crdoba	3	216	00:16.3
An der Etsch	5	109	00:32.9
Ancient Corinth	6	123	00:31.5
Anglo-Corsican Kingdom	8	509	00:10.1
Duchy of Magdeburg	5	123	00:10.4
Hatay State	13	308	00:06.7
County of Hoya	7	125	00:05.5
Despotate of the Morea	11	284	00:07.7
Archbishopric of Strasbourg	24	702	00:07.2
Aro Confederacy	6	108	00:08.3
Ashanti Empire	15	365	00:12.3
Augustw Voivodeship	3	66	00:05.7
Timeline of Philippine history	6	2109	00:07.7
Praetorian prefecture of Illyricum	8	181	00:05.2
Principality of Gttingen	3	101	00:01.7
United Provinces of Central Italy	5	117	00:04.8
Flensburg government	7	177	00:20.6
Portuguese First Republic	7	309	00:13.3
Colony of Aden	13	262	00:26.2
Federation of Arab Emirates of the South	7	140	00:26.9
Pskov Republic	5	160	00:31.1
Khanate of Khiva	9	259	00:07.6
Belastok Voblast	10	194	00:02.4
Belgian colonial empire	12	237	00:06.1
Benin Empire	5	215	00:31.3
Captaincy General of Chile	4	130	00:31.0
Second Bulgarian Empire	10	546	00:34.1
United States of Colombia	8	263	00:12.8
State of Dai	7	158	00:02.2
Canton of Oberland	8	165	00:02.2
Kingdom of Poland (13851569)	3	145	00:02.0
Western Satraps	15	261	00:08.2
Chola Dynasty	16	368	00:02.4
Reichskommissariat Ukraine	10	259	00:03.6
Powys Fadog	5	94	00:02.5
Republic of Uice	3	129	00:01.3
British Ceylon	9	259	00:08.1
Byzantium under the Komnenoi	8	293	00:03.2
Byzantium under the Macedonians	6	78	00:01.9
Kingdom of Fez	9	245	00:03.2
North-Western Provinces	6	86	00:01.9
Dominion of Pakistan	8	278	00:02.4
Saint Petersburg Governorate	40	1173	00:16.9
St. Ludger's Abbey	4	67	00:02.1
Three Leagues	10	197	00:02.3
Canton of Fricktal	7	161	00:03.0
Canton of Lugano	9	467	00:01.7
Canton of Raetia	7	178	00:05.1
Canton of Waldsttten	3	71	00:01.2
Captaincy General of Guatemala	8	173	00:06.2
Classical Athens	5	170	00:02.7
Sava Banovina	7	132	00:03.8
Weingarten Abbey	10	253	00:02.6
Gorizia and Gradisca	12	235	00:02.3
Dutch Gold Coast	7	152	00:05.1
Italian Regency of Carnaro	6	163	00:02.6
Longobardia	4	85	00:05.4
Democratic Kampuchea	5	176	00:03.2
East Hebei Autonomous Council	7	158	00:02.3
Punjab States Agency	5	71	00:02.0
Principality of Zeta	12	299	00:03.0
Republic of Connaught	8	187	00:02.2
Khanate of Nakhichevan	12	233	00:02.0
Donetsk-Krivoy Rog Soviet Republic	10	251	00:05.3
Kwantlen First Nation	5	97	00:02.3
Commune of the Working People of Estonia	10	314	00:04.2

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Country	Graphs	Triples	Time
County of Katzenelnbogen	6	133	00:01.9
Gran Colombia	16	420	00:03.6
Granadine Confederation	8	188	00:02.2
Grand Duchy of Hesse	14	673	00:02.4
Taurida Governorate	17	278	00:02.7
Western Chalukya Empire	11	201	00:06.1
Free State of Prussia (19181933)	3	143	00:05.3
Saar (League of Nations)	5	108	00:01.5
Province of East Prussia	7	161	00:02.4
Province of Westphalia	10	257	00:02.9
Province of Pomerania	7	183	00:02.2
First French Empire	10	784	00:12.4
First Hellenic Republic	7	140	00:02.0
Domini di Terraferma	7	118	00:02.4
Don Republic	4	114	00:02.2
Duchy of Courland and Semigallia (1918)	3	88	00:02.0
Diocese of Asia	6	93	00:02.5
Diocese of Egypt	8	129	00:03.0
Diocese of Gaul	6	102	00:04.1
Duchy of Lithuania	12	259	00:04.9
Duchy of Neopatria	10	199	00:02.3
Free State of Mecklenburg-Schwerin	5	81	00:02.2
Free State of Mecklenburg-Strelitz	5	89	00:02.1
Free State of Waldeck-Pyrmont	9	132	00:02.5
Neo-Babylonian Empire	17	423	00:03.0
Islamic Courts Union	27	601	00:06.5
Republic of North Peru	11	189	00:04.8
SAO North-Eastern Bosnia	7	118	00:05.0
Republic of South Peru	9	162	00:02.2
State of Somaliland	5	135	00:02.2
Kaabu	11	208	00:02.2
Ghana Empire	17	401	00:03.5
Greater Hesse	5	86	00:03.0
House of Schwarzenberg	11	292	00:02.6
Italian Libya	5	128	00:02.1
Euro gold and silver commemorative coins (Cyprus)	3	37	00:03.2
Euro gold and silver commemorative coins (France)	3	31	00:04.4
Juliana Republic	7	239	00:02.8
County of Eskilstunahus	7	91	00:02.1
Moro Province	5	70	00:02.1
Zala County (former)	3	61	00:01.2
Provisional Government of the Republic of China	9	211	00:02.6
Kingdom of Nri	10	150	00:02.4
Later Zhou Dynasty	7	182	00:02.8
Latvian Socialist Soviet Republic	5	128	00:02.0
Provisional Government of Saskatchewan	6	108	00:01.9
Jabal al-Druze (state)	3	87	00:01.2
Spanish West Indies	4	89	00:05.9
Prince-Bishopric of Osnabrck	1	0	00:01.5
Province of Jlich-Cleves-Berg	3	80	00:01.3
Free City of Danzig (Napoleonic)	4	77	00:02.1
General Anaya	4	45	00:02.2
New Kingdom of Granada	13	272	00:03.9
Tamil Eelam	14	394	00:02.7
Szepes County	9	133	00:03.9
Praetorian prefecture of Gaul	10	170	00:06.3
Prince-Bishopric of Augsburg	9	154	00:01.9
Principality of Anhalt-Aschersleben	7	128	00:02.0
Principality of Anhalt-Zerbst	5	124	00:02.0
Principality of Aschaffenburg	10	532	00:02.8
Province of Kurhessen	8	121	00:02.1
Province of Magdeburg	7	117	00:02.5
Ptolemaic Kingdom	8	143	00:02.7
Republic of Gumuljina	15	295	00:08.3
Republic of Tarnobrzeg	5	91	00:06.2
Republic of Zamboanga	7	180	00:02.7
Reuss-Lobenstein	6	122	00:01.4
Russian Empire	20	1607	00:10.3
Shun Dynasty	6	132	00:02.7
Rigsfllesskabet	3	81	00:03.0
Later Han Dynasty (Five Dynasties)	5	99	00:02.5
Kingdom of the Lombards	6	284	00:02.8
Somogy County (former)	3	58	00:01.2
Tsardom of Russia	14	336	00:05.2

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Country	Graphs	Triples	Time
People's Republic of the Congo	3	72	00:02.1
Vichy France	21	601	00:07.9
Louisiana (New Spain)	5	76	00:01.3
Rantzau (county)	5	56	00:01.4
Runkel (state)	5	44	00:01.6
Italian Colonial Empire	16	308	00:09.0
Italian Cyrenaica	5	150	00:02.4
Italian Tripolitania	5	134	00:03.1
Ursberg Abbey	5	127	00:02.2
Werle	7	117	00:01.9
Lemko Republic	6	145	00:02.5
Kingdom of Hungary (19201946)	3	230	00:03.6
Kristianstad County	9	232	00:04.3
Visigothic Kingdom	9	243	00:06.3
Republic of Yucatn	3	85	00:01.2
Kingdom of Serbia (17181739)	3	72	00:01.3
Military Administration in Belgium and North France	5	93	00:01.9
Mongolia during Qing rule	7	71	00:02.3
Viipuri Province	25	516	00:03.1
Dominion of Ceylon	4	76	00:02.2
People's Republic of Kampuchea	3	113	00:01.2
Zulu Kingdom	8	185	00:05.8
Sunda Kingdom	9	168	00:04.1
Marquis of the Valle de Oaxaca	6	85	00:01.9
United Nations Temporary Executive Authority	8	164	00:03.8
Pindus Principality	18	373	00:04.6
Kingdom of East Anglia	7	197	00:02.3
Republic of Prekmurje	12	237	00:06.6
People's Republic of Mozambique	3	59	00:03.3
Tanganyika Territory	7	235	00:03.2
Republic of Estonia 19901991	3	62	00:01.2
Yan (Anshi)	3	58	00:02.4
Vaiga	4	54	00:02.1
Volhynian Governorate	10	173	00:03.6
Stato da Mr	3	46	00:01.5
Principality of Salm	5	106	00:05.9
Tlatelolco (altepetl)	3	72	00:02.1
Italian Trans-Juba	4	68	00:01.8
Education in Tunisia	8	192	00:02.1
Turup	4	48	00:01.4
Kashmir and Jammu (princely state)	3	61	00:01.3
Lachin Kurdish Republic	4	64	00:01.4
Cook Islands Federation	5	112	00:03.3
Lithuanian Soviet Socialist Republic (19181919)	3	66	00:01.2
Taifa of Algeciras	4	70	00:01.3
Taifa of Jan	3	49	00:01.2
Taifa of Mrtola	3	47	00:00.9
Taifa of Morn	3	44	00:01.1
Taifa of Murviedro and Sagunto	4	66	00:01.4
Taifa of Salts and Huelva	3	46	00:01.2
Taifa of Santa Mara de Algarve	3	46	00:01.2
Taifa of Constantina and Hornachuelos	4	66	00:01.6
Israel	55	593306	03:23.8
Greece	1	0	00:15.0
Malawi	1	0	00:15.0
Monaco	1	0	00:13.4
Northern Mariana Islands	37	1561	01:25.1
Uganda	31	2958	00:11.1
North German Confederation	7	329	00:10.6
Grand Duchy of Finland	16	713	00:33.5
Democratic Republic of Yemen	6	170	00:02.2
Mutawakkilite Kingdom of Yemen	10	246	00:02.5
East Germany	33	2608	00:20.8
Greenland	38	589643	03:10.3
Kazakhstan	47	591311	18:31.8
Sri Lanka	58	591712	06:35.7
Switzerland	66	592418	12:44.7
Uzbekistan	39	590808	06:28.5
West Berlin	9	443	00:05.0
Weimar Republic	24	1725	00:07.4
Illyrian Provinces	7	259	00:02.9
South Yemen	15	569	00:09.5
Kingdom of Israel (united monarchy)	3	174	00:03.2
India	55	597102	03:19.7

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Country	Graphs	Triples	Time
Xin Dynasty	8	258	00:04.5
Yemen	9	589566	03:08.8
Saxe-Lauenburg	10	226	00:03.2
Lneburg-Celle	3	118	00:01.4
Waldburg-Wolfegg	6	103	00:02.4
Kuopio Province	8	144	00:02.2
County of Savolax and Kymmenegrd	3	44	00:01.5
Euro gold and silver commemorative coins (Greece)	3	36	00:01.2
Lordship of Anholt	5	102	00:01.8
Pashalik of Yanina	7	109	00:01.4
County of East Frisia	4	76	00:01.4
Pashalik of Berat	4	57	00:01.8
Republic of San Marco	7	163	00:02.1
County of Nrke and Vrmland	3	46	00:01.2
County of Jnkping and Kronoberg	3	41	00:01.2
Euro gold and silver commemorative coins (Monaco)	3	33	00:02.1
Zunghar Khanate	9	131	00:02.5
Autonomous Republic of Northern Epirus	7	140	00:01.9
Mamluk Sultanate (Cairo)	3	88	00:01.2
Xianbei state	5	59	00:01.7
Saxe-Eisenberg	6	115	00:03.8
European Rental Association	4	86	00:01.8
Governorate of New Castile	4	79	00:01.4
Belize	26	2159	00:22.2
Brunei	32	2112	00:21.8
North Korea	65	590952	02:56.1
Communist Romania	21	776	00:07.2
Solomon Islands	38	589794	03:23.3
Angola	24	590313	08:13.5
AustriaHungary	1	0	00:15.2
Azores	1	0	00:15.1
Brazil	1	0	00:15.0
Bassas da India	1	0	00:15.0
Christmas Island	1	0	00:15.1
Cyprus	1	0	00:15.0
Europa Island	1	0	00:15.1
Guinea	30	2259	00:19.8
Holy Roman Empire	1	0	00:15.0
Jersey	1	0	00:15.0
Kingdom of Jerusalem	1	0	00:15.0
Kosovo	58	1912	00:28.9
Latvia	38	3114	00:09.4
Netherlands	42	594412	03:08.3
Norway	68	593326	18:29.9
Netherlands Antilles	47	2302	00:25.7
Poland	45	593781	05:23.2
Panama	30	590616	15:25.7
Russia	56	593951	10:20.9
Roman Empire	1	0	00:15.1
Rwanda	1	0	00:15.0
Roman Republic	1	0	00:15.0
South Georgia and the South Sandwich Islands	1	0	00:15.0
Politics of Sudan	1	0	00:15.0
Seleucid Empire	1	0	00:00.8
Serbia	1	0	00:01.0
Abbey of Saint Gall	1	0	00:00.1
Tenochtitlan	1	0	00:00.0
Tuvalu	1	0	00:00.1
Trust Territory of the Pacific Islands	1	0	00:00.0
Western Sahara	1	0	00:00.0
Wessex	1	0	00:00.2
Zambia	1	0	00:00.1
Sparta	1	0	00:00.1
Northumbria	13	458	00:31.0
Etruscan civilization	6	514	00:06.1
Hoysala Empire	10	255	00:10.0
Mercia	7	500	00:15.5
Italian East Africa	1	0	00:01.0
Upper Canada	8	477	00:06.1
Republic of Upper Volta	4	206	00:03.1
Tang Dynasty	17	1200	00:22.7
Shang Dynasty	1	0	00:15.0
Adjara	28	758	00:16.9
Biafra	16	444	00:12.2

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Country	Graphs	Triples	Time
Portuguese Timor	6	290	00:03.9
Mozambique (Portugal)	1	0	00:15.0
Crimea	41	1304	00:09.9
Georgia (country)	9	1719	00:08.2
Batavian Republic	5	311	00:19.5
Jin Dynasty (265420)	3	283	00:01.8
Netherlands New Guinea	8	235	00:05.0
Cte d'Ivoire	2	252	00:01.1
Papal States	23	1038	00:14.8
Nagorno-Karabakh	30	902	00:36.4
Northern Wei	13	278	00:09.1
Tokugawa shogunate	15	359	00:18.5
United Nations Transitional Administration in East Timor	8	249	00:08.1
Frisia	8	270	00:19.8
Wrttemberg	1	0	00:15.0
Free Territory of Trieste	1	0	00:15.0
Acadia	1	0	00:15.0
German Confederation	1	0	00:15.0
Gallic Empire	1	0	00:09.0
Fugger	1	0	00:15.0
Irish Republic	1	0	00:00.0
Champa	1	0	00:00.1
Ross Dependency	1	0	00:00.1
Tobago	1	0	00:01.1
Ayutthaya Kingdom	1	0	00:00.0
British Honduras	1	0	00:09.7
Latin Empire	1	0	00:00.5
Neapolitan Republic (Napoleonic)	1	0	00:00.7
Kara-Khanid Khanate	1	0	00:00.0
Goryeo	1	0	00:00.1
Congo Free State	1	0	00:00.1
Nassau (state)	1	0	00:00.0
Orange River Colony	1	0	00:00.1
Gold Coast (British colony)	1	0	00:00.1
Turkmenistan	1	0	00:00.1
AzuchiMomoyama period	1	0	00:00.0
Tuvan People's Republic	1	0	00:00.1
QwaQwa	1	0	00:00.1
Saxe-Coburg and Gotha	1	0	00:00.0
Schaumburg-Lippe	1	0	00:01.4
Saint-Domingue	1	0	00:02.3
Union between Sweden and Norway	1	0	00:00.0
Ayyubid dynasty	1	0	00:00.1
French Third Republic	1	0	00:00.0
Kingdom of Yugoslavia	1	0	00:00.1
County of Skaraborg	1	0	00:00.0
Northwest Territory	1	0	00:00.1
Achaemenid Empire	1	0	00:00.0
Hesse-Kassel	1	0	00:01.2
Eastern Rumelia	1	0	00:00.0
Raka (state)	1	0	00:00.1
Viceroyalty of Peru	1	0	00:01.1
Over-Governor of Stockholm	1	0	00:00.0
French Algeria	1	0	00:00.0
Takrur	1	0	00:02.0
Spanish State	1	0	00:00.0
Delhi Sultanate	1	0	00:00.1
Baekje	1	0	00:00.1
Socialist Federal Republic of Yugoslavia	1	0	00:00.0
Federation of Malaya	1	0	00:00.1
Rotuma	1	0	00:00.9
Kingdom of Len	1	0	00:00.5
Pahlavi dynasty	1	0	00:00.0
Korean Empire	1	0	00:00.1
Buyeo kingdom	1	0	00:00.1
Zimbabwe Rhodesia	1	0	00:00.0
PolishLithuanian Commonwealth	1	0	00:00.1
Upper Senegal and Niger	1	0	00:00.1
Adlie Land	1	0	00:00.0
Northern Han	1	0	00:00.1
Lipt County	1	0	00:00.1
Bars County	1	0	00:00.0
Karakalpakstan	1	0	00:00.1
Cisalpine Republic	1	0	00:00.1

Continued on next page

Country	Graphs	Triples	Time
County of Hudiksvall	1	0	00:00.1
County of land	1	0	00:00.0
Vaasa Province	1	0	00:00.1
Independent State of Croatia	1	0	00:00.1
Dorpat Voivodeship	1	0	00:00.1
British Togoland	1	0	00:00.0
Federation of Bosnia and Herzegovina	1	0	00:00.1
Suwaki Voivodeship	1	0	00:00.1
North Borneo	1	0	00:01.1
Ciskei	1	0	00:00.1
Reichsgau Danzig-West Prussia	1	0	00:00.7
November Uprising	1	0	00:00.5
Hesse-Nassau	1	0	00:00.0
Hesse-Homburg	1	0	00:00.1
Democratic Republic of Georgia	1	0	00:00.1
Hariphunchai	1	0	00:00.0
Southwest Territory	1	0	00:00.0
Kansas Territory	1	0	00:00.0
Former Liang	1	0	00:00.1
Southern Liang	1	0	00:00.0
Northern Liang	1	0	00:00.0
Attalid dynasty	1	0	00:00.1
Alaska Territory	1	0	00:00.0
Nebraska Territory	1	0	00:00.0
Colorado Territory	1	0	00:00.1
Minnesota Territory	1	0	00:00.0
Illinois Territory	1	0	00:00.1
Indiana Territory	1	0	00:00.1
Free City of Danzig	1	0	00:00.0
Ascension Island	1	0	00:01.0
Bhutan	1	0	00:01.0
Canada	1	0	00:00.2
France	1	0	00:00.9
Missouri Territory	1	0	00:00.9
Vijayanagara Empire	1	0	00:15.0
Connecticut Colony	1	0	00:15.0
Republic of Ezo	1	0	00:15.0
Portuguese India	1	0	00:00.0
Finnish Democratic Republic	1	0	00:00.1
Balhae	1	0	00:00.1
Gallia Narbonensis	1	0	00:00.1
Republic of Serbian Krajina	1	0	00:06.9
Republic of Indian Stream	1	0	00:03.8
Polish government-in-exile	1	0	00:00.0
Karamanolu	1	0	00:00.1
Buyid dynasty	1	0	00:00.1
Estado Novo (Portugal)	1	0	00:01.5
Hesse-Marburg	1	0	00:00.7
Saxe-Weimar-Eisenach	1	0	00:00.0
New Kingdom	1	0	00:00.1
Songhai Empire	1	0	00:00.0
Territory of Papua	1	0	00:00.1
Qajar dynasty	1	0	00:00.0
Duchy of the Archipelago	1	0	00:00.0
Autonomous Silesian Voivodeship	1	0	00:00.1
Empire of Trebizond	1	0	00:00.1
Counts and Dukes of Bar	1	0	00:01.5
Duchy of Courland and Semigallia	1	0	00:00.7
Governorate of Estonia	1	0	00:00.0
Grand Duchy of Tuscany	1	0	00:00.0
Duchy of Modena and Reggio	1	0	00:00.1
Northern Yan	1	0	00:01.0
Sultanate of Sulu	1	0	00:01.7
Swedish Ingria	1	0	00:00.6
Schwarzburg-Rudolstadt	1	0	00:00.7
Jordan	1	0	00:15.0
Iraqi Kurdistan	1	0	00:15.0
Kuwait	1	0	00:15.0
Mexico	1	0	00:15.0
New Zealand	1	0	00:15.0
Roman Republic (18th century)	1	0	00:15.0
Special Activities Division	1	0	00:15.0
Chenla	1	0	00:15.1
Natalia Republic	1	0	00:15.0

Continued on next page

Country	Graphs	Triples	Time
Guyana	1	0	00:15.0
Sweden	1	0	00:15.0
Trinidad and Tobago	1	0	00:01.9
Lebowa	1	0	00:02.3
Bahmani Sultanate	1	0	00:00.2
Esztergom County	1	0	00:00.2
Nyitra County	1	0	00:06.9
Zlyom County	1	0	00:01.1
Mramaros County	1	0	00:00.1
Temes County	1	0	00:01.3
Torda-Aranyos County	1	0	00:00.5
Virovitica County (former)	1	0	00:00.6
Rozwi Empire	1	0	00:00.4
Scattered islands in the Indian Ocean	1	0	00:05.3
French Mandate for Syria and the Lebanon	1	0	00:03.1
State of the Teutonic Order	1	0	00:00.9
Warsangali Sultanate	1	0	00:00.3
Duke of Teck	1	0	00:00.3
Los Altos & Central America	1	0	00:00.3
Northern Qi	1	0	00:00.5
Canada & New France	1	0	00:00.4
Bavarian Soviet Republic	1	0	00:11.2
Armenian Kingdom of Cilicia	1	0	00:15.0
Kadamba Dynasty	1	0	00:15.0
Pattani Kingdom	1	0	00:09.6
Harsha	1	0	00:04.1
rva County	1	0	00:15.0
Qutb Shahi dynasty	1	0	00:04.6
Ruanda-Urundi	1	0	00:00.2
Angevin Empire	1	0	00:00.2
Chimor	1	0	00:02.2
Dutch Empire	1	0	00:00.1
Bishopric of sel-Wiek	1	0	00:00.1
Turkey	1	0	00:00.9
Kurdistan Regional Government	1	0	00:00.2
Ukrainian People's Republic	1	0	00:00.1
Mali Federation	1	0	00:01.1
Alodia	1	0	00:01.1
Zheng (state)	1	0	00:00.2
Principality of Regensburg	1	0	00:00.1
Italian Republic (Napoleonic)	1	0	00:00.1
Bengal Presidency	1	0	00:00.5
Cispadane Republic	1	0	00:01.2
Kingdom of Italy (Napoleonic)	1	0	00:00.3
Bamana Empire	1	0	00:01.4
Chu (Ten Kingdoms)	1	0	00:00.2
Southern Sudan	1	0	00:01.2
Kingdom of Westphalia	1	0	00:01.0
People's Democratic Republic of Ethiopia	1	0	00:01.9
Czech and Slovak Federal Republic	1	0	00:02.1
Czechoslovak Socialist Republic	1	0	00:07.5
Nogai Horde	1	0	00:01.0
Afsharid dynasty	1	0	00:00.2
Stadion-Warthausen	1	0	00:01.0
Waldburg-Zeil	1	0	00:00.3
Solms-Braunfels	6	116	00:02.4
Min (Ten Kingdoms)	5	74	00:01.7
Kingdom of Kurdistan	5	151	00:02.6
Pappenheim (state)	5	63	00:03.4
Wrttemberg-Hohenzollern	3	77	00:01.2
Khanate of Kokand	6	214	00:08.5
Principality of Auersperg	13	246	00:03.6
Salm (state)	1	0	00:01.9
Salm-Horstmar	1	0	00:02.5
Salm-Reifferscheid-Hainsbach	1	0	00:04.9
Salm-Reifferscheid-Krautheim	1	0	00:00.2
County of Manderscheid	1	0	00:00.7
Galician Soviet Socialist Republic	1	0	00:00.2
Sayn-Wittgenstein	1	0	00:01.3
Administration for Western Armenia	1	0	00:00.2
Albania under Nazi Germany	1	0	00:01.1
Albanian Republic	1	0	00:00.1
Serbian Vojvodina	1	0	00:01.6
SAO Herzegovina	1	0	00:01.5

Continued on next page

Country	Graphs	Triples	Time
Bequia	1	0	00:01.3
French Togoland	1	0	00:03.1
Bukharan People's Soviet Republic	1	0	00:00.9
Anhalt	1	0	00:00.2
Arizona Territory	1	0	00:01.0
Second Republic of Venezuela	1	0	00:00.2
Mountainous Republic of the Northern Caucasus	1	0	00:02.1
Kingdom of Mapungubwe	1	0	00:01.4
Macedonia (Roman province)	1	0	00:01.6
Slovak Republic (19391945)	1	0	00:00.6
Saxe-Coburg-Saalfeld	1	0	00:00.5
Riograndense Republic	1	0	00:04.0
North Ingria	1	0	00:00.1
Russian America	1	0	00:00.2
Protectorate of South Arabia	1	0	00:01.1
Serbian Despotate	1	0	00:00.2
Electorate of Brunswick-Lneburg	1	0	00:00.2
Autonomous Government of Khorasan	1	0	00:00.1
Autonomous Governorate of Estonia	1	0	00:00.3
Azcapotzalco (altepetl)	1	0	00:02.6
Later Jin Dynasty (Five Dynasties)	1	0	00:01.5
Khanate of Bukhara	1	0	00:01.2
Governorate of Livonia	1	0	00:01.6
Democratic Republic of Armenia	1	0	00:02.6
Bessarabia Governorate	1	0	00:01.0
Bishopric of Constance	1	0	00:01.2
Bishopric of Hildesheim	1	0	00:00.1
Bishopric of Ratzeburg	1	0	00:01.1
Bishopric of Regensburg	1	0	00:00.5
Da Nacional de Galicia	1	0	00:00.3
Saxe-Eisenach	1	0	00:00.2
Bornu Empire	7	151	00:03.6
Kingdom of Mann and the Isles	7	157	00:02.0
Powys Wenwynwyn	6	108	00:02.2
Punjab (British India)	5	113	00:02.3
Spanish East Indies	7	221	00:02.6
Kingdom of Montenegro	5	209	00:06.6
Union of African States	9	165	00:02.0
Union of India	7	165	00:02.2
Bosnia and Herzegovina (Austro-Hungarian condominium)	3	53	00:01.2
British America	5	106	00:03.0
British Leeward Islands	8	154	00:03.9
British Raj	6	1254	00:08.3
Byzantium under the Heraclians	10	121	00:02.2
Byzantium under the Isaurians	5	63	00:02.2
Kahlur	6	109	00:06.9
United States	1	0	00:15.0
Pacific Union	5	131	00:02.3
St. Emmeram's Abbey	4	153	00:01.7
Polish National Government (January Uprising)	3	60	00:01.3
Ambos Camarines	8	105	00:06.1
Principality of Montenegro	5	167	00:02.9
Talysh-Mughan Autonomous Republic	8	150	00:02.7
Michaelsberg Abbey & Siegburg	3	77	00:01.2
Wei (Dingling)	3	51	00:01.2
Ceded and Conquered Provinces	5	70	00:02.8
Central Department (Mexico)	3	30	00:01.1
Chalco	4	115	00:02.5
Chechen Republic of Ichkeria	8	253	00:02.4
Jaffna kingdom	12	204	00:05.7
Palmyrene Empire	5	143	00:02.5
United Kingdom of Portugal & Brazil and the Algarves	3	129	00:01.6
Colony of Vancouver Island	7	143	00:02.6
Sultanate of Maguindanao	6	136	00:02.2
Ministry of Environment (South Korea)	3	74	00:01.1
Thanjavur Nayak kingdom	14	245	00:07.5
Crimean Oblast	5	123	00:02.2
Dutch Brazil	5	161	00:08.2
Khanate of Erevan	8	165	00:02.4
Revala	12	171	00:02.2
Corsican Republic	7	141	00:06.7
County of Beilstein	6	100	00:02.1
County of Ravensberg	9	181	00:02.5
County of Schwarzburg	5	89	00:02.0

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Country	Graphs	Triples	Time
Cretan State	5	91	00:06.9
Cyme (Aeolis)	5	124	00:02.0
Grand Duchy of Cracow	10	202	00:02.4
Grand Duchy of Moscow	24	468	00:04.6
Grand Duchy of the Lower Rhine	9	177	00:05.7
First Philippine Republic	10	230	00:02.0
Minyue	6	127	00:02.6
Pffers Abbey	3	95	00:01.1
Kazakh Khanate	5	135	00:02.3
Province of Schleswig-Holstein	5	125	00:02.5
Republic of Mississippi	5	104	00:02.1
Diocese of Africa	6	103	00:03.0
Diocese of Pannonia	8	146	00:02.1
Diocese of Pontus	7	107	00:05.1
Diocese of Thrace	6	112	00:03.3
Diocese of the East	8	131	00:02.3
Duchy of Nysa	8	160	00:02.4
Duchy of Oels	10	190	00:02.2
Hungarian Democratic Republic	5	156	00:02.7
DenmarkNorway	3	361	00:04.4
Dogado	4	64	00:02.0
Dutch East Indies	13	373	00:03.4
Ethiopian Empire	8	337	00:06.2
Free State of Brunswick	6	91	00:04.5
Free State of Oldenburg	7	120	00:02.9
German Austria	10	248	00:02.6
Great Seljuq Empire	13	353	00:02.7
Halle-Merseburg	7	116	00:03.3
Izmail Oblast	7	132	00:02.7
Veszprm County (former)	3	62	00:01.5
Podolia Governorate	14	215	00:02.3
Empire of Great Fulo	9	129	00:07.5
United States Civil Administration of the Ryukyu Islands	13	223	00:05.0
County of Gripsholm	7	90	00:02.5
Kakatiya dynasty	12	192	00:07.0
Kingdom of Commagene	11	247	00:07.6
Kingdom of Rarotonga	6	123	00:02.2
Liao Dynasty	13	319	00:02.3
Lindau Abbey	5	138	00:04.2
Kingdom of Italy (medieval)	5	116	00:01.5
Taiwan under Japanese rule	17	225	00:04.2
United States of the Ionian Islands	6	169	00:02.3
Orange River Sovereignty	5	119	00:02.0
Emergency medical services in South Africa	6	74	00:08.0
Emirate of Afghanistan	4	94	00:02.4
Eretna	6	115	00:02.2
Euro gold and silver commemorative coins	4	77	00:04.0
Euro gold and silver commemorative coins (San Marino)	3	31	00:01.5
Federation of Ethiopia and Eritrea	6	90	00:02.3
Kingdom of Lithuania (1918)	5	72	00:01.4
March of Montferrat	12	227	00:07.1
Portuguese Malacca	5	107	00:02.2
Principality of Anhalt-Mhlingen	3	83	00:01.1
Principality of Anhalt-Pltzkau	3	88	00:04.4
Saxe-Gotha-Altenburg	6	161	00:01.6
Nanzan	5	107	00:02.5
Reichskommissariat Niederlande	5	94	00:09.7
Reichskommissariat Norwegen	5	85	00:02.1
Free City of Lbeck	3	120	00:01.4
French Dahomey	4	78	00:04.0
Fujian People's Government	4	101	00:01.3
Pagan Kingdom	9	182	00:08.6
County of Grz	3	68	00:01.1
Western Turkic Khaganate	10	177	00:17.3
Schntal Abbey	3	83	00:01.3
Reuss-Ebersdorf	9	177	00:09.2
Reuss Elder Line	13	280	00:03.8
United Nations Security Council resolutions concerning Cyprus	10	242	00:03.9
Saxe-Wittenberg	6	388	00:03.0
Ngrd County (former)	3	65	00:01.2
Italian occupation of France during World War II	7	115	00:02.2
Swedish Empire	7	310	00:04.2
Holstein-Glckstadt	3	79	00:01.2
Taiwan under Qing Dynasty rule	8	140	00:04.2

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Country	Graphs	Triples	Time
Knigsegg-Rothenfels	3	68	00:03.1
Grodno Governorate	14	219	00:04.2
Kornelimnster Abbey	3	158	00:03.4
Jogentagana	1	0	00:15.0
Saxe-Marksuhl	1	0	00:15.0
United Provinces of New Granada	1	0	00:15.0
Podlachian Voivodeship (15131795)	3	61	00:08.8
Stadion (state)	5	56	00:01.6
Rheda & Germany	5	83	00:03.3
Bavaria-Ingolstadt	5	91	00:01.7
Vilna Governorate	19	301	00:03.1
Liga Federal	7	123	00:02.0
Tarumanagara	10	162	00:03.6
Bavaria-Landshut	5	94	00:01.5
Kingdom of Montenegro (19411944)	3	110	00:03.2
Municipality of Ulladulla	4	44	00:02.1
Nabha State	4	59	00:02.5
Kingdom of Ceredigion	4	78	00:01.3
Wolfstein (principality)	3	40	00:00.9
Queen Maud Land	9	277	00:03.5
Principality of Mingrelia	4	68	00:01.6
Transitional Darfur Regional Authority	6	121	00:03.0
Republic of Serbia (federal)	3	78	00:01.1
Republic of Montenegro (federal)	3	73	00:01.3
Saxe-Weissenfels	5	113	00:02.6
Autonomous Province of Kosovo and Metohija (19901999)	3	64	00:01.3
Provisional Administrative Entity of South Ossetia	6	377	00:03.2
Taifa of Crdoba	3	76	00:01.2
Interim Government of Iran (1979)	3	131	00:01.2
Tacuba (Mexico City)	3	41	00:01.1
Virgle	4	86	00:02.1
Nuclear power in the European Union	6	66	00:01.5
zu Domain	3	50	00:01.3
Economy of Nagorno-Karabakh	4	76	00:02.2
Gau Eastern Hanover	5	74	00:01.4
Occupation of Mongolia	4	64	00:01.5
Biaystok Voivodeship (19451975)	3	54	00:03.0
Nabataean kingdom	9	126	00:01.8
County of Wernigerode	5	85	00:01.8
Euro proof sets	4	41	00:01.4
French occupation of Santo Domingo	4	76	00:01.3
Taifa of Mlaga	3	56	00:01.1
Spanish occupation of the Dominican Republic	4	64	00:01.3
Emergency medical services in Hong Kong	3	34	00:00.8
Mikkeli Province	6	114	00:01.6
Province of Northern Karelia	5	92	00:01.9
Emergency medical services in Australia	4	42	00:00.9
Urartu	15	322	00:02.7
Argentina	7	590402	04:04.1
Bangladesh	11	589919	22:08.2
Costa Rica	32	590095	14:53.8
Dominican Republic	41	590353	19:14.5
Equatorial Guinea	52	590319	23:32.5
Madagascar	44	590602	07:53.2
Guatemala	1	0	00:00.6
Papua New Guinea	41	3147	00:08.0
Saint Lucia	30	1794	00:09.5
Singapore	63	591564	02:58.3
Soviet Union	55	591462	18:35.0
Azerbaijan	11	590027	08:08.1
Archbishopric of Riga	14	327	00:04.3
British Virgin Islands	26	1311	00:13.2
Central African Republic	35	590429	02:57.4
Council of Europe	15	937	00:12.7
Kulmerland	15	286	00:02.8
Cook Islands	25	1571	00:09.9
European Economic Community	18	625	00:03.1
European Free Trade Association	13	622	00:03.6
French Guinea	7	190	00:02.2
French Polynesia	36	1944	00:15.2
Gaza Strip	12	589127	02:58.0
Guinea-Bissau	10	1662	00:05.8
Hong Kong	79	592848	02:53.8
Indonesia	43	591618	11:23.2

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Country	Graphs	Triples	Time
Juan de Nova Island	14	544	00:02.9
Luxembourg	51	591341	02:51.1
Louisiana Purchase	15	422	00:16.9
Lithuania	40	590955	02:51.5
Mauritius	39	3188	00:14.8
Montserrat	30	1784	00:05.4
Mozambique	32	2805	00:09.1
Montenegro	35	2287	00:09.3
Nicaragua	34	590247	02:51.0
Pitcairn Islands	36	1694	00:11.7
Phoenicia	25	655	00:03.9
Qing Dynasty	36	1420	00:10.9
South Korea	136	594750	02:59.2
Saint Kitts and Nevis	43	2081	00:07.7
Geography of Saint Pierre and Miquelon	6	136	00:09.1
Saint Vincent and the Grenadines	33	1920	00:07.2
San Marino	46	2378	00:14.8
Seychelles	37	589837	02:47.3
Swaziland	27	2475	00:07.9
South African Republic	11	366	00:02.3
Tajikistan	42	2649	00:07.1
Tromelin Island	13	583	00:02.6
Turks and Caicos Islands	34	1438	00:11.9
United Kingdom	153	598780	02:57.3
Venezuela	46	592363	04:04.8
Warsaw Pact	22	588689	04:26.9
Commonwealth of Independent States	24	588813	03:37.1
New Sweden	9	363	00:03.6
Viceroyalty of New Granada	7	343	00:04.9
Electoral Palatinate	5	413	00:02.9
Irish Free State	16	554	00:03.8
Ming Dynasty	47	1329	00:12.6
Sui Dynasty	11	371	00:06.2
Zhou Dynasty	5	510	00:04.6
Cape Colony	12	496	00:04.0
Wallachia	21	692	00:05.2
Kingdom of Sussex	6	232	00:02.4
Democratic Republic of Afghanistan	10	342	00:06.4
British Somaliland	10	334	00:02.9
Somaliland	16	1032	00:04.0
French Indochina	13	527	00:03.2
Kingdom of Asturias	7	257	00:02.5
Dutch Republic	24	1126	00:19.6
Kingdom of Holland	6	332	00:03.9
French Equatorial Africa	9	350	00:07.1
Easter Island	23	1187	00:06.2
Jin Dynasty (11151234)	3	247	00:11.0
Manchukuo	24	685	00:04.2
Song Dynasty	28	817	00:05.2
Western Xia	16	428	00:11.4
Republic of Benin (unrecognized state)	2	67	00:00.8
British Mandate of Palestine	34	1033	00:05.4
The Gambia	31	2483	00:05.8
Bishopric of Utrecht	17	377	00:02.8
Roanoke Colony	10	271	00:06.1
Transvaal	13	659	00:03.0
Mauretania	8	279	00:02.4
Sovereign Military Order of Malta	19	1058	00:11.2
New England Confederation	6	156	00:02.6
Occupation of Japan	28	620	00:10.7
Dos Pilas	5	217	00:02.8
Basutoland	6	180	00:03.2
Estonian Soviet Socialist Republic	14	486	00:02.7
Kingdom of Tavolara	5	170	00:02.5
Golden Horde	15	589	00:06.9
United Kingdom of Great Britain and Ireland	16	1732	00:07.1
Kingdom of Great Britain	13	1366	00:16.7
New France	15	501	00:03.0
Travancore	17	415	00:03.2
The Protectorate	8	298	00:02.1
Majapahit	13	359	00:02.2
Kingdom of Ireland	7	375	00:03.4
Kyrgyzstan	84	591092	03:01.4
Hasmonean	16	420	00:07.4

Continued on next page

Country	Graphs	Triples	Time
Vojvodina	17	707	00:04.0
Federal Republic of Central America	14	445	00:02.5
Mengjiang	23	494	00:04.2
Nyasaland	6	230	00:02.4
Coalition Provisional Authority	11	414	00:10.8
Waldeck (state)	5	226	00:01.8
French colonial empire	22	453	00:03.5
Nguyn Dynasty	3	211	00:01.5
Zengid dynasty	12	329	00:03.5
West Jersey	9	178	00:06.7
Mustang (kingdom)	6	198	00:01.4
Cochinchina	17	424	00:03.2
Serbian Empire	8	264	00:02.4
Australian Antarctic Territory	14	666	00:03.0
Kingdom of Prussia	8	1001	00:12.4
Calenberg	17	309	00:03.0
Kenmu restoration	7	240	00:02.7
County of Edessa	8	320	00:03.0
Principality of Antioch	7	291	00:02.8
County of Tripoli	9	300	00:05.8
Kingdom of Cyprus	10	342	00:04.5
Kingdom of Naples	9	587	00:08.1
British Central Africa Protectorate	7	183	00:02.5
Cameroons	10	264	00:02.3
Austrian Empire	7	725	00:08.6
Empire of Brazil	11	378	00:05.4
Colonial Brazil	9	269	00:02.2
Northern Cyprus	40	1317	00:07.2
County of Uppland	8	145	00:08.8
Eastern Wu	13	494	00:02.6
Gilbert and Ellice Islands	8	247	00:02.2
List of Zambians	4	103	00:02.2
Deheubarth	7	262	00:02.3
Han (state)	5	121	00:02.0
Islamic State of Afghanistan	5	137	00:02.2
French West Africa	12	475	00:04.6
Company rule in India	8	163	00:03.4
Kingdom of Romania	7	572	00:07.8
United Baltic Duchy	8	264	00:02.1
Zhao (state)	6	168	00:01.4
Empire of Nicaea	11	400	00:03.4
Principality of Achaea	11	371	00:02.4
Panama Canal Zone	9	359	00:04.9
California Republic	11	431	00:02.6
Islamic Emirate of Afghanistan	7	238	00:02.6
Atropatene	10	234	00:03.0
Korea under Japanese rule	23	603	00:09.6
Gallia Aquitania	11	250	00:02.3
Kingdom of Mutapa	22	458	00:03.8
Stellaland	11	341	00:03.8
Republika Srpska	19	783	00:05.3
Colonial Cambodia	10	239	00:06.2
Reichsgau Wartheland	11	255	00:02.4
Dmt	3	93	00:01.4
County of Norrland	7	160	00:02.2
Oregon Territory	6	243	00:02.2
County of Nykping	3	69	00:01.0
County of Viborg and Nyslott	21	359	00:03.5
County of Kexholm	17	352	00:03.1
African Union	19	928	00:16.2
Australia	5	590032	02:21.3
Rodrigues	14	609	00:03.4
German New Guinea	8	300	00:05.2
New Haven Colony	9	182	00:02.1
Roman Republic (19th century)	5	178	00:01.5
Transnistria	66	1898	00:09.7
France in the Middle Ages	9	286	00:02.4
Nakhchivan	51	1370	00:15.4
Harjumaa (ancient county)	3	66	00:01.1
Srivijaya	15	429	00:03.0
Wolof Empire	12	285	00:02.0
Kingdom of England	9	1037	00:16.6
Somali Democratic Republic	5	135	00:01.5
Former Qin	10	326	00:02.4

Continued on next page

Country	Graphs	Triples	Time
Southern Qi	8	260	00:02.5
Michigan Territory	6	215	00:07.2
Kingdom of Gwynedd	11	370	00:02.4
New Mexico Territory	6	232	00:02.4
County of Burgundy	14	340	00:02.3
East Timor	11	589257	02:49.7
Washington Territory	5	173	00:02.5
Cheng Han	5	210	00:02.5
Later Zhao	6	226	00:03.3
Iowa Territory	5	156	00:02.3
Arkansas Territory	8	210	00:07.8
Oklahoma Territory	6	162	00:02.3
Volga Bulgaria	17	408	00:02.7
State of Slovenes & Croats & and Serbs	3	183	00:01.7
Province of Pennsylvania	12	329	00:03.1
Province of South Carolina	9	204	00:02.5
Province of North Carolina	10	209	00:05.3
Helvetic Republic	8	348	00:03.9
Province of Massachusetts Bay	12	366	00:03.1
Florida Territory	5	175	00:02.4
Mississippi Territory	5	189	00:02.9
Province of Posen	10	314	00:03.5
British Indian Ocean Territory	35	589097	02:49.2
Cape Verde	54	590308	04:07.4
Faroe Islands	56	589791	04:55.8
Gibraltar	39	589835	03:41.3
French Somaliland	4	230	00:02.2
French Territory of the Afars and the Issas	7	250	00:02.6
Ilkhanate	32	669	00:04.3
Ghaznavids	15	418	00:02.8
Khwrazm-Shh dynasty	3	221	00:01.5
Kingdom of Aragon	8	321	00:02.9
First Mexican Empire	6	246	00:02.3
Ryky Kingdom	3	244	00:01.4
Mauritania	36	2512	00:06.2
Kingdom of Poland (10251385)	3	181	00:01.1
Kingdom of Sicily	10	462	00:06.4
Zirid dynasty	8	255	00:02.7
Barghawata	11	242	00:02.3
Italian North Africa	4	155	00:02.6
Later Qin	5	198	00:02.2
Western Qin	6	256	00:02.4
Former Yan	5	200	00:02.3
Later Yan	5	201	00:02.2
Duchy of Parma	8	343	00:02.5
Duchy of Milan	7	352	00:02.7
Kingdom of Saxony	6	297	00:02.2
Southern Yan	6	171	00:02.4
Western Yan	4	155	00:02.2
Qiao Zong	5	194	00:02.4
County of Hainaut	13	420	00:03.0
County of Holland	6	292	00:03.9
Kingdom of Navarre	7	313	00:02.9
Kingdom of Khotan	5	189	00:02.3
Provisional Government of Hawaii	6	212	00:02.7
Later Tang Dynasty	7	223	00:02.7
Prisoner in the Vatican	8	211	00:02.3
Bremen-Verden	10	491	00:02.1
Kingdom of Castile	9	406	00:05.2
Saxe-Coburg	7	245	00:02.3
Saxe-Gotha	7	236	00:02.2
German colonial empire	11	245	00:02.5
Singhasari	8	220	00:02.0
French protectorate of Morocco	7	284	00:02.2
Engelberg Abbey	8	241	00:03.8
Kingdom of Hanover	10	354	00:03.3
Kingdom of Desmond	8	189	00:02.1
Deccan sultanates	11	248	00:04.5
Candarolu	3	168	00:01.3
Kingdom of Hungary	10	529	00:14.2
Duchy of Savoy	6	413	00:05.9
Belarusian Peoples Republic	3	189	00:04.3
Pozsony County	13	267	00:03.3
Pest-Pilis-Solt-Kiskun County	6	130	00:02.3

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Country	Graphs	Triples	Time
Ung County	10	233	00:04.0
Szabolcs County	5	110	00:02.3
Szilgy County	3	94	00:01.2
Szatmr County	3	73	00:01.1
Krass-Szrny County	3	127	00:01.2
Torontl County	3	93	00:01.3
Csk County	3	108	00:02.7
Kis-Kkll County	3	84	00:01.2
Udvarhely County	8	153	00:02.3
Modru-Rijeka County	3	87	00:01.1
Varadin County (former)	3	82	00:01.2
Kingdom of Mysore	9	327	00:03.1
Gyr County	3	95	00:01.2
Kingdom of Armenia	12	351	00:03.0
South Africa	11	591301	02:54.9
Wu (state)	5	119	00:01.9
Kingdom of Cochin	15	325	00:03.6
Spanish Morocco	10	353	00:02.7
Odrysian kingdom	16	348	00:03.3
Qasim Khanate	11	244	00:03.1
Alamannia	9	199	00:01.9
Viceroyalty of the Ro de la Plata	3	184	00:01.3
Yangshao culture	9	254	00:02.3
Kingdom of Makuria	18	404	00:03.2
History of Colonial Hong Kong (1800s1930s)	3	148	00:02.2
Abdalwadid	15	309	00:04.3
Yue (state)	5	123	00:01.5
Banu Qasi	8	220	00:03.2
Caucasian Imamate	9	262	00:02.1
Roman Catholic Diocese of Passau	10	238	00:01.8
Chavn culture	4	163	00:01.6
Arzi Hukumat-e-Azad Hind	16	366	00:02.7
Free Republic of Schwarzenberg	6	180	00:02.2
Parnawa Voivodeship	7	163	00:02.0
Inflanty Voivodeship	12	263	00:03.3
Bishopric of Dorpat	7	226	00:04.1
Nisga'a	4	170	00:01.7
County of Artois	8	178	00:02.0
League of Lezh	3	84	00:01.2
Kingdom of Dublin	11	205	00:02.5
Confederate Ireland	12	340	00:04.1
Dutch Formosa	14	259	00:02.4
Ligurian Republic	5	173	00:02.3
Bishopric of Worms	9	166	00:02.2
Kingdom of Denmark	4	144	00:01.4
Seisyllwg	5	102	00:02.5
Kingdom of Tungning	9	208	00:02.2
Kingdom of Etruria	7	238	00:04.1
Principality of Bayreuth	18	326	00:03.3
Nakhon Si Thammarat Kingdom	6	102	00:03.3
Ugandi County	10	167	00:02.2
Kingdom of Bohemia	6	159	00:02.3
Sayn-Altenkirchen	6	101	00:03.2
Duchy of Lucca	8	196	00:02.2
Kingdom of LombardyVenetia	3	134	00:01.3
Southern Han	7	144	00:02.4
Marinid dynasty	19	393	00:04.2
Saar (protectorate)	5	146	00:04.4
Federation of Arab Republics	6	161	00:02.2
Oyo Empire	9	224	00:03.6
Saadi dynasty	14	291	00:03.4
South Pacific Mandate	16	325	00:02.8
Kingdom of Rwanda	9	158	00:02.8
Prince-Bishopric of Lige	3	243	00:01.5
Autonomous Province of Western Bosnia	10	263	00:02.5
Danish Estonia	6	144	00:03.0
Duchy of Jlich	3	169	00:01.2
Stadion-Thannhausen	6	182	00:04.4
Solms-Hohensolms-Lich	9	143	00:03.2
Klingenberg	5	73	00:09.1
Ortenburg-Neuortenburg	6	112	00:02.3
Later Shu	5	107	00:03.2
Aden Protectorate	13	247	00:02.6
KwaNdebele	6	155	00:02.5

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Country	Graphs	Triples	Time
Gazankulu	5	147	00:02.2
Anhalt-Kthen	3	116	00:01.9
Wied-Runkel	5	72	00:02.9
Toggenburg	7	135	00:03.2
Wrttemberg-Baden	3	77	00:01.2
Kingdom of Albania	7	143	00:02.5
Chupanids	9	186	00:02.4
Sayn-Wittgenstein-Hohenstein	6	109	00:02.3
Salm-Salm	6	117	00:02.3
Principality of Taranto	9	194	00:02.0
Bishopric of Speyer	8	147	00:03.0
Kediri (historical kingdom)	5	93	00:01.6
French Community	5	149	00:03.6
Persian Socialist Soviet Republic	12	210	00:04.2
Principality of Galilee	7	168	00:02.2
Ak Koyunlu	15	313	00:04.3
All-Palestine Government	8	153	00:02.3
County of Bentheim	6	123	00:02.7
SAO Krajina	5	89	00:02.1
SAO Eastern Slavonia & Baranja and Western Syrmia	3	125	00:01.2
Idrisid dynasty	11	278	00:02.4
South Kasai	6	161	00:03.3
Kingdom of Valencia	5	158	00:02.5
Ancient Thebes (Boeotia)	3	195	00:02.6
Anhalt-Harzgerode	6	106	00:02.1
Archduchy of Austria	8	359	00:06.0
Principality of Orange	6	127	00:02.6
Southern Cameroons	5	122	00:02.5
Austrian Littoral	7	182	00:03.5
Banu Ifran	5	187	00:02.3
Qu'aiti	4	74	00:01.5
Illyricum (Roman province)	5	132	00:01.4
Federal State of Austria	7	194	00:02.7
Sikh Empire	10	255	00:04.7
Principality of Anhalt-Bernburg	6	148	00:02.2
Hohenzollern-Hechingen	5	181	00:02.2
Saxe-Hildburghausen	7	176	00:02.0
Kingdom of Serbia	8	334	00:02.3
Tyrconnell	10	149	00:02.9
Grubenhagen	8	160	00:02.2
Sultanate of Lahej	16	268	00:03.6
Hotaki dynasty	6	143	00:03.3
Spanish Florida	4	126	00:02.2
Principality of Serbia	8	230	00:03.1
Former Shu	5	118	00:02.2
Bks County (former)	3	69	00:01.7
Csongrd County (former)	3	66	00:01.2
First Bulgarian Empire	53	592272	02:56.6
Fejr County (former)	3	67	00:01.5
Kingdom of Greece	10	454	00:07.0
Saxe-Weimar	9	227	00:02.4
Allied-occupied Germany	27	504	00:04.5
Kingdom of Bavaria	7	258	00:02.6
Republic of South Carolina	5	95	00:02.4
Berchtesgaden Provostry	6	153	00:12.2
Ditadura Nacional	4	107	00:02.5
Jalayirids	9	194	00:02.7
Grand Duchy of Wrzburg	4	201	00:08.1
Dinagat Islands	5	138	00:02.4
Shan States	6	256	00:02.8
Shaddadid	6	149	00:02.2
Western Wei	6	136	00:03.0
Bishopric of Brixen	17	292	00:04.3
Bishopric of Courland	6	158	00:02.0
Bishopric of Halberstadt	12	213	00:03.1
Bishopric of Lbeck	3	125	00:01.1
Bishopric of Trent	13	228	00:02.7
Bishopric of Verdun	10	171	00:02.0
British Windward Islands	6	130	00:02.2
Byzantium under the Angeloi	5	63	00:02.2
Byzantium under the Palaiologoi	7	92	00:03.5
Canton of Bellinzona	6	128	00:02.1
Canton of Lman	3	67	00:01.2
Canton of Sntis	3	74	00:02.4

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Country	Graphs	Triples	Time
Principality of Halberstadt	4	86	00:02.2
Tuyuhun Kingdom	6	162	00:02.8
Western Ganga Dynasty	8	160	00:02.3
Samma Dynasty	6	127	00:01.9
United States of Indonesia	5	105	00:02.3
People's Revolutionary Government	4	63	00:01.3
Principality of Bulgaria	6	138	00:03.4
Kingdom of Bulgaria	7	382	00:07.1
Zwiefalten Abbey	7	186	00:02.6
Petershausen Abbey	5	139	00:02.6
Territory of New Guinea	6	149	00:02.8
United Suvadive Republic	17	293	00:03.5
Palatinate-Zweibrcken	3	121	00:01.2
Grey League	8	149	00:02.2
County of Veldenz	9	159	00:02.7
Masovian Voivodeship (15261795)	3	60	00:01.2
Catalan Republic	5	126	00:02.2
County of Flanders	7	215	00:02.5
Reformed Government of the Republic of China	8	164	00:02.3
Sultanate of Demak	9	160	00:02.2
Kingdom of Pajang	7	96	00:03.7
Kalabhras dynasty	8	125	00:02.5
Erik the Red's Land	4	94	00:01.3
Chzan	3	79	00:01.1
Cisplatina	8	145	00:02.4
Coixtlahuaca	10	136	00:02.0
Colony of Natal	7	167	00:03.9
Principality of Polotsk	14	245	00:04.4
Huan Xuan	6	147	00:02.4
Parthian Empire	12	236	00:03.0
Patriarchate of Aquileia	12	267	00:03.0
County of Sargans	11	182	00:02.0
County of Sicily	5	87	00:02.1
County of Sponheim	5	116	00:03.6
Prince-Bishopric of Mnster	3	202	00:01.4
Wettenhausen Abbey	5	117	00:02.7
Empire of Vietnam	7	184	00:02.2
Republic of Pisa	5	170	00:03.6
Sankt Blasien Abbey in the Black Forest	9	208	00:02.2
Serbia (19411944)	3	184	00:01.5
Courland Governorate	16	261	00:02.5
Couto Mixto	5	126	00:03.0
Drohobych Oblast	6	122	00:02.2
Duchy of Brzeg	8	152	00:05.8
Duchy of Bytom	8	154	00:02.5
Duchy of Zator	7	144	00:01.9
Dutch Malacca	5	126	00:03.2
Province of Brandenburg	6	157	00:02.1
Principality of Theodoro	8	189	00:04.7
Principality of Trubetsk	7	152	00:02.2
Walkenried Abbey	5	129	00:02.3
Salem Abbey	11	232	00:02.5
Free State Bottleneck	8	156	00:02.3
Free State of Anhalt	7	131	00:02.1
French First Republic	7	765	00:11.6
Department of Mindanao and Sulu	5	71	00:02.2
Duchy of Gogw	3	94	00:06.7
Duchy of Opole	8	135	00:02.4
Duchy of Owicim	3	114	00:01.1
Yuan Dynasty	24	587	00:04.4
International Congo Society	11	264	00:04.5
Electorate of Trier	4	103	00:02.2
Weissenau Abbey	7	164	00:02.7
Schussenried Abbey	5	139	00:02.2
Rauracian Republic	8	145	00:02.4
Kingdom of Hawaii	11	487	00:47.1
Kingdom of Iceland	5	145	00:06.0
Kingdom of Livonia	5	115	00:04.0
Kingdom of Middag	1	0	00:15.0
Kingdom of Portugal	5	697	00:18.8
Kingdom of Sarawak	7	138	00:02.2
Kingdom of Scotland	8	700	00:18.2
Empire of China (19151916)	3	93	00:12.7
Sassanid Empire	40	732	00:12.8

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Country	Graphs	Triples	Time
Government of the Autonomous Republic of Abkhazia	13	229	00:03.4
County of Geneva	10	222	00:04.6
Labin Republic	5	95	00:03.5
Landgraviate of Hesse	6	136	00:04.7
Lordship of Negroponte	6	119	00:03.5
Kingdom of Italy (18611946)	3	636	00:07.3
Margraviate of Brandenburg	11	296	00:04.8
Metsepole	6	111	00:04.0
Franceville & New Hebrides	5	74	00:01.6
Saxe-Jena	7	141	00:05.1
Schaesberg	6	138	00:03.9
Mughal Empire	51	1112	00:08.9
Stolberg-Wernigerode	6	89	00:02.5
Straits Settlement of Malacca	1	0	00:15.0
Nurmekund	5	86	00:08.7
Odessa Soviet Republic	5	144	00:03.1
Regenstein	5	103	00:02.3
South West Caucasian Government	9	186	00:02.8
Old Swiss Confederacy	6	173	00:05.5
People's State of Hesse	3	74	00:01.2
Tarascan state	7	123	00:02.7
Praetorian prefecture of Italy	8	143	00:02.5
Principality of Albania	7	147	00:03.0
Principality of Anhalt-Dornburg	6	106	00:02.0
Principality of Piombino	9	184	00:03.5
Provisional Government of Oregon	9	148	00:03.7
Republic of Mountainous Armenia	7	150	00:02.3
Republic of New Granada	11	244	00:04.3
Roggenburg Abbey	6	151	00:04.5
Glywysing	7	129	00:04.6
Haitian occupation of Santo Domingo	18	276	00:08.2
Grand Duchy of Berg	4	77	00:01.8
Neukamerun	8	142	00:02.2
Second Philippine Republic	6	146	00:05.5
Selz Abbey	5	120	00:02.2
Semiahmoo First Nation	6	125	00:03.4
Seneca Nation of Indians	5	105	00:02.0
Septem Provinciae	6	92	00:02.7
South Baden	5	111	00:03.3
State of Burma	6	147	00:05.8
State of Haiti	5	123	00:02.9
History of Venezuela	5	139	00:02.2
Hungarian State	4	152	00:03.1
Republic of Entre Ros	3	66	00:01.1
Tolna County (former)	3	59	00:01.1
Rwenzururu	8	143	00:02.0
Kingdom of Pontus	6	122	00:04.0
Principality of Ryazan	8	174	00:02.3
Taungoo Dynasty	8	174	00:03.4
Lublin Voivodeship (14741795)	3	56	00:01.2
Republic of the Congo (Lopoldville)	3	68	00:01.1
Vilnius Voivodeship	8	168	00:03.5
Collectivity of Saint Martin	17	460	00:07.3
K'iche' Kingdom of Q'umarkaj	3	63	00:01.3
Kievan Rus'	4	270	00:02.7
Kingdom of Pergamon	5	111	00:02.3
Kingdom of Sardinia	19	577	00:07.9
Kingdom of the Two Sicilies	14	432	00:06.2
Languages of Nepal	4	54	00:03.4
Biaystok Voivodeship (19191939)	3	140	00:02.2
Yeke Kingdom	7	108	00:06.2
Empire of Haiti (1804-1806)	3	84	00:01.2
Allied-occupied Austria	11	259	00:02.6
Wiblingen Abbey	4	137	00:04.0
Sros County	3	57	00:01.1
Saamoothiri	17	283	00:05.4
Royal Audience of Quito	6	110	00:02.2
Republic of Cebu	4	68	00:03.7
Mhu	3	35	00:01.1
Waldburg-Waldburg	5	83	00:06.4
County of Zeeland	4	80	00:01.3
Trust Territory of Somalia	8	141	00:02.1
Tabaristan	9	165	00:04.1
Northland State	6	133	00:08.4

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Country	Graphs	Triples	Time
Krakw Voivodeship (14th century 1795)	3	55	00:01.2
Wari Empire	7	117	00:01.9
Nassau-Saarbrcken	4	118	00:01.4
Starhemberg	4	165	00:02.6
Bishopric of Cammin	41	599	00:17.6
Prince-Bishopric of Paderborn	14	224	00:04.1
Principality of Koknese	6	100	00:02.2
Taifa of Almera	3	70	00:05.1
Petseri County	5	75	00:02.1
Principality of Smolensk	7	108	00:02.4
Principality of Trinidad	4	75	00:01.9
Republic of Acre	4	104	00:02.1
Swiss Confederation (Napoleonic)	3	48	00:01.9
Sflingen Abbey	3	62	00:01.2
Soopoolitse	4	53	00:02.2
Yass Municipal Council	6	69	00:03.8
Republic of the North Solomons	6	93	00:01.4
Gau Swabia	5	88	00:01.4
Gau Mnchen-Oberbayern	3	49	00:01.2
Gau Franconia	6	88	00:01.7
Gau East Prussia	4	54	00:01.4
Duchy of Limburg (18391867)	3	73	00:02.1
Kingdom of Sitawaka	5	83	00:03.3
Office International d'Hygine Publique	3	41	00:02.1
Bialystok-Grodno District	4	62	00:01.3
Yotvingia	4	68	00:01.3
County of Stolberg	6	117	00:02.4
Suwaki Governorate	3	95	00:01.1
Taifa of Denia	5	100	00:01.4
Taifa of Albarracn	3	53	00:01.5
Taifa of Arcos	4	85	00:01.5
Taifa of Baeza	4	71	00:01.7
Taifa of Guadix and Baza	4	65	00:02.1
Taifa of Ronda	4	75	00:01.5
Spanish Formosa	4	82	00:03.1
Taifa of Jerez	4	71	00:01.3
Kingdom of Namayan	6	102	00:02.1
Province of Kymi	4	81	00:01.7
Second Republic of Hungary	5	111	00:01.7
Despotate of Angelokastron and Lepanto	4	66	00:01.6
Provisional Government of Albania	4	78	00:01.4
Kingdom of Maynila	4	82	00:01.7
Cabea do Cachorro	3	81	00:01.1
Kingdom of Nejd and Hejaz	6	111	00:04.2
County of Svartsj	3	42	00:03.1
Kingdom of Butuan	4	72	00:01.3
Waldburg-Friedburg-Scheer	5	71	00:02.7
Princely State of Mysore	5	75	00:01.5
New Kingdom of Len	3	47	00:01.2
Petsamo Province	5	86	00:01.5
Principality of Jersika	5	92	00:01.9
Saxe-Rmhild	3	70	00:01.1
Taiping Heavenly Kingdom	7	160	00:02.1
Isenburg-Limburg	4	76	00:01.3
Palatinate-Simmern and Zweibrcken	3	53	00:01.1
Kingdom of Artsakh	4	73	00:01.3
County of Rieneck	6	116	00:01.5
Principality of Stavelot-Malmedy	9	178	00:01.7
Barbadian	31	590214	03:18.6
Barbados	31	590214	08:50.3
Grenada	26	1984	00:11.3
Maldives	42	590169	02:49.1
Bermuda	32	2002	00:07.5
Colombia	31	592244	03:17.4
Ecuadoran	11	589563	02:28.7
Ecuador	11	589563	02:27.1
Eritrea	36	590065	18:34.0
Crown of Castile	15	585	00:05.7
Tunisia	37	590417	03:01.1
Honduras	29	3166	00:16.0
Republic of Ireland	7	5855	00:10.1
Sierra Leone	38	2962	00:16.9
Suriname	34	2587	00:09.0
Thailand	43	591727	02:53.5

Continued on next page

Country	Graphs	Triples	Time
Uruguay	35	590941	06:55.6
Algeria	33	590934	05:10.9
Austria	10	591083	06:57.3
Andorra	11	1757	00:05.5
Afghanistan	49	591969	03:02.1
Antigua and Barbuda	27	1880	00:11.4
Anguilla	11	1311	00:04.8
Bulgaria	11	590570	02:56.6
Belgium	12	591412	04:18.2
Bolivia	9	1542	00:15.3
Botswana	28	2839	00:16.5
Belarus	45	591061	03:17.9
Comoros	46	2268	00:05.8
Cameroon	32	3600	00:10.7
Cayman Islands	31	1685	00:06.6
People's Republic of China	5	2524	00:08.0
Clipperton Island	23	969	00:04.4
Croatia	40	591169	02:53.7
Cocos (Keeling) Islands	10	814	00:03.2
Central Powers	7	298	00:02.2
Commonwealth of England	10	398	00:02.6
Dahomey	9	291	00:05.6
El Salvador	39	3074	01:03.0
England	8	26152	00:12.0
East Berlin	15	710	00:04.5
European Coal and Steel Community	15	414	00:03.6
Kingdom of Essex	13	367	00:02.7
Finland	11	591202	02:54.8
Federated States of Micronesia	7	901	00:04.3
Germany	5	590032	02:21.2
Glorioso Islands	13	624	00:08.6
Guernsey	34	1766	00:12.5
Gktrks	3	393	00:02.4
Hungary	46	592798	03:06.4
Second Polish Republic	12	927	00:14.6
Iceland	37	591266	02:56.4
Isle of Man	31	589563	04:48.5
Inca Empire	24	659	00:06.9
Jamaica	34	590226	02:55.8
Khazars	27	596	00:07.1
Kiribati	34	2243	00:09.6
Kalmar Union	11	427	00:05.1
Kerguelen Islands	24	1004	00:47.6
Lebanon	38	590823	03:03.7
Lesotho	28	2562	00:16.0
Liberia	27	2737	00:11.1
Marshall Islands	31	589680	03:17.2
Mayotte	33	1677	00:09.2
Moldova	32	2847	00:08.8
Mongolia	10	589636	04:15.6
Morocco	38	2901	00:12.5
Madeira	8	1021	00:03.9
Northern Ireland	46	590366	03:07.8
Namibia	28	590764	07:03.7
Nigeria	54	591834	03:31.6
Ottoman Empire	5	1408	00:10.2
Portugal	91	592768	02:48.0
Pakistan	54	592509	05:00.8
Paraguay	35	590716	03:38.6
Province of Canada	11	418	00:03.4
Republic of Texas	14	519	00:02.5
Romania	38	592492	03:05.9
Republic of China	47	3042	00:20.1
Slovakia	45	591446	03:14.5
Saint Helena	34	1525	00:08.8
Scotland	50	592975	03:08.7
Saint Pierre and Miquelon	43	1514	00:09.0
Senegal	28	590514	02:58.1
Serbia and Montenegro	43	1213	00:07.7
Slovenia	36	590714	02:55.8
Somalia	35	590307	05:04.9
Svalbard	22	1006	00:05.9
Tanzania	33	590784	03:05.0
Tokelau	30	1327	00:19.5

Continued on next page

Country	Graphs	Triples	Time
Ukraine	49	591821	03:00.9
Vanuatu	34	2355	00:06.8
West Germany	18	3614	00:16.3
Wallis and Futuna	41	1530	00:14.7
Zimbabwe	38	590894	02:52.4
Zollern	8	220	00:02.2
Hohenzollern-Sigmaringen	7	390	00:03.9
United Nations Interim Administration Mission in Kosovo	24	474	00:04.3
South-West Africa	7	271	00:05.6
Qin Dynasty	21	596	00:03.7
Axis powers	21	671	00:07.5
United Arab Republic	13	624	00:07.1
Moldavia	14	717	00:08.5
Lorraine (duchy)	3	165	00:01.7
Almohad dynasty	16	502	00:02.5
Mecklenburg-Strelitz	11	332	00:03.9
Zeeland	12	931	00:04.4
Arab League	26	588777	02:46.6
Belgian Congo	5	320	00:02.4
Guelders	15	343	00:05.7
South Vietnam	13	1029	00:15.5
Saint Barthlemy	6	603	00:02.7
Curaao	6	660	00:01.8
Provisional Revolutionary Government of the Republic of South Vietnam	10	349	00:04.8
United Arab Emirates	58	591940	02:55.2
Seventeen Provinces	7	279	00:02.6
Xiongnu	30	634	00:04.3
Numidia	10	348	00:02.5
Democratic Republic of the Congo	62	591631	02:52.1
Denmark	46	593432	16:27.1
Bonaire	1	0	00:15.1
Mecklenburg-Schwerin	1	0	00:15.1
Duchy of Prussia	1	0	00:15.2
Southern Ireland	1	0	00:15.1
Thurn und Taxis	1	0	00:15.1
Kingdom of Nepal	1	0	00:15.1
Commonwealth of the Philippines	4	319	00:44.7
Transkei	1	0	00:15.1
Alderney	12	693	00:18.8
Goguryeo	20	612	00:34.0
Unterwalden	7	292	00:14.8
Central African Empire	7	256	00:06.6
Orange Free State	34	1548	00:24.1
Kingdom of Kent	8	283	00:04.3
Safavid dynasty	26	707	00:08.6
Mali Empire	18	485	00:02.8
Empire of Japan	20	2177	00:15.6
Anjouan	16	689	00:03.8
Berg (state)	5	168	00:01.6
Republic of Hawaii	7	288	00:08.5
Ethiopia	11	589807	03:00.2
Colony of Virginia	14	350	00:04.3
Louisiana Territory	7	180	00:02.2
German East Africa	8	394	00:02.9
Vietnam	10	591514	02:22.2
Lan Xang	11	285	00:02.7
Kingdom of Laos	5	302	00:04.0
British Antarctic Territory	12	575	00:03.9
French Union	5	272	00:02.4
Jubaland	8	254	00:02.5
Second French Empire	5	578	00:08.8
Osroene	11	305	00:03.0
Plymouth Colony	16	384	00:02.7
British North America	7	305	00:03.9
Kingdom of Funan	5	231	00:01.7
Bukovina	11	407	00:07.6
Gupta Empire	11	403	00:02.7
East Jersey	8	168	00:02.0
Puntland	20	900	00:03.8
Swedish Pomerania	5	331	00:06.6
Brandenburg-Prussia	5	245	00:02.3
Brunswick-Lneburg	3	410	00:04.6
Archbishopric of Mainz	26	453	00:08.0
Grand Duchy of Frankfurt	9	309	00:02.8

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Country	Graphs	Triples	Time
Electorate of Cologne	13	363	00:02.6
Archbishopric of Trier	17	445	00:05.6
West Florida	10	349	00:04.6
Archbishopric of Salzburg	15	368	00:17.8
Duchy of Saxony	5	281	00:16.2
Cao Wei	14	458	00:14.6
Shu Han	13	392	00:03.6
French Sudan	6	267	00:03.0
Republic of Florence	7	285	00:04.8
Sint Eustatius	18	1008	00:05.2
Buganda	10	326	00:02.5
German Samoa	5	206	00:02.2
Republic of Formosa	11	380	00:06.6
Spanish Empire	13	626	00:10.5
Germania Inferior	7	243	00:06.9
Dakota Territory	8	260	00:02.9
Duchy of Athens	11	352	00:02.5
State of Franklin	11	295	00:02.3
South Ossetia	20	685	00:07.3
Abkhazia	26	904	00:04.1
le Amsterdam	6	286	00:01.3
Armenia	39	591077	02:56.2
Bahrain	11	2220	00:05.4
Duchy of Brabant	13	612	00:05.2
Burundi	10	1472	00:03.8
United Nations Transitional Authority for Eastern Slavonia & Baranja and Western Sirmium	3	133	00:04.1
French Congo	7	163	00:02.2
Cambodia	46	590634	02:52.4
Far Eastern Republic	11	380	00:04.9
Gojoseon	25	597	00:06.3
Senegambia and Niger	6	152	00:02.7
Kushan Empire	17	498	00:03.7
Kabylie	12	340	00:06.8
Han Zhao	9	287	00:04.3
Saudi Arabia	43	592249	02:54.1
Turc County	3	114	00:11.2
Kingdom of Cambodia (19531970)	3	125	00:10.2
People's Republic of Poland	4	248	00:17.5
County of Gothenburg and Bohus	11	229	00:02.3
Qi (Shandong)	3	106	00:01.3
Turku and Pori Province	16	308	00:08.8
Duchy of Warsaw	10	498	00:04.9
Timurid dynasty	12	472	00:09.8
Province of Prussia	6	214	00:02.3
Prussia	22	1054	00:12.0
July Monarchy	9	330	00:08.2
Congress Poland	9	482	00:08.8
Padania	5	181	00:02.4
Province of Silesia	11	348	00:02.8
Province of Saxony	8	306	00:02.2
Biaystok Voivodeship (19751998)	3	99	00:01.2
Province of Hohenzollern	9	257	00:02.3
Gagauzia	20	846	00:04.0
Province of Lower Silesia	6	214	00:02.5
Province of Quebec (17631791)	3	114	00:01.2
Ruthenian Voivodeship	9	262	00:03.0
Tannaim	6	256	00:02.3
Uganda Protectorate	7	187	00:02.1
Bechuanaland Protectorate	9	344	00:02.3
Posen-West Prussia	13	279	00:02.9
Duchy of Burgundy	5	255	00:02.8
Western Liang	8	233	00:03.4
Idaho Territory	6	196	00:02.5
Department of Alaska	6	162	00:02.2
Utah Territory	7	307	00:02.5
Wisconsin Territory	6	199	00:02.1
Kamerun	9	247	00:02.5
Arizona Territory (Confederate States of America)	3	108	00:01.3
Gaya confederacy	16	369	00:03.2
Taebong	10	252	00:02.5
Brass County	3	77	00:01.1
Mountain Autonomous Soviet Socialist Republic	8	233	00:02.3
Province of New Hampshire	9	253	00:02.3
Province of New York	12	355	00:02.2

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Country	Graphs	Triples	Time
Province of Georgia	10	253	00:06.1
Province of Maryland	10	261	00:03.1
Delaware Colony	13	242	00:04.3
Province of Carolina	9	259	00:03.1
Estonia	36	591739	02:54.0
Kingdom of Gwent	11	461	00:03.2
Normans	15	503	00:03.6
Achaea (Roman province)	5	159	00:02.0
Western Roman Empire	11	485	00:02.9
Free City of Krakw	3	184	00:01.4
West Ukrainian People's Republic	3	203	00:01.2
Republic of Genoa	12	405	00:02.4
Sultanate of Rm	3	295	00:01.8
Exarchate of Ravenna	8	252	00:04.2
Crozet Islands	16	1183	00:26.4
Djibouti	41	2721	00:17.0
Dominica	28	2004	00:05.7
Economic Cooperation Organization	12	492	00:05.9
Kingdom of Galicia and Lodomeria	9	309	00:02.3
Republic of Venice	19	840	00:07.5
State of Kanawha	6	162	00:02.5
Kingdom of Powys	6	269	00:02.8
Kingdom of Nekor	12	236	00:01.9
Hammadid	8	231	00:02.5
Despotate of Epirus	10	297	00:04.8
Comtat Venaissin	11	330	00:02.3
Xia (Sixteen Kingdoms)	3	110	00:01.2
Ran Min	7	247	00:02.3
Later Liang Dynasty	5	218	00:02.5
Schwarzburg-Sondershausen	6	234	00:05.1
Himyarite Kingdom	11	288	00:02.7
Yemen Arab Republic	7	289	00:02.2
Malaysia	39	591728	02:47.1
Mohli	5	296	00:02.6
Federation of South Arabia	8	262	00:02.1
Adiabene	5	218	00:02.2
Spanish Sahara	5	238	00:02.4
West Prussia	8	319	00:05.0
Togoland	6	250	00:02.6
Indo-Greeks	18	440	00:03.9
Greco-Bactrian Kingdom	17	420	00:06.1
Spanish Guinea	5	250	00:02.2
Duchy of Teschen	16	432	00:02.6
Twenty-fifth dynasty of Egypt	14	322	00:02.6
Kara Koyunlu	13	336	00:07.0
Indo-Parthian Kingdom	11	277	00:01.9
Indo-Scythians	9	261	00:02.0
Samanids	15	382	00:05.2
French India	10	352	00:06.4
County of Savoy	7	229	00:02.1
Moson County	6	150	00:02.8
Jsz-Nagykun-Szolnok County (former)	3	78	00:06.1
Komrom County	3	99	00:01.1
Borsod County	13	217	00:03.0
Ugocsa County	6	149	00:02.2
Republic of Central America	6	193	00:02.2
Als-Fehr County	3	79	00:03.3
Beszterce-Naszd County	3	86	00:01.1
Hunyad County	6	134	00:02.1
Maros-Torda County	8	158	00:02.4
Zagreb County (former)	3	80	00:01.2
Chagatai Khanate	12	340	00:05.8
Sunga Empire	12	337	00:02.6
KwaZulu	7	244	00:02.6
Saint Christopher-Nevis-Anguilla	11	278	00:02.3
Wari culture	8	258	00:03.4
Akrotiri and Dhekelia	21	579	00:07.2
British Mandate of Mesopotamia	10	292	00:02.9
Canton of Baden	6	204	00:03.0
Septinsular Republic	7	256	00:03.2
Chile under Pinochet	7	212	00:02.0
Kingdom of Dali	7	258	00:02.8
Northern Nigeria Protectorate	6	210	00:02.5
Thomond	8	218	00:06.9

Continued on next page

Country	Graphs	Triples	Time
Southern Nigeria Protectorate	9	218	00:02.5
Eastern Wei	6	204	00:02.9
PeruBolivian Confederation	3	139	00:01.4
Transcaucasian Democratic Federative Republic	13	389	00:06.3
Hubaekje	7	193	00:02.5
Chalukya dynasty	16	370	00:02.6
State of Vietnam	5	237	00:05.9
Duchy of Livonia	9	318	00:02.3
Duchy of Spoleto	6	252	00:02.3
Kiev Voivodeship	19	383	00:02.8
Wenden Voivodeship	6	156	00:06.5
Hunnic Empire	7	201	00:02.4
Hafsid dynasty	11	298	00:02.4
le Saint-Paul	4	265	00:03.0
Terra Mariana	6	242	00:04.1
Vogtland	5	222	00:02.2
Anhalt-Dessau	6	248	00:01.9
Tagalog Republic	10	165	00:01.7
oma Department	3	56	00:01.1
Gmr s Kis-Hont County	3	73	00:01.1
Khorezm People's Soviet Republic	3	107	00:01.6
Kingdom of Kerma	6	136	00:04.9
Abaj-Torna County	3	61	00:02.4
Konbaung Dynasty	9	213	00:02.2
Isratin	6	139	00:01.6
Principality of Wales	6	132	00:02.9
Arenberg	7	137	00:05.8
Jingnan	5	112	00:03.1
Southern Tang	6	119	00:02.2
Muzaffarids of Iran	7	168	00:02.6
Norway in 1814	5	83	00:04.4
Exarchate of Africa	8	155	00:02.3
Mayreau	6	146	00:02.5
Duchy of Mantua	15	347	00:02.6
Duchy of Carniola	7	141	00:06.4
Germiyan	6	116	00:02.3
Ober Ost	21	330	00:02.9
Duchy of Limburg	6	181	00:02.2
Duchy of Cleves	12	263	00:05.4
Spain under the Restoration	7	161	00:02.1
Principality of Leyen	5	111	00:02.8
Wu (Ten Kingdoms)	5	82	00:01.5
KaNgwane	6	157	00:05.5
Rechberg and Rothenlwen	3	58	00:01.2
Stolberg-Stolberg	5	100	00:02.6
Salm-Kyrburg	5	96	00:02.5
Achaemenid Assyria	11	174	00:03.2
Cossack Hetmanate	11	252	00:05.5
Sayn-Wittgenstein-Karlsburg	5	81	00:02.2
Sayn-Homburg	5	77	00:02.1
Sayn-Wittgenstein-Wittgenstein	5	77	00:02.7
Province of Limburg (18151839)	3	58	00:01.1
County of Jaffa and Ascalon	12	223	00:04.7
Banat Republic	5	139	00:02.3
Injuids	5	85	00:02.2
SAO Kninska Krajina	4	82	00:02.0
SAO Bosanska Krajina	5	89	00:02.2
Nieder-Isenburg	6	93	00:07.1
Second East Turkestan Republic	6	151	00:02.3
Al-Harm	4	46	00:01.9
Alavids	10	193	00:02.3
Canouan	7	178	00:05.3
Austrian Silesia	7	157	00:02.2
Voivodeship of Serbia and Banat of Temeschwar	14	240	00:02.5
Saybrook Colony	6	98	00:03.9
Mataram Kingdom	6	182	00:02.4
Suri dynasty	8	151	00:02.4
Transpadane Republic	6	214	00:02.3
Ghurid Dynasty	12	274	00:02.6
Sundgau	6	143	00:05.8
People's Republic of Bulgaria	4	156	00:01.5
Baranya County (former)	3	62	00:01.2

TABLE 4: Expansion Algorithm Results for ECS People

Person	Graphs	Triples	Time
Name	Number of Graphs	Number of Triples	Time Taken
Ahmed Abuelgasim	3	62	00:00.9
Amit Acharyya	4	118	00:00.3
Matthew Addis	4	247	00:00.4
Sara Aghdaei	3	51	00:00.5
Mohammad Al Hakim	39	387	00:17.6
Bashir Al-Hashimi	4	1012	00:06.4
Muayed Al-Huseiny	4	77	00:02.4
Jamal Al-Sumait	4	77	00:01.9
Saad Alahmari	4	100	00:01.4
Harith Alani	3	151	00:03.4
Rocio Aldeco Perez	4	81	00:03.2
Abdulsalam Alghamdi	3	65	00:00.9
Mustafa Ali	2	38	00:00.6
Feras Alkhalil	3	47	00:00.6
Muhammad Alsubaie	4	93	00:01.4
Gabrielle Anderson	4	88	00:06.0
Paul Andre	4	190	00:05.6
Kikelomo Apampa	4	93	00:01.7
Faezeh Arab Hassani	4	68	00:01.5
David Argles	4	219	00:02.2
Jordi Arranz	3	45	00:02.2
Peter Ashburn	260	2370	02:12.0
Ani Asnawi	3	97	00:03.7
Jo Axtell	3	59	00:00.6
Peter Ayliffe	3	47	00:00.8
Tayyaba Azim	3	46	00:01.7
Norhidayah Azman	3	80	00:00.6
Karthik Baddam	4	99	00:01.7
Darren Bagnall	4	344	00:03.1
Chuan Bai	3	47	00:12.0
Mehdi Banakar	3	63	00:09.7
Pedro Barbosa	4	100	00:02.1
David Barron	4	73	00:01.7
Richard Bayly	3	45	00:00.6
Richard Beales	4	88	00:01.5
Wendy Beeby	3	58	00:00.9
Steve Beeby	4	720	00:04.4
John Bell	8	109	00:01.7
Abdeldjalil Belouettar	3	59	00:04.7
Catia Bernabini	4	82	00:08.8
Wenming Bian	4	140	00:01.9
Colin Bird	3	48	00:00.9
Sam Birtwell	23	241	00:07.9
Stuart Boden	4	101	00:01.6
Rares-Andrei Bodnar	3	47	00:00.9
Maggie Bond	3	60	00:00.6
Philip Boulain	10	224	00:03.3
Richard Bradley	4	72	00:01.4
Dave Braines	4	140	00:01.1
Stephen Brewer	3	58	00:03.6
Neil Broderick	3	65	00:00.6
Tim Brody	4	177	00:03.3
Andrew Brown	129	1260	00:59.2
Dominic Buchstaller	4	78	00:01.4
Seth Bullock	4	461	00:03.8
Aisha Bushager	3	58	00:00.8
Michael Butler	3	509	00:03.8
Prins Butt	4	64	00:01.4
Andrew Byde	36	299	00:09.5
Zhonglun Cai	4	152	00:02.1
Mary Campbell	3	58	00:04.2
Tracey Cantlie	3	59	00:11.5
Les Carr	388	3750	03:16.6
John Carter	4	527	00:03.1
Renato Cavalcante	3	57	00:06.5
Jaime Cerda Jacobo	3	46	00:00.6
Ajay Chakravarthy	4	103	00:01.4
Georgios Chalkiadakis	4	108	00:01.9
Dave Challis	3	62	00:03.1
Archie Chapman	4	119	00:01.7
Paul Chappell	4	333	00:05.4

Continued on next page

Person	Graphs	Triples	Time
Martin Charlton	4	269	00:05.3
Wen-Pin Chen	4	77	00:02.4
Xiaoyu Chen	4	82	00:05.1
George Chen	4	860	00:02.9
Sheng Chen	1234	7820	10:55.1
Ruiqi Chen	4	78	00:03.0
Richard Chippendale	3	62	00:00.6
Harold Chong	51	541	00:27.2
Chin Choo	4	108	00:01.7
Tim Chown	4	146	00:01.6
Corina Cirstea	4	165	00:05.5
Justin Cobb	3	48	00:00.6
Marcus Cobden	3	51	00:00.6
Samantha Collins	3	58	00:00.8
Eric Cooke	4	91	00:01.4
Lucas Cordeiro	4	123	00:01.4
Gianluca Correndo	24	288	00:11.7
Enrico Costanza	3	95	00:03.3
Andrew Cranny	50	493	00:24.3
Stephen Crouch	4	125	00:01.0
Richard Crowder	4	435	00:05.6
Don Cruickshank	4	219	00:05.8
Alastair Cummings	3	51	00:00.6
Kriangsak Damchoom	5	96	00:01.6
Bob Damper	388	3258	03:20.1
Lauren Dampier	3	58	01:05.7
Ngoc Dao	4	77	00:01.7
John Darlington	60	399	00:21.9
Rajdeep Dash	3	94	00:03.7
Srinandan Dasmahapatra	84	759	00:37.8
William Davies	3	49	00:02.0
Hugh Davis	3	679	00:05.6
Kees De Groot	4	426	00:02.8
Maria De Leon	3	56	00:00.6
Franz De Leon	3	58	00:01.7
Paulo De Oliveira Cantante De Matos	4	105	00:02.2
Maurits De Planque	4	187	00:01.9
David De Roure	491	4213	04:05.4
Francesco Delle Fave	3	54	00:00.6
Kheiredine Derouiche	4	73	00:01.5
Sotirios Diamantas	4	113	00:01.4
Farrah Djidjeli	3	53	00:02.8
E.A. Draffan	4	188	00:02.0
Lance Draper	3	47	00:01.1
David Dupplaw	4	146	00:02.0
Economopoulos	3	64	00:00.6
Andrew Edmunds	4	86	00:01.4
Ehab El-Salamouny	4	78	00:02.6
Terry Elliott	4	233	00:02.7
Sue Ellis	4	74	00:01.6
Joshua Ellul	4	127	00:04.1
Donald Esrafili-Gerdeh	4	64	00:01.4
Neil Fagan	3	51	00:00.8
Alessandro Farinelli	4	119	00:00.5
Simon Farrenden	3	58	00:00.8
Julian Field	4	118	00:01.4
Adam Field	4	80	00:03.8
Bernd Fischer	4	166	00:02.4
David Flynn	8	126	00:01.7
Tim Forcer	4	86	01:06.7
Christine Foster	3	48	01:06.4
David Fowler	4	115	00:06.7
Ken Frampton	4	108	01:07.1
Nicola Freebody	4	66	01:06.4
Christopher Freeman	4	342	01:07.1
Mark French	5	1445	01:15.5
Maria Gallagher	3	45	01:05.9
Feng Gao	3	122	00:00.6
Nicholas Geard	4	245	00:02.3
Enrico Gerding	4	199	00:03.2
Salman Ghafoor	3	45	00:02.0
Mustansar Ghazanfar	4	105	00:01.5
Nicholas Gibbins	117	977	00:52.0
Lester Gilbert	98	935	01:45.6

Continued on next page

Person	Graphs	Triples	Time
Kevin Goddard	4	171	00:01.4
Carsten Gollasch	3	86	00:02.0
Igor Golosnoy	4	228	00:02.4
Ali Gondal	4	81	00:01.9
Amanda Goodacre	3	47	00:00.6
Neil Grabham	4	164	00:01.9
Simon Grange	4	191	00:01.5
Andrew Gravell	4	242	00:02.0
Nicolas Green	4	385	00:02.7
Christopher Green	4	76	00:02.2
Paul Groth	4	109	00:03.9
Tao Guan	4	89	00:01.7
Steve Gunn	4	517	00:03.0
Christopher Gutteridge	4	191	00:01.5
Sardaouna Hamadou	3	48	00:01.8
Lajos Hanzo	4	3508	00:09.0
Liwei Hao	4	180	00:29.4
Jonathan Hare	4	228	01:09.6
Charles Hargood	4	106	00:03.7
Stevan Harnad	4	938	01:12.4
Nick Harris	5	1417	00:04.3
Denise Harvey	3	58	01:08.6
Ali Hassan	3	63	00:01.4
Graham Hearn	4	86	00:01.5
Thomas Hebbron	4	384	00:01.5
Peter Henderson	184	1364	01:25.6
Tony Hey	290	2403	02:19.8
Jessie Hey	287	2397	01:58.4
Steve Hitchcock	4	206	00:02.2
Veronica Hollis	3	52	00:03.0
Alex Holt	3	48	00:00.3
Neil Hong	3	47	00:00.6
Clare Hooper	4	147	00:03.1
Ross Horne	4	115	00:02.0
Ian Hosier	4	307	00:07.9
Yvonne Howard	4	184	00:02.3
Glenys Howe	3	48	00:00.6
Hui Huang	3	57	00:06.6
John Hughes	4	593	00:03.3
Anne-Marie Hughes	4	210	00:01.9
Toby Hunt	3	59	00:01.8
Jack Hunter	3	64	00:00.9
Muhammad Husain	25	282	00:10.9
Nuriziani Hussin	4	84	00:01.4
Trung Huynh	4	128	00:03.6
Roziana Ibrahim	3	84	00:00.6
Hazlee Illias	3	44	00:04.2
Afraz Jaffri	4	123	00:00.5
Syed Jalal	3	57	00:03.1
Ehtesham Jam	4	99	00:01.7
Nick Jennings	3	1305	00:08.4
Gareth Jones	4	126	00:01.4
Sung Jung	3	57	00:00.6
Yannis Kalfoglou	4	288	00:05.2
Tom Kazmierski	4	374	00:03.2
Melvyn Kelly	3	47	00:00.8
Andriy Kharechko	4	85	00:02.1
Syed Khursheed	4	124	00:02.8
Kian Kiang	3	62	00:00.6
Philip King	3	53	00:03.5
Tobias Kleemann	3	83	00:01.6
Jorg Kliewer	4	75	00:01.7
Maralyn Knight	3	46	00:04.7
Kenton Knight	3	46	00:00.9
Lingkun Kong	4	98	00:01.4
Ramachandra Kota	9	104	00:02.8
Elena Koukharenko	4	187	00:03.0
Michael Kraft	4	450	00:04.0
Konstantinos Lagogiannis	3	51	00:00.6
Andrew Landells	3	89	00:01.1
Thomas Leonard	4	115	00:00.8
Paul Lewin	4	1039	00:05.1
Adam Lewis	4	106	00:03.3
Joyce Lewis	3	62	00:00.6

Continued on next page

Person	Graphs	Triples	Time
Paul Lewis	4	755	00:03.4
Yunjia Li	5	118	00:01.6
Xiaoli Li	3	60	00:04.1
Ke Li	4	82	00:01.4
Li Li	3	45	00:00.6
Siwen Liang	3	48	00:02.4
Ilaria Liccardi	3	48	00:02.2
Christopher Lovell	4	89	00:01.4
Fan Lu	3	50	00:02.3
Bartosz Lukasik	4	82	00:01.5
Ahmed Maache	5	59	00:05.0
Kathryn Macarthur	5	97	00:01.4
Koushik Maharatna	61	585	00:28.7
Sasan Mahmoodi	3	151	00:02.2
Kanad Mallik	4	136	00:03.8
Ivan Markovsky	58	568	00:22.1
Joao Marques-Silva	4	455	00:02.6
Kirk Martinez	4	484	00:02.8
Darko Matovski	3	59	00:00.9
Robert Maunder	4	248	00:01.8
Iain McNally	4	82	00:01.4
Patrick McSweeney	4	89	00:02.9
Ken Meacham	4	103	00:01.9
Dain Mead	3	59	00:01.7
Panos Melas	3	53	00:01.1
Tracy Melvin	4	244	00:02.2
Geoff Merrett	4	177	00:04.2
Michael Merrett	4	64	00:03.3
Cheryl Metcalf	4	156	00:02.1
Danius Michaelides	4	303	00:05.7
Lee Middleton	4	162	00:02.9
Stuart Middleton	4	140	00:01.7
Timothy Miles-Board	4	219	00:04.2
Ian Millard	47	523	00:18.7
David Millard	272	2230	02:05.3
Robert Mills	3	74	00:01.9
David Mills	4	79	00:01.8
Jatin Mistry	3	60	00:00.8
Mark Mitchinson	4	111	00:00.7
Hiroshi Mizuta	4	1291	00:04.5
Ramizi Mohamed	4	85	00:02.6
Suhana Mohamed Sultan	3	46	00:00.6
Zakaria Moktadir	4	238	00:02.0
Luc Moreau	375	2439	03:01.2
Hywel Morgan	149	1428	01:18.1
Jane Morgan	3	59	00:30.6
Matt Mowlem	3	56	00:06.4
Jose Munoz De Cote Flores Luna	4	81	00:01.7
Bart Nagel	3	75	00:03.2
Victor Naroditskiy	3	48	00:01.8
David Newman	4	174	00:01.5
Russell Newman	3	90	00:01.2
Soon Ng	4	498	00:01.5
Yizhao Ni	3	85	00:00.6
Fiona Nichols	3	46	00:00.8
Denis Nicole	5	411	00:05.4
Mahesan Niranjan	159	1228	01:15.8
Athitaya Nitchot	3	88	00:03.3
Mark Nixon	451	3436	03:47.4
Jason Noble	4	391	00:02.8
Dade Nurjanah	3	82	00:05.5
Kieron O'Hara	149	1293	01:06.6
Iain Ogilvie	3	70	00:02.1
Temitope Omitola	3	56	00:00.8
Adrian Osmond	4	116	00:00.7
Aniza Othman	4	73	00:02.3
Asma Ounnas	3	57	00:04.4
Alisdair Owens	21	229	00:07.0
Yulita P Iskandar	4	97	00:01.7
Kevin Page	4	168	00:01.5
Neil Palmer	3	85	00:00.6
Lucyna Palmer	3	47	00:00.9
Greg Parker	182	1683	01:26.6
Timothy Parkinson	3	59	00:06.0

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Person	Graphs	Triples	Time
Jarutas Pattanaphanchai	3	56	00:00.6
Reena Pau	4	81	00:01.5
Dave Payne	4	66	00:07.0
David Payne	3	45	00:01.7
Stuart Pearce	3	53	00:00.9
Alexandra Penn	4	189	00:01.7
Adrian Pickering	4	88	00:03.6
James Pilgrim	5	138	00:01.4
Michael Pollard	3	50	00:02.2
Mariya Polukarov	4	119	00:01.5
Mike Poppleton	4	213	00:06.4
Claire Poupart	3	58	00:00.6
Simon Powers	4	160	00:01.8
Simon Powers	3	46	00:01.7
Sarah Prendergast	3	58	00:04.0
Joseph Price	4	108	00:02.1
Rikki Prince	3	99	00:03.0
Adam Prugel-Bennett	4	295	00:02.7
Oleksandr Pryymak	3	89	00:01.1
Marek Przedwojski	4	64	00:01.4
Betty Purwandari	3	76	00:00.7
Mohamed Qasem	9	132	00:05.1
Talal Rahwan	4	132	00:04.7
Amirthalingam Ramanan	5	96	00:05.6
Sarvapali Ramchurn	4	192	00:02.0
Paolo Rapisarda	49	510	00:22.4
Julian Rathke	3	167	00:02.7
Hwanjit Rattanasonti	3	45	00:02.1
Martin Reading	4	99	00:01.3
Till Rebenich	4	133	00:03.0
William Redman-White	164	1480	01:17.2
Jeff Reeve	4	449	00:02.4
Daniel Reid	3	46	00:13.1
Yukun Ren	3	45	00:00.6
Ferran Revilla	4	70	00:01.4
Abdolbaghi Rezazadeh	10	159	00:02.5
Valentin Robu	7	175	00:02.6
Somphop Rodamporn	4	75	00:01.4
Benedicto Rodriguez	4	163	00:00.7
Alex Rogers	4	74	00:04.5
Eric Rogers	4	1153	00:02.7
Harry Rose	3	59	00:02.9
Mihai Rotaru	4	164	00:19.3
Alan Roy	4	87	00:01.4
Alistair Russell	4	169	00:00.8
Harvey Rutt	4	801	00:04.2
Manuel Salvadores	11	172	00:08.7
Sina Samangooei	4	81	00:04.4
Michael Santer	3	116	00:00.9
Mike Santer	3	116	00:00.9
Ibrahim Sari	3	63	00:00.8
Farhana Sarker	3	66	00:00.6
Mohammad Sarshogh	3	65	00:01.7
Vladimiro Sassone	4	613	00:04.1
Alejandra Saucedo	3	48	00:03.7
Gill Schofield	3	47	00:00.9
monica schraefel	188	1187	01:29.9
Benjamin Schumann	3	44	00:02.0
Nigel Shadbolt	4	1185	00:09.5
Rishad Shafik	4	178	00:01.5
Hamed Shahidipour	4	60	00:03.6
John Shawe-Taylor	4	695	00:06.4
Bing Shi	4	67	00:05.6
Renato Silva	4	83	00:01.4
Eileen Simon	3	49	00:00.6
Sebastian Skuse	3	102	00:00.6
Paul Smart	4	361	00:01.9
Ashley Smith	4	145	00:04.7
Daniel Smith	4	318	00:04.1
Michael Smith	2	24	00:00.6
Peter Smith	248	1431	02:04.9
Richard Smith	3	45	00:01.1
Colin Snook	47	489	00:15.9
Pawel Sobocinski	35	349	00:15.8

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Person	Graphs	Triples	Time
Jennifer Sorge	4	91	00:01.4
Robert Spanton	9	125	00:01.9
Petros Stavroulakis	3	55	00:04.0
Sebastian Stein	4	189	00:00.8
Kai Sun	3	61	00:01.2
Somjet Suppharangsan	3	58	00:00.6
Matthew Swabey	4	114	00:01.4
David Swaffield	4	236	00:01.8
Steve Swingler	3	227	00:04.1
Elzbieta Sykulska	4	71	00:03.0
Adam Sykulski	6	138	00:01.4
Jan Sykulski	259	2280	02:10.7
Alan Taberham	4	70	00:05.8
Antulio Tarazona	3	48	00:02.0
David Tarrant	4	226	00:01.0
WT Teacy	4	108	00:01.5
Ken Thomas	4	184	00:04.9
Rupert Thomas	3	82	00:00.6
Bjorn Thorbjornsen	4	72	00:01.4
Daniel Thorpe	3	87	00:00.6
Thanassis Tiropanis	4	269	00:02.2
Russel Torah	4	206	00:04.0
Nam Tran	4	109	00:01.4
Long Tran-Thanh	4	99	00:06.4
Hoang Truong	3	49	00:00.6
Yoshishige Tsuchiya	4	509	00:02.5
Soichiro Tsuda	4	114	00:05.7
John Tucknott	55	366	00:21.2
John Tudor	4	407	00:02.5
Mischa Tuffield	4	203	00:00.5
Takashi Uchino	4	257	00:02.1
Colin Upstill	4	114	00:02.6
Ashwin Usgaocar	4	64	00:01.4
Johannes Van Der Horst	4	81	00:05.9
Alun Vaughan	4	617	00:02.6
Galina Veres	36	317	00:10.1
Ioannis Vetsikas	4	109	00:01.7
Thomas Voice	4	78	00:07.7
Perukrishnen Vytelingum	4	122	00:02.0
Mike Wald	50	601	00:18.9
Robert Walters	4	220	00:01.3
Ping Wang	23	243	00:07.2
Ning Wang	3	50	00:02.2
Leran Wang	4	102	00:01.7
Xin Wang	3	44	00:00.6
Richard Watson	4	340	00:04.5
Mark Weal	4	353	00:01.9
Eric Webb	3	47	00:02.0
Alex Weddell	4	164	00:01.6
Alexander Weddell	4	164	00:00.6
Yang Wei	3	67	00:00.8
Lyn Westerman	3	47	00:03.5
Neil White	5	1417	00:00.7
Su White	4	448	00:02.6
Roger White	3	48	00:00.6
Daniela Wieser	3	48	00:01.3
James Wilkinson	4	734	00:05.4
Colin Williams	3	78	00:00.6
Gary Wills	240	2158	01:51.6
Peter Wilson	4	362	00:01.4
Ivan Wolton	5	411	00:01.4
John Wynn	3	68	00:00.6
Liang Xiao	4	114	00:08.7
Zhiqiang Xu	3	14	00:01.4
Chong Xu	4	82	00:01.9
Xinyi Xu	3	49	00:05.8
Chao Xu	3	45	00:02.8
Sheng Yang	4	76	00:01.4
Lie-Liang Yang	3	419	00:06.3
Kai Yang	3	67	00:05.0
Wang Yao	4	99	00:01.4
Danlin Yao	3	48	00:00.6
Jiadi Yao	3	47	00:00.6
Celia Yeung	3	48	00:00.6

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Person	Graphs	Triples	Time
Amri Yusoff	4	78	00:01.4
Lailatul Zakaria	3	70	00:01.3
Ed Zaluska	4	372	00:05.9
Klaus-Peter Zauner	4	329	00:02.0
Ioannis Zeimpekis-Karakonstantinos	3	49	00:00.6
Junwei Zha	3	48	00:00.6
Pei Zhang	4	100	00:07.4
Rong Zhang	4	105	00:01.9
Jiayi Zhang	13	114	00:02.7
Yan Zhao	3	45	00:02.1
Junwei Zhao	4	97	00:01.4
Shida Zhong	3	77	00:00.4
Dibin Zhu	4	73	00:01.4
Yuan Zhuang	3	68	00:00.8
Mark Zwolinski	4	553	00:03.0
P M Fortune	3	22	00:08.1
L Hanzo	4	3508	00:01.3
R Steele	3	510	00:09.7
W Hall	678	4151	05:39.8
L Nanu	3	23	00:03.3
A G R Evans	3	443	00:03.6
C-E Sundberg	3	23	00:06.6
W C Wong	3	30	00:02.6
T Tanoue	3	37	00:01.5
S Takahashi	3	41	00:04.9
K Hashimoto	3	23	00:02.4
STS Chia	3	16	00:02.5
D G Hasko	3	45	00:04.3
A Potts	3	65	00:02.6
J R A Cleaver	3	43	00:01.5
C G Smith	3	37	00:01.4
H Ahmed	3	41	00:02.1
M J Santana	3	33	00:04.3
R H C Santana	3	31	00:06.6
E J Zaluska	4	372	00:00.8
K H Wong	3	27	00:01.5
RP Aldridge	3	23	00:07.0
SA El-Dolil	3	15	00:02.4
WC Wong	3	30	00:01.3
P H Hartel	626	2898	05:13.3
J F Hughes	4	593	00:01.4
T Hirata	3	23	00:06.1
N R Shadbolt	4	1185	00:01.8
R D Stewart	3	49	00:02.5
F F Tusubira	3	25	00:05.9
M E Bialkowski	3	23	00:02.7
S Cox	3	34	00:01.4
H Glaser	213	1531	01:31.9
M Reeve	3	39	00:01.6
T Johnsson	2	9	00:05.2
S L Peyton Jones	2	9	00:01.6
K Karlsson	2	9	00:01.4
K Hiruma	3	27	00:01.4
E Yanakura	3	25	00:01.4
M Mori	3	27	00:05.6
IJ Wassell	3	15	00:02.5
DJ Goodman	3	23	00:11.8
J L Altrip	3	51	00:01.7
M J Hart	3	41	00:02.6
G A J Amaratunga	3	49	00:01.7
M Kijek	3	25	00:10.7
R M Crowder	4	435	00:00.7
G Lovegrove	3	27	00:01.5
T Buckley	3	23	00:01.4
P W Garratt	3	112	00:01.9
T G Gough	3	23	00:04.8
J van Leeuwen	2	9	00:01.5
D A Nicole	5	411	00:01.4
C Kusano	2	14	00:00.2
J C Carter	4	527	00:00.7
A Blackburn	3	25	00:07.4
MA Bennet	3	23	00:02.4
M M Farooqui	3	26	00:01.5
P T E Roberts	3	31	00:11.7

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Person	Graphs	Triples	Time
A H Veen	3	14	00:01.4
G J Parker	186	1691	01:22.2
G Edmunds	3	31	00:03.8
G C Fox	2	9	00:08.3
A C Catania	3	22	00:02.5
S Harnad	4	938	00:01.0
M L Anido	3	16	00:01.5
D J Allerton	3	23	00:08.4
P Ashburn	267	2384	02:04.5
A A Rezazadeh	13	102	00:09.5
E F Chor	3	30	00:01.5
A Brunnschweiler	3	66	00:08.1
N L Biggs	3	18	00:01.6
B Mohar	3	29	00:07.1
J Shawe-Taylor	4	695	00:01.5
S A Billings	3	63	00:01.7
M J Korenberg	3	25	00:01.4
S Chen	1235	7822	10:08.2
R L Bowles	3	25	00:01.6
R I Damper	389	2978	03:00.6
S M Lucas	3	45	00:01.5
John E Brignell	3	61	00:03.8
Neil M White	5	1417	00:00.7
Andy Cranny	51	548	00:27.6
N Burgess	3	26	00:01.5
R I Damper	384	3250	02:56.2
K A E Totton	3	23	00:07.4
S J Shaw	3	31	00:01.4
A M Burton	3	55	00:07.2
G Rugg	3	35	00:00.7
A P Hedgecock	3	25	00:01.4
M Burton	3	55	00:00.3
L Castaner	3	43	00:01.4
L Prat	3	23	00:10.6
G Wolstenholme	3	23	00:02.1
D Cohen	3	24	00:07.7
C L T Mannion	3	23	00:04.9
John K Atkinson	53	329	00:20.1
E D McGaw	2	9	00:01.4
G Ensell	3	188	00:02.4
A Holmes-Siedle	3	23	00:01.4
L Adams	3	23	00:07.9
A Evans	3	443	00:00.4
P J French	3	21	00:02.5
A Pickering	2	9	00:04.9
M J Reeve	3	39	00:00.4
S Wright	3	23	00:02.5
B Stavely-Taylor	3	23	00:02.4
L Hinsenkamp	3	29	00:11.2
L Osvath	3	23	00:01.8
G Paksy	3	23	00:01.4
J Nadrchal	2	9	00:01.5
J H Merlin	3	20	00:06.8
D J Pritchard	62	362	00:21.0
M Surridge	3	77	00:02.5
J S Reeve	4	449	00:00.4
R Honarmand	3	27	00:07.9
D Nunn	3	140	00:02.1
J Layman	3	33	00:01.5
Paul H Lewis	4	755	00:04.3
K J Goodson	3	16	00:01.4
J Lin	3	23	00:01.3
P D Roberts	3	35	00:01.4
E K Lloyd	3	27	00:01.5
Bill Mitchell	3	61	00:09.6
J S Ward	3	25	00:01.5
P J Walters	3	23	00:04.6
M J Pont	3	37	00:01.6
M McTear	2	9	00:05.7
H Reichgelt	3	23	00:01.8
C Musson	3	25	00:00.4
J K Sykulski	265	2292	02:09.2
P Hammond	3	31	00:02.7
K S Thomas	4	184	00:00.6

Continued on next page

Person	Graphs	Triples	Time
MJ Tudor	4	407	00:00.4
MV Andres	3	29	00:01.4
KWH Foulds	3	29	00:01.4
JM Naden	3	23	00:07.4
G R Wolstenholme	3	23	00:01.3
N Jorgensen	3	27	00:01.4
D Gold	3	31	00:08.4
G RBooker	3	71	00:02.0
D C Browne	3	23	00:02.5
P T Landsberg	3	23	00:01.4
I A Dempster	2	11	00:01.4
P E Secker	3	31	00:04.1
D C Hanna	3	35	00:01.4
B Luther-Davies	3	31	00:04.4
H N Rutt	4	801	00:01.6
R C Smith	3	45	00:02.1
DC Hanna	3	35	00:00.3
HN Rutt	4	801	00:00.6
RC Smith	3	45	00:00.3
P K Kabir	3	27	00:01.4
H P Barendregt	3	27	00:06.6
M C J D van Eekelen	3	25	00:01.6
L O Hertzberger	169	783	01:13.6
M J Plasmeijer	3	30	00:02.1
W G Vree	3	39	00:01.8
E Green	3	27	00:06.5
A Baran	3	27	00:02.5
A Green	3	23	00:04.4
KHH Wong	3	27	00:01.3
NT Cheng	3	23	00:06.2
R Lam	3	23	00:02.5
KHJ Wong	3	16	00:09.8
C Cleverly	3	23	00:02.5
P Walters	3	25	00:02.5
AS Bhandal	3	25	00:02.4
H Gharavi	3	20	00:01.4
WH Lam	3	29	00:02.5
CE Sundberg	3	41	00:02.5
M Streeton	3	23	00:25.7
E Chiricozzi	2	9	00:01.7
A d'Amico	2	9	00:01.2
A M Hall	3	23	00:02.5
W Redman-White	161	1474	01:18.6
E Yanokura	3	23	00:06.4
AR Potter	3	23	00:02.5
S Chia	3	17	00:01.4
C R Askew	3	26	00:02.2
D B Carpenter	3	22	00:03.9
I Glendinning	3	31	00:06.2
W H Lam	3	17	00:01.7
C Minkowitz	3	17	00:02.5
P Henderson	185	1366	01:20.7
M Mac an Airchinnigh	2	9	00:03.5
D Bjrner	2	9	00:01.6
C B Jones	2	9	00:01.5
E J Neuhold	2	9	00:01.4
J M Nightingale	3	23	00:03.0
W Ash	2	9	00:07.6
P Thompson	3	14	00:04.6
P A Nelson	3	27	00:03.9
A R D Curtia	3	23	00:08.0
R C Crosthwaite	3	23	00:02.4
J D Evemy	3	23	00:01.4
N D Knee	3	29	00:04.3
S Amir-Azizi	3	24	00:05.0
T R Morris	3	24	00:02.4
D J Roulston	3	25	00:01.4
C R Selvakumar	3	23	00:01.4
D S Moralee	2	9	00:06.1
P D Coddington	3	24	00:02.5
J E Mandula	3	37	00:01.5
M Ogilvie	3	23	00:06.3
M Cooper	3	24	00:06.0
R A W Bladon	3	23	00:02.5

Continued on next page

Person	Graphs	Triples	Time
R W Hukin	3	25	00:02.9
G N A Irvine	3	23	00:02.5
J A Sheppard	3	23	00:10.9
J W Burnett	3	25	00:01.4
P W Gray	3	25	00:02.7
L P Straus	3	25	00:01.4
R A Symes	3	25	00:01.8
C L Hankin	3	31	00:05.7
D Till	3	19	00:01.6
C Godsil	3	23	00:02.5
S Rahtz	3	28	00:11.4
J Moonen	2	9	00:01.1
T Plomp	2	9	00:01.7
C Han	3	25	00:03.7
N K Bartlett	3	23	00:08.0
A Hashemi-Sakhtsari	3	23	00:02.5
G C Fox	3	33	00:01.3
S W Otto	3	29	00:09.7
Peter D Jeffery	3	25	00:01.4
Peter M Burr	3	27	00:02.1
Peter J Eccles	3	25	00:01.4
K Yamaguchi	3	51	00:01.7
R Schweickert	3	23	00:06.3
N K Taylor	3	23	00:01.5
E N Corlett	3	23	00:01.4
K Takita	3	35	00:01.5
H Akinaga	3	23	00:08.3
H Katoh	3	23	00:02.9
T Uchino	4	257	00:00.6
T Ishigaki	3	23	00:02.4
H Asano	3	23	00:10.6
T Ipposhi	3	25	00:02.4
T Gochou	3	25	00:02.5
K Masuda	3	31	00:01.4
D R Till	3	19	00:03.6
S Eisenbach	2	9	00:01.4
J S Wilkinson	4	734	00:01.4
S Hao	2	11	00:01.4
D Murphy	2	11	00:01.4
J G Smith	2	11	00:05.7
N Nourshargh	2	11	00:01.4
N Howard	2	11	00:01.4
G R Booker	3	71	00:00.3
Yolanda Gil	2	11	00:01.4
Ewa Deelman	2	11	00:05.8
Mark Ellisman	2	11	00:01.4
Thomas Fahringer	2	11	00:01.4
Geoffrey Fox	2	11	00:01.4
Dennis Gannon	2	11	00:02.4
Carole Goble	2	11	00:01.4
Miron Livny	2	11	00:01.4
Jim Myers	2	11	00:06.3
Simon Miles	2	11	00:01.3
Ewa Deelman	2	11	00:01.4
Paul Groth	2	11	00:01.4
Karan Vahi	2	11	00:04.3
Gaurang Mehta	2	11	00:01.2
Cassiano Becker	2	11	00:07.3
Raimundo Barreto	2	11	00:02.0
Liudi Jiang	7	77	00:03.7
G Pandraud	2	11	00:01.4
P J French	2	11	00:01.4
S M Spearing	2	11	00:05.5
E Koukharenko	4	187	00:00.4
X Li	6	64	00:04.3
I Nandhakumar	12	93	00:03.5
MJ Tudor	2	11	00:01.5
SP Beeby	3	16	00:09.7
B Schiedt	7	68	00:01.5
C Trautmann	7	68	00:01.8
NM White	2	11	00:02.1
Xiaohong Li	5	42	00:02.7
Iris Nandhakumar	12	93	00:03.6
SP Beeby	4	720	00:00.8

Continued on next page

Person	Graphs	Triples	Time
NM White	5	1417	00:01.5
Simon Miles	2	11	00:02.2
Paul Groth	2	11	00:07.4
Steve Munroe	2	11	00:01.4
Michael Luck	2	11	00:01.5
Simon Miles	2	11	00:06.8
Steve Munroe	2	11	00:01.1
Michael Luck	2	11	00:01.4
D Sun	12	126	00:03.2
W Dong	8	79	00:03.7
C Liu	6	56	00:02.4
G Wang	6	56	00:05.1
W Chen	6	56	00:01.4
Mohammad Tayarani Najaran	2	18	00:01.4
Mohammad R Akbarzadeh T	2	11	00:02.0
Mohammad R Akbarzadeh T	2	11	00:01.4
Kartik Patel	2	11	00:01.1
Ivo Ayala Garcia	2	12	00:06.4
M Anthony	3	47	00:03.0
N Berrington	3	28	00:01.7
David C DeRoure	486	4203	03:47.3
J Padget	3	26	00:03.6
M Daalen	3	41	00:02.4
J Zhao	3	20	00:01.6
A Dunlop	3	29	00:06.4
S A Hellberg	3	22	00:01.7
GA Hutchings	3	48	00:03.8
X Lin	3	18	00:04.2
W T Webb	3	32	00:01.7
WT Webb	3	21	00:01.6
JEB Williams	3	16	00:04.9
RM Crowder	4	435	00:02.4
R Bernard	3	38	00:02.1
I Heath	3	86	00:01.6
A N Evans	3	34	00:05.6
M S Nixon	447	3428	03:31.2
R Crowder	4	435	00:00.7
I Health	3	86	00:00.3
K Osterbye	2	9	00:01.1
GJ Hill	3	46	00:01.7
HC Davis	3	679	00:05.6
E Motta	3	80	00:03.4
A Rouge	3	22	00:01.8
Robert J Wilkins	3	21	00:01.5
Mark J Weal	4	353	00:00.7
J N Carter	4	527	00:00.6
M S V de Pavia	3	23	00:06.4
L H Henrique	2	9	00:01.4
J de Miranda Gomes	2	9	00:01.4
M S L Lee	3	79	00:01.7
B M Tenbroek	3	69	00:03.1
M Robinson	3	31	00:01.7
J M Smallwood	3	23	00:03.1
A G Bailey	3	23	00:01.4
M Beemster	3	25	00:01.4
R F H Hofman	3	15	00:02.9
K G Langendoen	139	749	00:59.9
L L Li	10	66	00:02.4
R Milikowski	11	74	00:04.3
J C Mulder	10	72	00:03.8
M Bracey	3	39	00:00.5
J Tijou	3	31	00:01.4
C Hopwood	3	25	00:02.1
B Murray	3	25	00:01.4
B Mulgrew	3	97	00:00.9
S McLaughlin	3	51	00:01.5
W Webb	3	32	00:01.3
R Salami	3	51	00:01.5
R Harris	3	25	00:01.4
G J Ensell	3	188	00:02.5
J M Wild	3	36	00:01.9
X Jia	3	33	00:03.7
J M Roberts	3	29	00:02.8
D Charnley	3	29	00:02.8

Continued on next page

Person	Graphs	Triples	Time
PJ Soper	3	42	00:05.5
M Pasha	3	27	00:02.5
M J Uren	3	81	00:00.7
M C L Ward	3	23	00:01.4
P J Barth	3	23	00:02.4
T P Monks	3	29	00:01.4
C N Paulson	3	23	00:01.4
C H Shadle	3	83	00:05.4
A G Tescher	2	9	00:01.4
P M Grant	3	73	00:01.6
C Goodings	3	48	00:01.5
J R A Cleaver	3	33	00:04.9
H Ahmed	3	95	00:01.8
S Ho	3	35	00:01.5
A Moriyoshi	3	27	00:01.7
I Ohbu	3	29	00:04.6
O Kagaya	3	29	00:01.4
M Oohira	3	23	01:06.4
O Kagoya	3	23	01:07.5
R A Wilgoss	3	23	00:02.4
D J Pritchard	3	23	00:02.4
K Katupitiya	3	23	00:03.6
Hugh C Davis	3	679	00:01.4
Gerard A Hutchings	3	48	00:00.3
Wendy Hall	673	4150	06:23.6
A M Durham	3	23	00:03.1
W Redman-White	3	23	00:02.4
M Eastwood	3	23	00:02.2
HM Foster	3	25	00:02.6
J Stefanov	3	33	00:03.2
H Strelouhov	3	23	00:06.9
PR Gould	3	23	00:02.4
K G Nichols	3	32	01:06.5
T J Kazmierski	4	374	01:05.7
M Zwolinski	4	553	00:00.4
A D Brown	129	1260	00:51.9
J C S Cheung	3	30	01:06.5
G D Pratten	3	27	01:08.4
R W Stewart	3	60	00:03.0
R Duncan	3	23	00:01.6
S Weiss	3	225	00:02.4
R L Stoll	3	23	00:08.0
B Bodner	3	23	00:02.8
A H Al-Khoury	3	23	00:02.5
S Wegerif	3	21	00:02.4
S A G Chandler	3	31	00:05.8
S J Braithwaite	3	67	00:00.6
H R Mgombelo	3	25	00:02.5
Ian Heath	3	86	00:00.4
J J Dongarra	3	33	00:08.5
R Hemel	3	29	00:01.4
D W Walker	3	18	00:01.7
D Karami	3	23	00:06.3
M Ross	2	9	00:01.6
V Sivess	3	29	00:02.5
F Colson	3	43	00:01.6
G Hutchings	3	48	00:02.7
P Thorogood	3	25	00:02.2
CC Lee	3	29	00:01.5
R Stedman	3	33	00:01.4
S Atken	3	21	00:01.4
O Kuhn	3	23	00:04.9
F Schmalhofer	3	25	00:02.2
K Martinez	4	484	00:00.7
J Cupitt	44	240	00:14.3
D Saunders	3	33	00:05.2
S J Stealey	3	23	00:02.5
J Ni	3	23	00:05.3
JCS Cheung	3	30	00:01.4
P J Chitamu	3	23	00:03.5
L M Christodoulides	3	25	00:04.2
P Jeavons	3	21	00:03.1
R Harrison	3	23	00:02.4
E Rogers	4	1153	00:01.5

Continued on next page

Person	Graphs	Triples	Time
Y Li	3	22	00:04.2
C A Addison	3	24	00:01.4
V S Getov	95	537	00:37.0
R W Hockney	3	21	00:02.8
I C Wolton	5	411	00:01.4
J Dongarra	3	33	00:00.3
W Gentzsch	3	22	00:01.4
N Afshar-Hanaii	3	43	00:01.4
J Peerlings	3	25	00:01.4
N Afshar-Nanaii	3	43	00:00.3
A S Aguado	3	25	00:02.5
M E Montiel	3	25	00:02.4
J Alarcon	3	23	00:02.4
M Garza	3	25	00:02.4
Giuseppe Albertini	3	27	00:01.4
Barry M McCoy	3	21	00:02.1
J-M Maillard	3	22	00:01.6
P E An	3	57	00:02.7
M Brown	3	92	00:03.0
C J Harris	3	560	00:02.0
A J Lawrence	3	27	00:02.5
C G Moore	3	41	00:03.7
R Tribe	3	25	01:07.6
N Clarke	3	23	00:05.6
M A Arain	3	23	00:01.8
Z A Shafi	3	45	00:01.5
I R C Post	3	61	00:07.1
H J Gregory	3	33	00:01.4
K R Baker	3	32	00:01.6
A J Currie	3	67	00:05.7
K G Nichols	3	25	00:01.4
P Broadbery	3	24	00:02.5
R Bradford	3	24	00:07.8
N A Bridgett	3	23	00:02.5
M F Yeung	3	23	00:05.7
A H Falkner	3	23	00:04.2
H Wang	3	27	00:03.0
P C Parks	3	23	00:12.8
M J Butler	3	509	00:00.6
E Best	2	9	00:01.3
D B Carpenter	3	25	00:10.0
K K Chan	3	23	01:06.4
G A J Amaratunga	3	23	01:06.7
S P Wong	3	23	00:01.4
Q Chan	3	23	00:02.6
M Willander	3	23	00:01.4
J Carter	4	527	00:00.6
H Thanki	3	23	00:01.4
Y Q Chen	3	41	00:03.5
D W Thomas	3	33	00:01.6
Y B Cheng	3	18	00:01.9
C Corbridge	3	29	00:00.5
M Bramer	2	9	00:01.4
A L Macintosh	2	9	00:05.3
C Baber	3	22	00:02.4
J M Noyes	3	22	00:01.4
S D Wood	3	31	00:01.4
Rinat Kedem	3	27	00:06.9
Tim Klassen	3	23	00:02.5
Ezer Melzer	3	25	00:05.1
P O A L Davies	3	29	00:01.5
R S McGowan	3	23	00:05.0
I Titze	2	9	00:02.4
M Debbage	3	33	00:01.5
M B Hill	3	37	00:01.4
A Sturgess	3	23	00:03.4
R Di Meglio	3	21	00:01.4
V Sassone	4	613	00:00.7
R Hempel	3	29	00:00.3
D WWalker	3	18	00:01.3
Geerd-R Hoffman	2	9	00:15.0
Tuomo Kauranne	2	9	00:01.5
K E Youden	3	23	00:01.5
T Grevatt	3	23	00:13.5

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Person	Graphs	Triples	Time
R S Deol	3	23	00:02.3
G Wylangowski	3	23	00:07.0
D S Gill	3	43	00:01.5
T Elliott	4	233	00:00.6
S F King	3	35	00:01.4
P L White	3	31	00:01.4
M D Emmerson	3	33	00:01.5
H A Kemhadjian	3	52	00:04.4
J G Smith	3	33	00:01.4
D Banks	3	25	00:01.4
W Balachandran	3	25	00:01.4
D Ewins	3	25	00:01.4
D Chetverikov	2	9	00:01.4
W Kropatsch	2	9	00:01.2
Alan G R Evans	3	443	00:00.4
N Floros	3	25	00:01.5
W A Gambling	2	11	00:28.0
W K Giloi	2	9	00:01.9
S Jahnichen	2	9	00:01.4
B D Shriver	2	9	00:01.4
R Harrison	3	28	00:01.7
S Hellberg	3	22	00:01.3
R Hockney	3	21	00:01.3
I O Golosnoy	4	228	00:00.7
N N Kalitkin	3	17	00:01.4
V S Volokitin	3	27	00:01.6
M Mouis	3	31	00:01.4
D Mathiot	3	23	00:30.4
D J Robbins	3	31	00:01.5
J Glasper	3	29	00:04.1
S Nigrin	3	29	00:03.1
JA Pickering	3	23	00:01.5
M I Hannah	3	27	00:01.5
A T Sapeluk	3	47	00:00.5
I M Roger	3	23	00:12.7
R J C Fraser	3	39	00:02.6
J A Powell	2	9	00:13.5
N J W Rayner	3	33	00:02.5
R Harrison	3	23	00:01.4
S A Hellberg	3	25	00:01.4
M D Hemus	3	21	00:02.9
D Chetverikov	2	9	00:01.6
W Kropatsch	2	9	00:06.3
G Hill	3	46	00:02.9
R Wilkins	3	35	00:02.1
J B Hughes	3	33	00:02.3
CJ Colbourn	3	25	00:01.4
G Salvendy	2	9	00:08.1
MJ Smith	2	9	00:01.4
N R Jennings	3	1305	00:01.6
J A Pople	3	15	00:07.9
L Z Varga	3	31	00:03.3
R P Aarnts	3	25	00:05.2
J Fuchs	3	21	00:02.0
P Skarek	3	27	00:01.4
Jong Yong Kim	3	33	00:01.7
C R Lavers	2	11	00:06.1
C Piraud	2	11	00:02.3
M Brust	2	11	00:16.9
K O'Dwyer	2	11	00:10.3
D J Schiffrin	2	11	00:01.4
Mark R Dobie	3	71	00:01.5
G Lonsdale	3	23	00:01.4
G Clinckemaille	3	23	00:01.3
S Vlachoutsis	3	23	00:01.4
J de Ronde	3	23	00:01.4
J Sloot	3	23	00:06.4
M Luck	3	299	00:02.7
M Filgueiras	2	9	00:01.4
L Damas	2	9	00:01.4
R W P Luk	3	51	00:00.5
N D Matthews	3	23	00:02.4
P Greenway	3	23	00:04.0
J Merlin	3	35	00:11.7

Continued on next page

Person	Graphs	Triples	Time
J Meseguer	3	24	00:29.0
U Montanari	2	29	00:03.3
N E Moiseiwitsch	3	59	00:01.5
D Chetverikov	2	9	00:01.4
W Kropatsch	2	9	00:02.3
Daniel Ribbens	3	31	00:01.6
Eustace K Mwarania	2	11	00:16.0
Ji Wang	2	11	00:01.1
John Lane	2	11	00:01.6
James S Wilkinson	4	734	00:01.5
M Nanba	3	25	00:10.1
M Kondo	3	27	00:01.9
T Nakamura	3	27	00:01.5
T Kobayashi	3	25	00:02.4
Y Tamaki	3	33	00:08.1
M Tanabe	3	25	00:02.4
M Cosnard	3	22	00:05.6
R Puigjaner	3	22	00:01.4
C Barnaby	3	23	00:01.5
M D May	3	23	00:01.4
D Chetverikov	2	9	00:07.4
W Kropatsch	2	9	00:01.6
T K Hames	3	25	00:02.5
D Nunn	2	11	00:09.6
Christiane Lckenhoff	2	9	00:01.5
Dieter Fensel	421	2230	03:24.0
Rudi Studer	298	1497	02:13.9
M Takahama	3	23	00:01.4
J D Williams	3	31	00:01.4
R C Jerome	3	23	00:02.5
P Routley	3	25	00:06.0
M Nielsen	143	712	00:56.1
G Winskel	115	525	01:11.2
Tom Scutt	3	24	00:01.5
WJ Shi	3	23	00:01.4
JE Brignell	3	61	00:04.9
A J Shire	3	25	00:02.5
D E N Davies	3	22	00:02.5
A W Rudge	3	22	00:05.5
K P H Sullivan	3	29	00:06.4
S J Sutton	258	1244	02:07.4
A S Vaughan	4	617	00:00.6
M Suyama	2	11	00:01.2
R I Laming	2	11	00:01.4
D N Payne	2	11	00:07.7
S M S Syed-Mustaffa	3	23	00:03.7
P Tersptra	3	23	00:02.5
G Van Heijst	3	23	00:07.1
B Wielinga	27	166	00:06.2
J M David	2	9	00:01.4
J P Krevine	2	9	00:05.8
R Simmons	2	9	00:01.4
Judy M Bishop	3	23	00:01.4
T Shiba	3	45	00:01.5
T Kikuchi	3	25	00:07.9
A Watanabe	3	25	00:03.0
Y Kiyota	3	35	00:02.0
M Honda	3	23	00:03.4
B J Hunt	3	22	00:07.2
M I James	3	22	00:02.4
G C Stevens	3	31	00:00.4
M Dosiere	3	22	00:06.5
M Wagner	3	45	00:06.8
R J Walker	3	23	01:07.4
VTK Ko	3	23	00:02.5
S M Wykes	3	25	00:08.8
O Trindade Jnr	3	23	00:02.4
A Zegadi	3	25	00:01.5
D M Bagnall	4	344	00:01.7
A Belattar	3	23	00:01.4
R D Pilkington	3	22	00:01.4
M A Slifkin	3	26	00:01.6
A E Hill	3	29	00:07.3
R D Tomlinson	3	29	00:01.4

Continued on next page

Person	Graphs	Triples	Time
J R Zhang	3	29	00:04.8
R J Wilson	3	25	00:10.2
P L F Hemment	3	25	00:07.9
A Claverie	3	25	00:02.6
F Cristiano	3	25	00:02.5
P Salles	3	29	00:07.2
J Q Wen	3	25	00:02.5
J H Evans	3	25	00:03.4
A R Peaker	3	25	00:02.4
D Walsh	3	25	00:09.7
T W Dakin	3	23	00:01.4
MWS Thomas	3	23	00:02.6
Rocio Aldeco-Perez	4	81	01:05.6
Letu Yang	9	81	00:01.6
Michael Poppleton	4	213	00:00.4
Nurlida Basir	3	22	00:01.4
Ewen Denney	37	185	00:11.0
Richard Lowe	3	35	00:01.5
Nicola Salvo	2	20	00:04.5
Zlatko Zlatev	3	25	00:01.6
William Mitchell	3	61	00:01.1
Mike Boniface	3	509	00:00.6
Craig Saunders	3	75	01:07.1
Sandor Szedmak	3	42	01:06.9
Clare J Owens Hooper	4	147	00:01.5
David E Millard	275	2247	01:48.1
Andy Stanford-Clark	2	11	00:01.4
A S Weddell	4	164	01:05.6
W T L Teacy	4	108	00:00.3
N J Grabham	4	164	00:02.7
G V Merrett	4	177	00:00.3
N R Harris	5	1417	00:00.9
A Rogers	4	74	00:02.4
N M White	5	1417	00:02.3
Heather S Packer	4	65	00:06.1
Nicholas R Jennings	3	1305	00:01.6
Noel Carboni	2	11	00:01.4
P Moore	2	10	00:05.3
Nicolas G Green	4	385	00:00.7
B S Ahluwalia	2	11	00:01.2
A Z Subramanian	2	11	00:07.0
O G Helleso	2	11	00:02.8
N M B Perney	2	11	00:01.5
N P Sessions	2	11	00:04.3
Paolo Baldan	100	493	00:43.9
Andrea Corradini	184	851	01:28.1
Tobias Heindel	9	74	00:03.0
Barbara Konig	3	24	00:05.6
Pawe? Sobociński	35	349	00:11.1
Alexander Kurz	2	9	00:01.4
Marina Lenisa	2	9	00:01.4
Andrzej Tarlecki	2	9	00:05.7
Christian Bizer	33	517	00:11.1
Tom Heath	21	335	00:07.8
Tim Berners-Lee	3	184	00:01.2
Mike Surridge	3	77	00:00.4
A Hassan	3	63	00:00.6
David Hausheer	2	11	00:01.5
Pekka Nikander	2	11	00:01.4
Vincenzo Fogliati	2	11	00:01.4
Klaus Wunstel	2	11	00:05.5
Maria Angeles Callejo	2	11	00:02.1
Santiago Ristol Jorba	2	11	00:01.5
Spiros Spirou	2	11	00:01.4
Latif Ladid	2	11	00:05.1
Wolfgang Kleinwachter	2	11	00:01.5
Burkhard Stiller	2	11	00:01.4
Malte Behrmann	2	11	00:01.4
Costas Courcoubetis	2	11	00:04.1
Man-Sze Li	2	11	00:01.4
J Kuleshova	5	26	00:05.1
S Kok	14	159	00:08.2
D O'Connell	2	11	00:02.6
J Pike	2	11	00:01.4

Continued on next page

Person	Graphs	Triples	Time
G S Murugan	2	11	00:00.4
M N Zervas	2	11	00:00.3
Simon T Powers	4	160	00:00.3
Richard A Watson	4	340	00:00.4
Pawel Sobociński	35	349	00:10.7
Oshani Seneviratne	2	11	00:01.1
Lalana Kagal	9	68	00:04.7
Philip A Shields	6	52	00:02.4
Tom Lee	18	162	00:05.8
Majd Zoorob	97	583	01:49.0
Duncan Allsopp	2	11	00:01.6
Mohammad R Akbarzadeh T	2	11	00:01.5
M N Zervas	2	11	00:01.4
G S Murugan	2	11	00:01.4
Chenxu Zhao	3	28	00:06.6
P N Robson	3	25	00:02.4
J A Effenberger	3	23	00:02.5
M D B Charlton	4	269	00:06.9
Richard M Crowder	4	435	00:00.4
Gary B Wills	243	2164	01:42.9
C F Edwards	3	45	00:01.5
B M Tenbroek	3	69	00:03.2
M S L Lee	3	79	00:00.3
M J Uren	3	81	00:00.3
R Harrison	3	23	00:01.8
L Briand	3	23	00:01.4
J Daly	3	23	00:01.4
M Kellner	3	23	00:01.3
D M Raffo	3	23	00:05.9
J Sheppherd	3	23	00:01.4
Joseph K P Kuan	3	35	00:02.0
Mark S Nixon	452	3438	03:32.5
Y Omura	3	25	01:06.5
H Matsumoto	3	23	00:02.0
I Nagano	3	23	00:01.4
S Yagitani	3	23	00:03.3
O Traynor	3	14	00:01.5
D Hazel	3	21	00:03.0
P Kearney	3	14	00:04.1
A Martin	3	21	00:01.7
R Nickson	3	14	00:01.7
L Wildman	3	14	00:08.3
M Johnson	2	9	00:00.1
Y Wu	3	31	00:01.4
G L Hearn	4	86	00:01.3
Dr K L Gandhi	3	23	00:01.4
S Abbott	3	23	00:01.4
Suleiman M Abu Sharkh	3	23	00:01.4
Martyn R Harris	3	23	00:10.9
Neamat Taghizadeh Irenji	3	23	00:02.3
M Leuschel	3	199	00:01.5
J Brecht	3	23	00:01.4
P J Cherriman	3	95	00:09.0
T Keller	3	94	00:03.4
Les A Carr	396	3776	02:50.0
Gary J Hill	3	46	00:04.6
C F Edwards	3	45	00:00.3
G Puebla	2	9	00:00.1
J Ma?uszy?ski	2	9	00:00.3
D Parsons	4	374	00:00.4
C Phongphanphanee	3	15	00:01.4
H C Sim	3	31	00:01.7
R J T Bunyan	3	34	00:01.5
J M Torrance	3	55	00:01.6
L Lampe	3	27	00:01.4
A C Williams	3	23	00:05.6
J P Woodard	3	33	00:01.8
T Nie	3	37	00:01.4
H Kuchen	3	15	00:01.6
A D Barton	3	35	00:08.1
P L Lewin	4	1039	00:01.1
D J Brown	3	27	00:00.5
M DelBuono	3	23	00:01.5
M Breiling	3	31	00:01.5

Continued on next page

Person	Graphs	Triples	Time
D Catelain	8	79	00:03.0
M Koch	3	47	00:04.2
PG Dargie	2	16	00:06.6
NR Harris	5	1417	00:00.7
JK Atkinson	53	329	00:17.0
AT Augousti	2	9	00:00.3
NM White	2	9	00:00.1
Hugh Glaser	216	1537	01:29.4
Pieter Hartel	633	2912	05:00.3
Herbert Kuchen	3	15	00:02.1
F Dudek	3	39	00:01.5
B M Al-Hashimi	4	1012	00:01.9
M Moniri	3	51	00:01.5
G Fettweis	3	23	00:01.4
P Charas	3	23	00:01.3
AT Augousti	2	9	00:04.8
NM White	2	9	00:00.1
G T Leavens	2	9	00:00.3
M Sitamaran	2	9	00:00.3
I L Hosier	4	307	00:01.0
S G Swingler	3	227	00:00.7
G Woynarovich	2	9	00:00.3
MEX Mendes	3	53	00:01.5
O Morger	3	29	00:04.2
U Nitsche	3	104	00:02.6
S Teufel	3	37	00:02.5
R Muche	2	9	00:00.4
G Bchele	2	9	00:00.3
D Harder	2	9	00:01.8
W Gauss	2	9	00:00.3
F Y Ogrin	13	139	00:06.0
S L Lee	46	284	00:20.4
C Ager	27	177	01:17.1
Y Su	3	37	00:01.4
R Duffee	3	25	00:00.4
S Bramwell	3	25	00:01.4
H Rijns	3	25	00:02.6
S James	3	25	00:08.5
G van der Weide	3	29	00:01.4
T E Schilhabel	3	25	00:02.6
Jonathan L Shapiro	3	29	00:01.5
Adam Prgel-Bennett	4	295	00:03.1
R K Belew	2	9	00:01.4
M D Vose	2	9	00:00.1
S M Abu Sharkh	3	24	00:01.5
M R Harris	3	24	00:05.6
N Taghizadeh Irenji	3	24	00:01.7
B M Tenbroak	3	23	00:01.4
G Whiting	3	25	00:07.1
M Harteneck	3	33	00:01.5
S Dehghan	2	11	00:00.2
S Malaika	3	24	00:01.4
CE Vandoni	2	9	00:00.3
P Kollig	3	26	00:01.4
B M Al-Hashimi	4	1012	00:01.0
R M Leahy	3	23	00:04.6
J C Mosher	3	23	00:02.0
Z Q Wu	2	22	00:01.5
M I Alberda	3	24	00:01.7
E K de Jong Frz	3	31	00:08.5
R Asal	3	25	00:01.4
P E Rivers	3	25	00:05.3
D G Green	3	23	00:01.7
C J Scott	3	29	00:01.5
A Colbrook	3	23	00:01.4
Steve M Hitchcock	4	206	00:06.3
Stephen W Harris	3	90	00:02.1
Jessie M N Hey	293	2409	02:04.3
R B Allen	2	9	00:02.7
E Rasmussen	2	9	00:00.1
S Kirtay	3	23	00:00.4
Pat Maier	3	23	00:01.4
E Barnet	3	23	00:03.6
A Martin	3	23	00:01.4

Continued on next page

Person	Graphs	Triples	Time
R Nickson	3	23	00:04.6
M Utting	3	23	00:01.4
L Groves	2	9	00:02.9
S Reeves	2	9	00:00.3
D Williams	65	300	00:27.0
M Papiani	3	30	00:06.7
C Chalk	3	30	00:11.4
S W Roberts	3	41	00:01.6
H Yuen	3	37	00:01.5
R Harrison	3	23	01:08.3
M Shepperd	3	23	00:01.4
J Daly	3	23	00:01.3
C D G Minto	3	29	00:06.2
F J Muniz	3	25	00:01.4
T B Oon	3	16	00:01.4
K T Phalp	3	24	00:01.6
S J Counsell	3	24	00:09.0
R Harrison	2	9	00:00.1
Jan C Willems	47	256	00:17.1
J Streit	3	41	00:05.4
J Torrance	3	55	00:02.1
Z Y Wu	3	23	00:01.6
S Hall	3	106	00:04.7
J M Bonar	3	115	00:01.7
M J Butler	3	509	00:02.4
J Bowen	2	9	00:00.4
M Hinchey	2	9	00:00.4
D Till	2	9	00:00.3
G B Wills	244	2166	01:42.2
M A R Dantas	4	372	00:00.6
V N Dubey	45	298	00:17.4
P H Chappell	4	333	00:26.7
D R Whatley	3	35	00:28.5
Stuart Goose	3	26	00:03.7
Jonathan Dale	3	32	00:03.0
J Hall	2	11	00:08.5
A Martin	2	11	00:00.4
J P Bowen	2	9	00:00.5
M G Hinchey	2	9	00:00.5
D Till	2	9	00:00.4
R Harrison	3	27	01:05.4
S J Counsell	3	27	00:01.5
R Nithi	3	27	00:02.7
Y Ting	3	25	00:01.6
J Mountjoy	3	24	00:01.4
H Corporaal	3	24	00:04.4
C Delgado Kloos	2	9	00:00.3
E Cerny	2	9	00:00.3
D E Benn	3	31	00:00.4
J Bigun	2	9	00:02.8
G Chollet	2	9	00:03.5
G Borgefors	2	9	00:00.3
D Cunado	3	28	00:01.5
J Bigun	2	9	00:00.4
G Chollet	2	9	00:00.3
G Borgefors	2	9	00:00.4
J Hey	289	2401	02:01.1
k m abbott	3	23	00:01.4
T P K Nijhar	3	25	00:01.4
J M Schooling	3	24	00:01.5
M Brown	3	24	00:07.2
P A S Reed	3	24	00:02.6
R S Doyle	3	25	00:01.4
J Hollands	3	23	00:04.5
P Melas	2	14	00:01.5
M E Montiel	3	57	00:00.6
A S Aguado	3	34	00:01.6
E Zaluska	4	372	00:00.7
Y Li	3	15	00:01.5
K R Baker	3	32	00:06.4
A C Williams	3	29	00:03.7
Alberto Greco	3	31	00:01.9
Angelo Cangelosi	3	31	00:06.6
C S Li	3	55	00:01.6

Continued on next page

Person	Graphs	Triples	Time
B Roberts	3	22	00:01.5
PJ Cordo	3	16	01:06.7
AT Augousti	3	25	00:03.2
G Abeysinghe	3	25	00:01.5
K Phalp	3	28	00:01.9
R J Walters	4	220	00:02.0
J Gyorkos	2	9	00:00.4
M Krisper	2	9	00:00.3
H C Mayr	2	9	00:00.3
G K Abeysinghe	3	23	00:01.4
K T Phalp	3	23	00:04.1
G S Aglietti	3	55	00:02.0
R S Langley	3	59	00:02.6
S B Gabriel	3	63	00:01.9
M R Al-Mohenadi	3	23	00:07.5
J N Ross	3	137	00:00.7
J E Brignell	3	61	00:00.3
J Amin	30	182	00:11.0
V Pruneri	3	101	00:03.2
J Webjorn	20	102	00:12.7
J Russell P St	3	26	00:07.2
D C Hanna	557	2583	04:45.6
A A Anderson	3	29	00:03.6
C L Bonner	3	47	00:02.0
D P Shepherd	305	1632	02:36.9
C Grivas	3	44	00:05.5
N Vainos	3	23	00:02.2
A A Anderson	2	11	00:00.4
C L Bonner	2	11	00:00.4
D P Shepherd	2	11	00:00.4
R W Eason	2	11	00:00.4
C Grivas	2	11	00:00.4
D S Gill	2	11	00:00.4
N Vainos	2	11	00:02.6
L M B Hickey	3	23	00:06.2
M Jelinek	3	29	00:01.6
N A Vainos	3	23	00:01.3
D Lane	3	25	00:08.0
K Rogers	14	107	00:03.7
C Fotakis	3	29	00:04.6
I Anteney	3	23	00:01.6
G Lippert	3	27	00:01.4
H J Osten	3	25	00:01.4
Y F Chen	3	24	00:31.5
Z Zhu	3	41	00:01.7
T Yao	3	45	00:30.8
S Koyama	3	25	00:01.5
M Y Shen	3	31	00:01.6
T Goto	3	31	00:08.6
A G Bailey	3	103	00:01.9
L Baramov	3	29	00:02.4
H Kimura	3	29	00:01.4
I E Barry	3	23	00:01.4
R W Eason	3	23	00:06.5
K Bauknecht	3	23	00:01.5
R Holbein	3	25	00:01.5
U Morger	3	23	00:01.4
C Bollig	3	49	00:10.2
R A Hayward	47	294	00:18.1
W A Clarkson	382	1982	03:11.3
M A Kern	3	27	00:03.5
J Schiz	3	49	00:01.5
A S Borisov	3	23	00:01.5
K M Bossley	3	23	00:01.5
D J Brady	3	56	00:01.8
T Schweizer	3	74	00:06.4
J Wang	3	51	00:01.6
D W Hewak	232	1128	01:52.1
F M T Brazier	3	29	00:04.6
B M Dunin-Keplicz	3	19	00:03.7
J Treur	3	26	00:03.5
A H Taner	3	25	00:02.5
N G R Broderick	3	23	00:01.4
C M deSterke	3	23	00:03.2

Continued on next page

Person	Graphs	Triples	Time
N G R Broderick	234	1239	01:55.7
D J Richardson	872	4518	07:34.5
L Dong	220	1014	01:48.0
D Taverner	3	39	00:04.6
M Ibsen	399	2014	03:22.0
R I Laming	341	1559	02:50.7
C T A Brown	33	166	00:13.4
A C Tropper	205	1114	01:38.9
M Hempstead	3	64	00:07.5
J M Almeida	2	12	00:01.3
T J Warburton	3	41	00:01.4
R D Harris	3	76	00:01.9
B Ferrand	3	39	00:03.5
S R Gunn	4	517	00:02.1
C Y Ng	3	23	00:01.7
K Warwick	3	22	00:01.4
M Brown	3	23	00:03.4
T Ullrich	3	26	00:01.4
K Bubke	3	23	00:03.4
H Gnewuch	3	23	00:01.9
M Hempstead	3	23	00:01.4
J Hammer	3	23	00:01.3
M L H Green	3	23	00:01.3
Philip Husbands	2	9	00:00.3
Inman Harvey	2	9	00:00.3
Dave Cliff	3	80	00:06.8
G Burdge	3	29	00:01.5
S U Alam	53	351	00:20.1
A B Grudinin	160	829	01:14.9
I Khrushchev	12	107	01:07.8
M Durkin	3	81	00:02.1
I White	3	27	00:01.4
P Burge	3	28	00:08.0
C Cooke	3	23	00:01.6
Y Moreau	3	15	00:05.4
B Preneel	3	23	00:01.9
C Stoermann	3	25	00:01.4
H Verrelst	3	21	00:01.4
P Gosset	3	21	00:03.6
Peter Burge	3	28	00:01.3
L Groves	2	9	00:00.4
S Reeves	2	9	00:03.6
J Grundy	3	28	00:03.6
T Lngbacka	3	25	00:01.5
R Ruksenas	3	29	00:01.4
J von Wright	3	61	00:08.6
L Groves	2	9	00:00.7
S Reeves	2	9	00:00.4
S D Butterworth	3	28	00:01.9
D C Hanna	3	28	00:03.3
S D Butterworth	77	386	00:32.7
L Lefort	3	59	01:06.8
D H Jundt	3	29	00:00.4
K Puech	3	56	00:01.5
P G R Smith	250	1491	01:57.6
P Camner	3	23	00:01.9
M Anderson	3	23	00:01.4
K Philipson	3	23	00:03.7
A H Hashish	3	45	00:01.5
N Jarvis	3	23	00:01.4
M Bailey	3	29	00:01.4
M Svartengren	3	23	00:01.4
H Camon	3	35	00:02.0
Z Moktadir	4	238	00:01.2
V Cautaerts	3	25	00:01.4
R Paschotta	90	468	00:39.7
B R Wilkins	3	33	00:01.5
C D Chalk	3	30	00:04.2
A D Channon	3	32	00:01.5
J A Sillitoe	3	23	00:01.6
G Chen	4	860	00:01.0
H M Banford	3	51	00:00.5
A E Davies	3	191	00:00.7
Y Chen	3	24	00:01.3

Continued on next page

Person	Graphs	Triples	Time
T Sekiguchi	3	27	00:05.5
K T Park	3	27	00:01.4
K Hiraga	3	27	00:00.4
K S Chiang	3	23	00:01.4
Y T Chow	14	115	00:04.3
L Reekie	230	1097	01:51.9
D Cliff	3	80	00:00.4
J Noble	4	391	00:01.4
J R Clowes	3	25	00:01.4
J McInnes	3	25	00:01.3
M N Zervas	342	1628	02:52.4
D N Payne	334	1619	02:48.3
M J Cole	3	80	00:03.8
S Aina	3	23	00:01.4
F Vaninetti	3	25	00:01.4
L Arcangeli	16	141	00:08.4
V Gusmeroli	3	41	00:01.5
H Geiger	3	93	00:01.7
S Y Set	47	257	00:22.0
W H Loh	108	572	00:48.3
J L Corral	3	25	00:11.8
J Marti	3	27	00:07.0
J M Fuster	3	27	00:01.4
R I Laming	3	29	00:01.4
A Santos	3	23	00:00.3
J Capmany	3	31	00:01.0
D Pastor	3	29	00:01.4
M J Cole	3	23	00:01.4
G J Cowle	3	23	00:06.5
W H Loh	3	23	00:01.4
R I Laming	3	23	00:01.4
J L Cruz	3	25	00:01.3
B Ortega	3	29	00:01.4
M V Andres	3	25	00:00.4
B Gimeno	3	25	00:01.4
L Dong	3	25	00:01.6
D O Culverhouse	3	36	00:20.0
T A Birks	3	57	00:08.3
S G Farwell	3	55	00:01.5
J Russell P St	3	55	00:01.6
S H Yun	3	33	00:01.4
D J Richardson	3	39	00:01.4
M d'Inverno	3	116	00:02.4
M Fisher	3	19	00:02.4
A Lomuscio	3	39	00:00.8
M de Rijke	3	14	00:02.5
M Ryan	3	21	00:01.4
M Wooldridge	3	134	00:13.3
M G Hinchey	2	9	00:09.5
L Shaoying	2	9	00:00.4
C Zhang	2	9	00:00.4
D Lukose	2	9	00:00.3
M Priestley	3	21	00:00.4
J P Dakin	3	25	00:00.4
W Ecke	3	25	00:00.1
M Rothardt	3	23	00:01.4
J Schauer	3	23	00:01.6
K Usbeck	3	23	00:06.3
R Willsch	3	25	00:01.3
C Dalle	3	23	00:01.4
P Cordier	3	25	00:01.4
C Depecker	3	23	00:06.2
P Bernage	3	25	00:01.4
M Douay	3	25	00:01.4
P Niay	3	25	00:01.3
J F Bayon	3	25	00:07.2
L Dong	3	25	00:02.6
J F G Eastmond	3	25	00:01.4
K Gustafson	3	29	00:04.0
RP Sion	3	20	00:01.4
K deSouza	25	204	00:09.9
D O Culverhouse	3	23	00:01.4
T P Newson	106	595	00:50.2
P C Wait	38	226	00:13.4

Continued on next page

Person	Graphs	Triples	Time
A Diez	3	27	00:05.0
M V Andres	3	27	00:01.4
J L Cruz	3	23	00:01.4
D O Culverhouse	3	27	00:01.4
L A Dissado	3	37	00:03.0
P A Norman	3	37	00:04.0
I Doble	3	31	00:05.3
S W Wolfe	3	17	00:01.4
Q Zhong	3	23	00:01.4
W B Wargotz	3	23	00:01.3
M M Sanders	3	23	00:02.5
A D Ellis	43	293	00:19.2
T Widdowson	3	35	00:01.5
L Dong	3	23	00:00.4
W F Liu	3	23	00:01.4
W F Liu	3	31	00:01.5
J E Caplen	81	412	00:32.8
K Hsu	3	31	00:02.5
J D Minelly	3	51	00:01.5
J L Cruz	3	49	00:01.5
J P deSandro	24	160	00:07.0
J E Doran	3	21	00:01.4
S Franklin	3	21	00:01.4
T J Norman	3	65	00:03.0
W X Xie	3	23	00:05.9
T Taunay	3	23	00:01.5
B Poumellec	3	23	00:01.5
H Poignant	3	23	00:01.4
E Delevaque	3	23	00:06.7
R S Doyle	3	23	00:01.4
B Drapp	3	23	00:01.3
J Piehler	3	33	00:00.4
A Brecht	3	41	00:01.4
G Gauglitz	3	49	00:06.9
B J Luff	3	57	00:01.6
J Ingenhoff	3	25	00:01.4
A N Dunlop	3	29	00:01.4
B J Egner	3	24	00:08.5
S Rana	3	24	00:01.4
H Smith	3	24	00:31.3
N Bouloc	3	24	00:31.6
J G Frey	3	24	00:02.1
W S Brocklesby	3	72	00:02.1
M Bradley	3	24	00:01.4
C I Howarth	3	25	00:00.4
C J Emeleus	3	29	00:01.5
M A Sadeghzadeh	3	23	00:02.4
P J Phillips	3	40	00:01.6
E H C Parker	3	69	00:01.8
T E Whall	3	68	00:02.1
M Pepper	3	23	00:01.9
K Ennser	48	262	00:18.9
P D Fairley	3	30	00:01.4
M E Fermann	3	35	00:01.4
A Galvanauskas	3	37	00:01.5
D Harter	3	39	00:01.6
M A Arbore	3	23	00:01.3
M M Fejer	3	23	00:01.3
R A Finan	3	28	00:00.5
R A Finan	3	28	00:00.3
A T Sapeluk	3	47	00:00.3
J Bigun	2	9	00:00.4
G Chollet	2	9	00:00.3
G Borgefors	2	9	00:00.1
Johann Schumann	3	31	00:02.3
William McCune	2	9	00:00.4
J S Fleming	3	43	00:01.6
J H Conway	3	35	00:05.0
R Hartley-Davis	3	23	00:01.5
M Nassim	3	31	00:01.5
M H Guy	3	29	00:01.7
J Coupe	3	25	00:01.4
S T Holgate	3	35	00:02.6
E Moore	3	37	00:01.4

Continued on next page

Person	Graphs	Triples	Time
T B Martonen	3	35	00:01.5
M French	5	1445	00:04.3
K Galkowski	3	266	00:01.4
D H Owens	462	2265	03:46.1
V Getov	95	537	00:35.7
E Hernandez	3	29	00:05.9
M A Gibney	3	26	00:01.5
S J Gilson	3	35	00:01.4
I Middleton	3	35	00:01.5
Stuart Goose	3	23	00:01.4
Stuart Goose	3	23	00:03.4
Andy J Lewis	3	23	00:01.4
S Gray	21	144	00:07.4
J E Caplen	24	182	00:06.8
J D Minelly	37	236	00:14.6
T Nagatsuma	3	23	00:01.4
M Le Flohic	3	23	00:02.9
C H de Groot	4	426	00:00.6
K H J Buschow	3	78	00:01.8
F R de Boer	3	75	00:04.5
A Schiffini	11	120	00:03.1
P Franco	3	23	00:01.4
E Grandi	3	23	00:01.7
M Romagnoli	3	23	00:03.5
A B Grudinin	3	35	00:02.1
S Gray	3	35	00:01.4
K M Bossley	3	51	00:00.6
X Liu	2	9	00:00.7
P Cohen	2	9	00:00.3
M Berthold	2	9	00:00.1
S Guy	3	31	00:01.4
M F Joubert	3	33	00:05.2
B Jacquier	3	33	00:01.9
H Poignant	3	27	00:01.4
D C Hanna	2	11	00:00.3
D C Hanna	3	23	00:01.4
P J Hardman	3	50	00:03.7
K I Martin	3	45	00:01.5
M Pollnau	38	190	00:15.6
Matt Hemus	3	24	00:03.9
I Butterworth	3	22	00:01.4
I G Harpur	3	25	00:02.2
N G Wayth	3	39	00:00.5
M T Thew	3	37	00:00.8
T J Williams	3	63	00:00.4
O Urdahl	3	33	00:00.5
S G Tzafestas	3	27	00:01.4
M Feng	3	31	00:06.5
Martyn Hill	135	636	01:03.3
John Turner	6	63	00:01.6
J K Hart	3	58	00:01.9
H L Muller	137	760	00:55.8
D W J Harwood	3	23	01:06.3
R W Eason	3	23	00:00.4
E R Taylor	3	23	00:01.4
M D R Hashim	3	27	00:02.4
R F Lever	3	29	00:05.6
D Hautot	3	25	00:01.5
G J Long	3	25	00:01.4
F Grandjean	3	25	00:01.4
Z He	3	33	00:04.4
J R Hector	3	28	00:03.3
M Hempstead	3	23	00:01.4
D Hewak	3	23	00:01.4
D W Hewak	3	23	00:03.7
T Hey	286	2395	02:04.2
Patrick Walters	3	19	00:01.4
L M B Hickey	3	23	00:28.1
T Hildebrandt	31	192	00:07.3
D Peled	2	9	00:01.6
V Pratt	2	9	00:00.7
G Holzmann	2	9	00:00.2
F Quek	3	25	00:01.4
A Witbrock	3	25	00:00.4

Continued on next page

Person	Graphs	Triples	Time
I Tarr	4	226	00:00.6
L M Hogg	3	35	00:03.6
X Hong	3	158	00:01.0
S A Billings	3	42	00:04.7
C M Miller	3	23	00:01.3
Z Hu	3	25	00:03.5
H Luo	3	23	00:00.4
W B Yelon	3	25	00:02.1
Rebecca Hughes	13	92	00:02.6
Patrick A McCarthy	2	9	00:02.2
Paul Tiessen	2	9	00:04.4
J R Campos	3	21	00:01.4
A Jha	3	25	00:01.4
B E Kinsman	3	25	00:01.3
E R Taylor	3	25	00:04.2
G Kakarantzas	3	25	00:01.3
M Joy	3	29	00:02.3
M Kaczmarek	64	366	00:25.7
G Maatz	3	23	00:00.4
M H Garrett	3	29	00:01.4
I Mnushkina	3	25	00:03.9
P Hribek	3	29	00:01.4
M Kaczmarek	3	23	00:01.6
G Ross	3	23	00:01.4
R Eason	3	23	00:01.4
A A Anderson	3	23	00:04.2
P Brown	3	23	00:01.4
G Maatz	3	23	00:01.4
P G Kazansky	3	33	00:01.4
V Pruneri	3	33	00:01.6
H H Kee	78	473	00:35.2
G P Lees	92	486	00:40.1
S Kippax	3	33	00:01.1
G Prestage	3	25	00:02.0
J Crawford	3	33	00:01.5
D Campbell	3	23	00:03.8
D Baxter	3	25	00:01.4
D Cooper	3	25	00:02.6
J C Knight	3	129	00:02.7
T A Birks	3	124	00:03.2
J Russell P St	3	43	00:01.5
J P deSandro	3	27	00:02.8
B Mangan	3	24	00:00.4
N Harris	5	1417	00:03.5
N M White	5	1417	00:01.3
A Brunnscweiler	3	66	00:00.4
R Maas	3	27	00:01.5
N White	5	1417	00:00.6
R Koch	3	23	00:02.5
S Jiang	3	25	00:01.9
M J Myers	3	25	00:03.9
D Rhonehouse	3	25	00:01.4
S J Hamlin	30	182	00:09.7
U Griebner	3	25	00:01.5
H Schonnagel	3	25	00:02.5
M Kraft	4	450	00:01.3
C P Lewis	3	49	00:00.6
T G Hesketh	3	45	00:05.5
S Szymkowiak	3	23	00:01.4
Joseph K P Kuan	3	23	00:01.4
Y Lam	3	29	00:01.6
K E Ennser	48	262	00:15.9
R J P Lander	3	27	00:01.4
B M McGregor	3	23	00:03.8
G P Kennedy	3	27	00:01.8
David Lewis	3	39	00:01.7
Alistair McEwan	3	25	00:01.4
Cliff Redmond	3	23	00:01.4
Vincent Wade	3	17	00:05.9
Ralf Bracht	3	23	00:01.4
Vincent P Wade	3	17	00:01.3
Stephen T Perry	3	24	00:01.5
Q A Li	3	23	00:01.3
C M Light	3	52	00:01.5

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Person	Graphs	Triples	Time
P J Kyberd	2	24	00:01.5
V Litovski	3	37	00:04.3
J Russell P St	3	33	00:00.4
S D Butterworth	3	25	00:01.4
W A Clarkson	3	25	00:01.4
B N Samson	97	516	00:42.2
G J Cowle	3	25	00:02.8
W H Loh	2	11	00:00.4
B N Samson	2	11	00:00.1
L Dong	2	11	00:00.4
G J Cowle	2	11	00:00.6
K Hsu	2	11	00:00.4
B J Luff	3	25	00:01.4
S J Mackenzie	3	22	00:01.5
J Hodgkinson	3	32	00:03.5
M Johnson	3	32	00:01.4
J P Dakin	3	74	00:03.8
A E Mahadi	3	39	00:01.6
T Hughes	3	28	00:01.4
C Beduz	3	88	00:01.9
Y Yang	83	471	00:39.2
R L Stoll	2	35	00:04.0
P Haldar	3	24	00:01.8
R S Sokolowski	3	24	00:01.7
A Power	3	33	00:01.4
Bayan Sharif	57	288	00:25.6
Graeme Chester	18	122	00:04.7
J Owen	17	135	00:04.5
R Lee	102	556	00:41.2
Vasco Manquinho	3	60	00:02.0
Paulo Flores	3	17	00:01.5
Arlindo Oliveira	3	25	00:01.6
P Marenbach	3	23	00:03.9
M Brown	3	23	00:00.4
Rui Marinheiro	3	22	00:01.4
Karem Sakallah	171	803	01:13.8
C D Marsh	3	53	00:00.9
M J Martin	2	11	00:01.7
J E Alfonso	2	11	00:00.7
J Mendiola	2	11	00:00.4
C Zaldo	2	11	00:00.5
D S Gill	2	11	00:00.6
R W Eason	2	11	00:00.3
P J Chandler	2	11	00:00.6
Danius T Michaelides	4	303	00:00.7
M Mohammad	3	25	00:01.7
E Moore	3	23	00:01.4
G P Kennedy	3	27	00:01.4
S Wainwright	3	20	00:01.5
N Moore	3	46	00:01.9
David DeRoure	493	4217	03:48.9
Ian Foster	3	138	00:04.6
Christian Queinnec	3	45	00:02.9
C Mouvet	3	25	00:01.4
C Maciag	3	23	00:05.3
R Abuknesha	3	28	00:01.6
G Ismail	3	23	00:01.5
J P Mueller	5	30	00:01.4
M J Wooldridge	3	134	00:04.6
M Mulas	3	23	00:04.1
Z Beeri	3	23	00:01.4
D Golby	3	23	00:04.9
M Talice	3	23	00:02.7
Paul Kutler	2	9	00:00.1
Jolen Flores	2	9	00:00.4
Jean-Jacques Chattot	2	9	00:00.1
Jason M Nash	3	24	00:01.5
John N Carter	4	527	00:01.2
J Nilsson	3	25	00:01.4
W H Loh	3	23	00:01.3
S T Hwang	3	25	00:01.3
J P deSandro	3	23	00:12.6
S J Kim	3	25	00:01.4
J Nilsson	2	11	00:00.4

Continued on next page

Person	Graphs	Triples	Time
R Paschotta	2	11	00:00.3
J E Caplen	2	11	00:00.5
D C Hanna	2	11	00:00.4
S Adian	2	9	00:00.4
A Nerode	2	9	00:06.6
P Ochsenschlger	3	35	00:01.7
J Repp	3	26	00:01.4
R Rieke	3	25	00:01.7
Ulrich Nitsche	3	104	00:03.4
Pierre Wolper	3	56	00:00.7
M S Nixon	451	3436	03:33.9
L S Ng	3	27	00:00.4
D E Benn	3	31	00:00.3
S R Gunn	4	517	00:00.4
P Faratin	3	65	00:00.3
O Oleksyn	3	31	00:01.5
P Schobinger-Papamantellos	3	41	00:05.8
C Ritter	3	37	00:01.4
E Oliveira	3	47	00:02.0
P R Barber	3	31	00:01.5
R Paschotta	3	25	00:07.4
D J Brinck	3	25	00:01.4
S G Farwell	3	25	00:00.3
D C Hanna	3	25	00:01.4
R Paschotta	3	14	00:07.0
D C Hanna	3	14	00:01.5
P DeNatale	3	24	00:01.6
G Modugno	3	24	00:04.4
M Inguscio	3	24	00:01.5
P Laporta	3	24	00:01.4
G Maze	3	23	00:01.4
J Nilsson	268	1411	02:11.7
L Reekie	3	25	00:01.5
H M Pask	2	11	00:00.5
A C Tropper	2	11	00:00.4
D C Hanna	2	11	00:02.5
Terry R Payne	3	261	00:04.6
Peter Edwards	3	16	00:01.7
Claire L Green	3	26	00:01.8
Rachel Pevtzow	3	27	00:05.9
M Ramscar	2	9	00:03.3
U Hahn	2	9	00:00.5
E Cambouropolos	2	9	00:00.9
H Pain	2	9	00:01.1
G W Ross	201	1001	01:37.7
P E Britton	49	289	00:22.1
P J Britton	50	291	00:18.5
B E Postlethwaite	3	23	00:02.9
M Brown	3	23	00:01.4
C H Sing	3	23	00:02.0
C V Poulsen	3	27	00:01.4
O C Graydon	18	133	00:04.5
A Prgel-Bennett	4	295	00:02.1
J L Shapiro	3	29	00:00.4
P G Kazansky	3	58	00:02.9
G Bonfrate	3	48	00:01.5
D Hewak	231	1205	01:50.5
H Takebe	3	20	00:01.8
F Samoggia	3	28	00:01.5
G Qiu	3	25	00:01.6
G R Quigley	3	23	00:04.7
A I Abdul Rahim	3	24	00:01.7
A Rameix	3	31	00:00.4
C Borel	3	31	00:01.4
B Chambaz	3	25	00:01.5
L Reekie	3	25	00:05.4
L Dong	3	25	00:01.2
D J Richardson	3	23	00:01.5
D J Richardson	3	23	00:01.3
P Britton	50	291	00:17.9
D J Richardson	3	23	00:06.8
J D Minelly	3	23	00:01.4
D C Hanna	3	23	00:02.3
Barry Rising	3	18	00:01.5

Continued on next page

Person	Graphs	Triples	Time
Max Daalen	3	41	00:01.1
E E Robertson	3	29	00:01.5
Y Yokoo	3	23	00:07.1
P J Chandler	3	27	00:01.4
P Rocha	3	33	00:00.6
J Wood	3	98	00:01.8
E Ronnekleiv	3	23	00:03.8
S Rotich	3	31	00:03.1
G J Smith	3	23	00:01.5
M D Rouhanie	3	33	00:02.0
R Malek	3	23	00:05.1
A M Gue	3	25	00:01.5
A Esteve	3	23	00:01.4
H Idrissi-Saba	3	23	00:01.4
S Salam	3	21	00:04.7
B N Samson	3	23	00:03.6
W H Loh	3	23	00:01.4
P J deSandro	3	23	00:01.4
R C Moore	69	396	00:26.7
M Sato	2	11	00:02.6
D C Hanna	2	11	00:00.3
F R de Boer	3	75	00:00.6
PK Scivier	3	37	00:00.5
JW Gardner	3	33	00:01.6
M Vidic	3	25	00:01.4
S M Scotcher	3	25	00:12.6
D A H Laidlaw	3	25	00:00.5
C R Canning	3	25	00:01.4
M J Weal	4	353	00:00.5
R A Harrad	3	25	00:03.3
T W Scutt	3	41	00:01.5
A Browne	3	22	00:01.4
Christine H Shadle	3	83	00:06.3
W J Hardcastle	3	22	00:01.7
J Laver	3	22	00:01.4
Robert C Williamson	4	695	00:06.3
D P Shepherd	2	11	00:00.4
C T A Brown	2	11	00:00.3
T J Warburton	2	11	00:00.4
D C Hanna	2	11	00:00.1
A C Tropper	2	11	00:00.4
C Sierra	3	35	00:02.3
P Noriega	3	20	00:05.6
S Parsons	3	119	00:04.0
AJ Smith	3	19	00:01.5
P T Brown	31	180	00:15.9
G J Daniell	3	23	00:02.0
P Stefanyi	3	27	00:01.5
C C Zammit	3	29	00:01.4
C C Fozooni	3	23	00:03.8
M J Lea	3	29	00:01.4
P Fozooni	3	27	00:03.7
B Sturman	3	29	00:01.5
M Aguilar	3	29	00:02.7
F Agullo-Lopez	3	29	00:01.6
K Yoshino	3	23	00:03.1
T Murata	3	25	00:01.5
K Morinaga	3	16	00:01.2
J Hector	3	28	00:03.9
A Tijsseling	3	29	00:02.4
M Ramscar	2	9	00:00.4
U Hahn	2	9	00:00.5
E Cambouropolos	2	9	00:00.4
H Pain	2	9	00:00.4
Lewis David	3	23	00:01.3
Rong Shi	3	25	00:03.8
Alexander Richter	3	25	00:01.4
N J Traynor	3	27	00:04.2
Z J Chen	3	29	00:01.4
J Porta	3	29	00:03.1
N J Traynor	3	25	00:01.4
A B Grudinin	3	25	00:04.5
V Pruneri	3	23	00:02.5
A A Sysoliatin	3	25	00:01.4

Continued on next page

Person	Graphs	Triples	Time
V A Semenov	3	23	00:01.4
B Le Tron	3	33	00:05.4
A Chantre	3	29	00:01.4
G Vincent	3	27	00:00.4
A C Tropper	3	23	00:01.4
S G Grubb	3	23	00:01.4
M J Tudor	4	407	00:09.1
S P Beeby	4	720	00:00.7
P J Turner	3	52	00:01.5
K Ohnishi	3	29	00:02.0
A Miyauchi	3	25	00:01.4
M Nakata	3	23	00:01.5
Y Inoue	3	23	00:06.0
T Suzuki	3	23	00:01.4
C Upstill	4	114	00:00.6
P Van de Ven	3	23	00:01.3
M Volanthen	3	49	00:01.5
K J Trundle	3	25	00:03.1
N Wada	3	23	00:01.3
K Morinaga	3	25	00:03.5
J Wang	3	23	00:01.5
D Brady	3	56	00:02.4
M Kluth	3	25	00:01.4
J Wang	2	11	00:00.4
J R Hector	2	11	00:00.4
D Brady	2	11	00:00.4
D Hewak	2	11	00:04.6
W S Brocklesby	2	11	00:00.4
M Kluth	2	11	00:05.0
R Moore	2	11	00:02.0
D N Payne	2	11	00:00.5
J D Ward	3	23	00:00.4
P E MacKay	3	23	00:00.5
E J Tarbox	3	23	00:01.4
D O Culverhouse	3	23	00:01.3
S G Farwell	3	23	00:01.4
JD Turner	3	24	00:01.4
S White	4	448	00:00.4
M Hempstead	3	23	00:01.5
C J Broan	3	33	00:05.3
Peter R Wilson	4	362	00:00.6
X Wu	3	35	00:01.5
S G Swingler	3	227	00:00.6
R N Hampton	3	27	00:01.5
S Sutton	252	1123	02:04.5
F C Morabito	2	9	00:00.7
Z-J Xin	3	57	00:01.6
Fenglian Xu	3	25	00:01.4
S Yamashita	3	25	00:01.4
K Hsu	3	25	00:04.7
W H Loh	3	25	00:01.3
C C Ye	3	25	00:01.6
M Hempstead	3	25	00:01.4
B Y Kim	3	27	00:01.8
K -P Zauner	4	329	00:00.4
M Conrad	3	34	00:01.6
D Zhang	3	23	00:01.4
E Bruck	3	31	00:02.2
K Arai	3	23	00:01.5
E Kurtz	3	23	00:01.3
P Tomasini	3	23	00:04.7
F Lu	3	23	00:01.5
T Yasuda	3	23	00:01.6
Y Segawa	3	29	00:01.4
A J Perkins	3	25	00:01.4
A M Durham	3	35	00:01.8
K Ward	3	23	00:02.5
R Howes	2	21	00:00.2
I Glendinning	3	23	00:02.5
D J Pritchard	3	23	00:09.5
J P Mesirov	2	9	00:01.4
K G Nicols	3	39	00:01.4
S Bird	3	29	00:05.1
P J Mole	3	22	00:01.4

Continued on next page

Person	Graphs	Triples	Time
N Siabi-Shahrivar	3	39	00:04.4
C M K Starbuck	3	35	00:01.4
M Imaniah	3	23	00:03.5
M Slifkin	3	26	00:03.7
J -P Bantre	2	9	00:01.4
D le Mtayer	2	9	00:01.5
B C Warboys	3	39	00:01.9
C J Goodings	3	48	00:00.5
M A A Ali	3	23	00:01.4
S Murray	3	19	00:03.2
P Mole	3	22	00:01.3
RA Salami	3	23	00:06.6
R Salammi	3	51	00:00.4
S Wellington	3	17	00:02.4
G King	3	23	00:06.3
K Boyanov	2	9	00:01.2
M Stedman	3	27	00:02.4
J A Haycocks	3	31	00:30.2
R Harrison	3	23	00:02.6
H Muammar	3	23	00:08.0
J Corera	3	35	00:01.6
J Perez	3	25	00:02.4
D Gureghian	3	23	00:02.4
Hamid Abrishami	3	18	00:01.4
Edmon Zahedi	3	18	00:01.1
N Afshar-Hanaee	3	43	00:00.3
N D Young	3	23	00:02.5
J R Logan	3	27	00:14.2
P E An	3	23	00:15.3
W T Miller	3	23	00:02.4
P C Parks	3	23	00:02.4
A Anjewierden	13	96	00:02.5
Kenneth T V Grattan	3	22	00:01.4
H M Banford	3	51	00:00.4
R A Fouracre	3	25	00:01.4
D J Tedford	3	27	00:01.4
P Batten	3	25	00:01.5
O R Tutty	3	31	00:11.9
H B Jamaluddin	3	25	00:02.4
S Prehn	2	9	00:01.4
W J Toetenel	2	9	00:01.7
L M Castaner	3	43	00:00.4
F A Fouracre	3	23	00:06.3
C F N Cowan	3	47	00:01.5
G J Gibson	3	47	00:01.5
Adrian Clark	3	23	00:06.5
Don Pearson	3	33	00:01.4
Bill Welsh	3	21	00:02.5
S J Corfield	3	23	00:10.0
Julian W Gardner	3	22	00:02.4
Phillip N Bartlett	3	22	00:03.5
David Mack	3	23	00:01.4
Richard Crowder	3	23	00:05.8
A D Brown	132	1266	00:52.9
Max Van Daalen	3	41	00:03.1
Peter Jeavons	3	21	00:01.5
M Hill	3	37	00:00.5
P D Scott	3	23	00:02.4
L Steels	2	9	00:01.7
B Smith	2	9	00:01.2
M D Emmerson	3	33	00:00.4
A J G Hey	289	2401	01:59.7
L W Mathias	3	23	00:01.6
A Pickering	2	9	00:01.2
J A Pickering	4	88	00:00.4
J A McDermid	2	9	00:01.2
A M Gravell	4	242	00:00.4
J M Morris	2	9	00:07.3
R C Shaw	2	9	00:21.8
J E Nicholls	2	9	00:01.5
B De Neumann	2	9	00:01.8
D Simpson	2	9	00:01.3
G Slater	2	9	00:01.4
S J Hanson	3	28	00:02.8

Continued on next page

Person	Graphs	Triples	Time
J Lubin	3	28	00:02.5
D W Powers	2	9	00:01.4
L Reeker	2	9	00:01.3
M Hockley	3	23	00:01.4
C G Tuppen	3	31	00:08.3
C J Gibbings	3	21	00:14.9
J Kerr	3	23	00:03.2
Reeve JS	4	449	00:00.4
D Gassilloud	2	9	00:01.2
J Grossetie	2	9	00:05.9
B Segal	4	31	00:02.0
S M Lucas	3	23	00:02.5
S M Lucas	3	45	00:00.4
R W P Luk	3	51	00:00.4
Hamid Abrishamchi	3	18	00:01.1
Edmond Zahedi	3	18	00:07.2
D C Murray	3	43	00:01.5
S Taylor	3	23	00:04.3
J Zhang	3	17	00:01.5
W Eccleson	3	23	00:03.7
E K Mwarania	2	11	00:00.3
J Wang	2	11	00:00.4
C Piraud	2	11	00:00.4
Y T Chow	2	11	00:04.7
L Reekie	2	11	00:01.4
S Iijima	3	23	00:01.3
T Kure	3	23	00:01.5
K Petersen	3	23	00:01.6
F Pourahmadi	3	23	00:07.9
J Brown	3	27	00:02.6
P Parsons	3	23	00:01.6
M Skinner	3	23	00:06.4
M Tudor	4	407	00:00.3
M J Pont	3	37	00:00.3
M J Kelly	3	39	00:01.5
D G Hasko	3	45	00:00.3
C G Smith	3	37	00:00.3
J R A Cleaver	3	43	00:00.4
D C Peacock	3	35	00:01.4
J E F Frost	3	39	00:04.0
D A Ritchie	3	47	00:02.1
G A C Jones	3	41	00:02.1
J Singleton	3	25	00:01.4
T J B M Janssen	3	29	00:04.4
D J Pritchard	3	23	00:03.9
P D Rabinzohn	3	25	00:01.4
T Usagawa	3	25	00:04.6
L Steels	2	9	00:01.4
B Smith	2	9	00:01.3
C Roda	3	25	00:01.4
E H Mamdani	3	40	00:01.6
S M Deen	2	9	00:03.7
P Badin	3	25	00:02.6
A Moulinier	3	25	00:02.4
A M Barney	3	46	00:01.5
D W Thomas	3	25	00:06.6
J Gauffin	2	9	00:01.4
B Hammarberg	2	9	00:01.4
D J Godfrey	3	25	00:01.5
A S R Martin	3	23	00:04.2
C Gibbings	3	21	00:01.3
C Tuppen	3	31	00:02.3
M E Jones	3	23	00:01.4
J Whitehurst	3	25	00:01.4
P Wensley	3	23	00:03.6
P B Moynagh	3	23	00:01.4
A Stephens	3	23	00:02.4
N D Matthews	3	23	00:13.7
P Greenway	3	23	00:02.4
A A Tampion	3	27	00:09.2
R I Taylor	3	25	00:04.8
E K Mwarania	2	11	00:05.5
G Coe	3	23	00:01.9
M Jessup	3	23	00:02.8

Continued on next page

Person	Graphs	Triples	Time
C E Sundberg	3	41	00:00.4
R G M Crockett	3	25	00:01.4
J G Smith	3	37	00:04.1
K C Hawkins	3	37	00:01.4
D W Debney	3	23	00:02.5
V K Prabhu	3	27	00:02.5
S Kivelson	3	23	00:01.4
F A van Harmelen	3	25	00:01.4
C S Xydeas	3	47	00:01.6
B Kostic	3	25	00:05.0
KG Nichols	3	32	00:00.4
D J Allerton	3	29	00:01.4
D A Batt	3	25	00:01.4
B Soerowirdjo	15	108	00:03.8
F C Holroyd	3	22	00:05.7
R J Wilson	3	22	00:02.5
R D Carlitz	3	27	00:05.9
J Churcher	3	23	00:01.4
A Cuthbertson	11	98	00:02.5
H H Dabbagh	3	31	00:02.5
A Pedotti	2	9	00:01.5
R Andrich	2	9	00:02.0
R G Baker	3	35	00:01.4
A D Lambourne	3	27	00:01.5
A C Downton	3	31	00:01.4
R W King	3	31	00:03.9
A F Newell	3	23	00:01.5
S L MacDonald	3	25	00:04.1
G J Daniell	3	23	00:02.5
R P Dudley	3	23	00:02.4
PJ French	3	21	00:01.5
P F Gascoyne	3	25	00:04.9
S B Jones	3	25	00:02.5
J M C Roberts	3	27	00:01.6
A Kotani	3	27	00:09.5
Dr G J Parker	183	1685	01:21.0
J S Saini	3	27	00:07.6
N M Nwessry	3	23	00:03.3
M A Yeoman	3	23	00:02.4
S D Cridge	3	23	00:07.5
I R Bonilla	3	27	00:01.4
D V Morgan	3	31	00:01.9
M J Howes	3	25	00:06.5
A G Bailey	3	23	00:02.4
D Harries	3	23	00:02.5
R J Cashmore	3	30	00:04.4
P J Litchfield	3	26	00:02.7
E W Colglazier	3	24	00:02.5
K J Barnes	3	24	00:04.0
A J G Hey	3	24	00:08.9
R K P Zian	3	23	00:02.5
R Hinchcliffe	2	9	00:01.4
D F N Harrison	2	9	00:01.2
R Hinchcliffe	2	9	00:01.5
D F N Harrison	2	9	00:03.6
P A Houston	3	29	00:02.5
B M Makin	3	33	00:05.1
R P Corbett	3	23	00:01.5
A W Bright	30	179	00:07.7
A G Bailey	3	23	00:06.7
D Nunn	3	23	00:02.6
M J Laird	3	23	00:01.4
D D Betts	3	27	00:03.5
C R Jesshope	3	23	00:04.5
Lesley Carr	399	3782	02:51.0
N D'Halleweyn	3	57	00:00.5
M Swaneneberg	3	19	00:01.4
J Benson	3	51	00:00.4
H C Davis	3	679	00:01.5
Q Gan	3	39	00:05.2
C J Harris	3	560	00:04.3
A Knickenberg	3	25	00:02.4
B L Yeap	3	89	00:00.5
J Hamorsky	3	33	00:01.4

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Person	Graphs	Triples	Time
J Jrgensen	3	25	00:01.4
P H Lewis	4	755	00:05.9
L A Carr	398	3780	02:47.9
D DeRoure	490	4194	03:44.4
P Panzarasa	3	39	00:03.4
J K Satapathy	3	33	00:01.5
S Das	3	29	00:01.5
D Shi	3	49	00:00.5
C Dong	3	21	00:01.5
D S Yeung	3	21	00:05.1
C H Wong	3	31	00:02.2
L-L Yang	3	419	00:00.7
M S Yee	3	59	00:00.8
T W Ang	3	37	00:01.6
A Vonsovici	3	43	00:04.2
G T Reed	3	37	00:01.7
P R Routley	3	35	00:03.8
M R Josey	3	41	00:01.5
JN Ross	3	137	00:00.3
M Boero	3	29	00:01.4
J K Vincent	3	25	00:01.4
J C Inkson	3	29	00:05.7
H -O Muller	3	65	00:00.6
M E Zoorob	97	583	00:39.7
M C Netti	133	695	01:02.7
J J Baumberg	3	67	00:04.5
S J Cox	1258	7983	10:15.4
J Wu	3	114	00:03.1
R H Istepanian	3	78	00:01.7
J Chu	3	73	00:04.4
J F Whidborne	3	51	00:05.0
D De Schreye	2	22	00:02.2
R Glck	3	25	00:01.6
B Martens	3	41	00:01.7
M H Sørensen	3	23	00:04.1
U N Straube	3	37	00:02.0
R Sidek	3	29	00:01.4
A Waite	3	82	00:01.5
J Luke	3	23	00:01.5
Shakeel A Khoja	43	327	00:21.1
R H Olley	3	23	00:06.9
I L Hosier	4	307	00:00.7
D C Bassett	3	67	00:01.5
J R Sarkies	3	25	00:01.5
SMT Almodarresi Yasin	3	25	00:05.8
Alberto S Aguado	3	34	00:01.4
Eugenia Montiel	3	15	00:02.2
A Blackburn	3	25	00:01.5
B L Luk	3	39	00:03.7
David Cunado	3	28	00:00.9
Larry O'Gorman	2	9	00:00.2
Steve Shellhammer	2	9	00:00.4
Samhaa El-Beltagy	3	23	00:01.8
Steven Blackburn	3	24	00:01.6
O P Femminella	3	28	00:06.2
M J Starink	3	26	00:01.7
I Sinclair	3	29	00:01.7
P A S Reed	3	42	00:01.7
A C Hodgkinson	3	23	00:09.3
N C Debnath	2	9	00:00.5
R Y Lee	2	9	00:01.4
G R Greenway	3	23	00:01.5
S M Moody	3	31	00:01.4
M Hammersley	3	25	00:01.5
D A Golightly	3	23	00:01.8
H D Cottam	3	51	00:00.5
P H Riley	3	23	00:01.4
R J Walters	4	220	00:00.4
P A Wilson	3	29	00:04.8
L F Whitmore	2	46	00:01.5
R T Fox	3	53	00:01.6
N Harrison	3	51	00:00.5
J Lancaster	3	25	00:00.4
D Garcia-Alis	3	31	00:01.5

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Person	Graphs	Triples	Time
G C Freeland	3	23	00:05.6
G Rice	3	25	00:05.1
A Stenger	3	31	00:02.0
M Schabert	3	15	00:01.5
I K Proudler	3	16	00:01.5
M W Hoffman	3	23	00:04.3
H Yeap	3	23	00:05.3
M Stuttle	3	25	00:01.4
T Papakostas	3	28	00:01.7
G Braithwaite	3	36	00:01.5
T J Grasby	3	44	00:05.7
M J Palmer	3	48	00:01.5
M J Prest	3	41	00:01.5
C P Parry	3	30	00:00.4
A M Waite	3	82	00:00.3
S Roy	3	25	00:01.6
A Asenov	3	21	00:02.4
B J Choi	3	48	00:00.5
E L Kuan	3	34	00:01.5
J P Dakin	3	28	00:04.8
M Volanthen	3	28	00:02.5
Nigel Walker	3	24	00:01.8
Leslie Carr	402	3788	02:49.9
T J Dodd	3	37	00:01.5
M S Lee	3	79	00:04.4
B El-Jabu	3	29	00:02.7
Michael G Grant	3	27	00:01.5
Tony Pridmore	2	9	00:00.4
David Elliman	2	9	00:00.1
E C R Hehner	3	21	00:01.4
J M Wing	2	9	00:00.4
J Woodcock	2	9	00:07.0
J Davies	2	9	00:00.5
Luis M T Jesus	3	37	00:01.4
T Massart	3	35	00:01.6
A Bossi	2	9	00:00.3
Hugh G Lewis	3	73	00:07.1
Mike Hughes	3	23	00:01.5
Marianne Edwards	3	23	00:01.4
Adrian Tatnall	3	31	00:01.4
Martin Brown	3	92	00:05.0
Adrian R L Tatnall	3	31	00:00.5
T H Liew	3	49	00:01.8
J Living	3	37	00:01.6
A P Martin	3	21	00:01.4
J M Wing	2	9	00:05.5
J Woodcock	2	9	00:00.3
J Davies	2	9	00:00.4
M Mehta	3	27	00:01.5
M Mnster	3	51	00:01.5
Mark Papiani	3	30	00:00.4
Jasmin L Wason	3	24	00:06.0
Alistair N Dunlop	3	29	00:02.4
Denis A Nicole	5	411	00:03.5
A Pepin	3	23	00:05.0
C Vieu	3	23	00:02.1
H Launois	3	23	00:01.6
M Rosmeulen	3	23	00:07.0
M van Rossum	3	23	00:01.5
K Nakazato	3	117	00:02.2
C Easson	3	23	00:01.4
R L Rabe	3	23	00:05.7
J D Revill	3	24	00:01.5
W Banzhaf	3	22	00:01.4
C Reeves	3	22	00:01.6
Suleiman Abu Sharkh	3	23	00:03.5
Neamat Taghizadeh Irenji	3	23	00:02.7
Martyn Harris	3	23	00:03.3
S Taylor	3	19	00:02.8
A J Barragan	3	25	00:01.5
J Thoma	3	23	00:05.1
G-J M Kruijff	2	9	00:00.1
R T Oerle	2	9	00:00.1
D Lim	3	21	00:00.5

Continued on next page

Person	Graphs	Triples	Time
Sigi Reich	3	65	00:00.7
Jon-Paul Griffiths	3	26	00:01.5
P J B Jackson	3	47	00:01.7
Y Tian	3	108	00:05.2
Z Richardson	3	16	00:01.7
R J Peaty	3	28	00:01.5
Alex Bailey	3	18	00:01.4
Chris Harris	3	560	00:01.7
M R R de Planque	4	187	00:04.5
J A W Kruijtzer	3	26	00:01.5
R M J Liskamp	23	166	00:05.7
D Marsh	3	25	00:04.1
D V Greathouse	3	36	00:01.6
R E Koeppe II	3	34	00:01.5
B de Kruijff	3	28	00:01.4
J A Killian	3	38	00:06.3
J B Gao	3	36	00:01.6
P Hartel	628	2892	05:01.4
M Butler	3	509	00:00.7
A Currie	3	67	00:00.3
A Martin	3	26	00:01.5
A Smith	11	117	00:02.9
U Ultes-Nitsche	3	104	00:07.2
S Gnesi	2	9	00:06.6
D latella	2	9	00:00.4
J S Kandola	4	517	00:00.4
J E Theed	3	25	00:01.5
S T Larsen	21	114	00:05.5
A C Irvine	3	29	00:02.7
Z A K Durrani	3	113	00:00.8
V Sauret	3	31	00:01.4
K A Goatman	3	25	00:01.5
J Blogh	3	46	00:07.5
K Bryson	3	29	00:00.5
D Jones	3	19	00:01.6
Stephen C Y Chan	3	28	00:01.4
Dionysius P Huijsmans	2	9	00:01.3
Arnold W M Smeulders	2	9	00:01.5
B Chapman	16	128	00:03.6
J Merlin	3	20	00:01.4
D Pritchard	62	362	00:19.7
T Sorevic	3	23	00:02.9
F Bodin	3	55	00:02.9
Y Mevel	3	21	00:01.5
L Hill	3	23	00:09.2
S Haussermann	3	23	00:01.4
R A Guilmette	3	23	00:01.4
M J Youngman	3	23	00:06.0
M R Bailey	3	29	00:01.7
G Etherington	3	23	00:01.6
C S Lee	3	33	00:01.7
K Itoh	3	31	00:04.4
T Mitchell	3	23	00:01.4
Luigi Portinale	3	24	00:04.8
Pietro Torasso	3	24	00:01.4
K Yen	3	47	00:01.9
Shakeel Khoja	43	327	00:14.2
J S Blogh	3	46	00:00.4
F C A Brooks	3	33	00:01.4
S Curtis	3	23	00:03.7
E Daran	2	11	00:00.4
D P Shepherd	2	11	00:00.4
T Bhutta	2	11	00:00.5
F Lahoz	2	11	00:00.4
J M Harrison	3	23	00:07.0
P Swarup	3	25	00:01.6
P R Rice	3	25	00:01.4
A Sharma	3	25	00:06.7
H E Jackson	3	25	00:02.7
D Naghski	3	25	00:01.4
J T Boyd	3	25	00:02.2
Yannis Kalfoglou	3	23	00:01.4
David Robertson	3	23	00:01.6
S Mailis	159	852	01:18.6

Continued on next page

Person	Graphs	Triples	Time
C Riziotis	16	122	00:05.5
J Wang	38	270	00:13.8
E Taylor	3	29	00:04.2
S J Barrington	3	31	00:01.6
C D Mansfield	3	32	00:01.8
J P Marques-Silva	4	455	00:00.7
K A Sakallah	173	807	01:09.0
K Tsukagoshi	3	29	00:01.4
P L Philips	3	29	00:01.7
B J Mangan	3	46	00:01.8
P St J Russell	3	148	00:03.6
J A Pople	3	23	00:04.1
G R Mitchell	3	37	00:00.4
J M Yarrison-Rice	3	23	00:01.4
R Coombs	3	21	00:01.5
J N Carter	4	527	00:01.5
Steven G Blackburn	3	24	00:01.3
J L Davidson	3	25	00:06.2
C S Ea	3	23	00:01.5
Luis Guerra e Silva	3	19	00:01.7
Miguel Silveira	3	23	00:01.3
L Piazzo	3	29	00:01.8
P Mandarini	3	25	00:01.4
Thomas Glass	3	21	00:01.4
N Nicolici	3	39	00:06.8
A R Price	3	31	00:02.0
H Fangohr	3	31	00:02.3
P A J De Groot	181	977	01:30.9
M J Reeves	3	25	00:01.6
A G Howard	3	23	00:01.4
Y Wang	3	23	00:01.5
N Bouvin	3	26	00:01.8
K Grnbk	63	320	00:26.0
P J Nrnberg	82	466	00:29.7
L Sloth	2	15	00:03.6
U K Wiil	2	18	00:03.5
K M Anderson	3	20	00:04.6
Nicholas M Gibbins	116	975	00:44.6
Robert H Tansley	3	20	00:01.6
Dan W Joyce	3	32	00:01.6
David J Harper	2	9	00:02.6
John P Eakins	2	9	00:00.4
Mark Dobie	3	71	00:00.4
U K Will	2	9	00:00.1
G Halsey	3	23	00:01.8
G Chana	3	23	00:02.3
P R White	3	23	00:01.4
D A G Pedder	3	29	00:01.5
J A Skinner	3	23	00:01.4
S Reich	3	65	00:00.3
Uffe K Wiil	2	9	00:00.1
Anna Barney	3	46	00:00.3
Gursel Duzenli	3	23	00:01.5
Yavuz Kilic	3	47	00:01.9
Hakan Kuntman	3	23	00:10.7
Atilla Ataman	3	23	00:01.8
M R Harris	3	35	00:01.9
K Goddard	4	171	00:00.7
R J T Bunyan	3	34	00:05.1
K Brunson	3	35	00:01.2
L J Adams	3	24	00:02.0
M J Adamson	3	33	00:02.0
M J Addis	4	247	00:05.2
P J Allen	3	29	00:02.7
Y Cheng	3	25	00:01.9
M Hall	3	41	00:06.1
A Mendelzon	2	9	00:00.4
M Stairmand	28	179	00:08.3
J Stoustrup	3	35	00:24.0
G Biffi	9	92	00:02.1
S U Alam	3	23	00:00.5
A B Grudinin	3	23	00:01.8
G L Burdge	3	23	00:01.4
V Albanis	3	33	00:02.0

Continued on next page

Person	Graphs	Triples	Time
S Dhanjal	3	51	00:01.9
V Emelyanov	31	292	00:12.6
P Petropoulos	291	1516	02:51.5
N I Zheludev	259	1457	02:17.2
C Alegria	3	29	00:15.5
R Feced	58	373	00:23.6
N K Allsopp	3	23	00:17.0
T P Cooper	3	23	00:00.4
P Ftakas	3	23	00:01.4
P C Macey	3	23	00:01.5
N K Allsopp	3	23	00:01.8
P L Gordon	3	23	00:01.5
J A Alvarez-Chavez	46	269	00:17.9
P W Turner	97	524	00:41.5
C C Renaud	3	36	00:01.6
R Selvas-Aguilar	9	94	00:01.8
P D Hewitt	3	27	00:01.6
T Blackburn	3	25	00:01.6
I M Anteney	3	23	00:03.8
B Heinemann	3	23	00:03.4
D Knoll	3	23	00:01.5
Wendy V Glasspool	3	23	00:01.4
John A Mihell	3	23	00:05.2
T S P Austin	3	29	00:01.5
P J Gregson	3	29	00:01.5
J P Dakin	3	29	00:01.4
P M Powell	3	27	00:03.2
M M Singh	3	27	00:01.4
T Autenrieth	3	23	00:01.5
D Ayala	3	23	00:01.9
F Navarro	3	23	00:01.4
N Munoz	3	23	00:01.4
J Delgado	3	23	00:02.9
G Orellana	3	23	00:01.4
M C Moreno-Bondi	3	23	00:03.0
T Vick	3	23	00:00.4
M Driver	3	23	00:00.4
J P Dakin	3	23	00:04.0
S Backes	3	24	00:01.5
J R A Cleaver	3	27	00:01.8
A P Heberle	3	27	00:03.6
H M Banford	3	23	00:01.5
G Chen	3	23	00:00.6
L Baramov	3	23	00:01.4
I E Barry	43	252	00:15.8
A Miller	3	22	00:01.5
M Ebrahimzadeh	3	22	00:01.9
D M Finlayson	3	22	00:05.2
M Beer	3	21	00:00.5
C Preist	3	41	00:02.3
M Schroeder	3	59	00:03.0
P J Bennett	3	48	00:03.5
T M Monro	2	46	00:02.9
C A Easson	3	23	00:01.3
N V D'Halleweyn	3	57	00:07.0
S E Benton	3	35	00:01.5
T Bhutta	36	252	00:15.7
W Bian	4	140	00:03.6
J R L Webb	3	25	00:02.4
P R Tapster	3	25	00:01.5
J G Rarity	3	25	00:01.4
H E Meissner	17	120	00:10.5
K M Bossley	3	23	00:05.7
R J McKendrick	3	23	00:01.4
C J Harris	3	23	00:01.4
C Mercer	3	23	00:01.4
Y H Pao	2	9	00:05.0
S R LeClair	2	9	00:01.2
B Bourliaguet	3	26	00:01.8
V Couderc	3	26	00:01.8
A Barthelemy	3	26	00:05.0
C deAngelis	3	31	00:02.5
N Fagan	3	23	00:01.4
D W J Harwood	3	32	00:01.8

Continued on next page

Person	Graphs	Triples	Time
M J Hesford	3	23	00:05.6
B Hudson	3	23	00:02.2
E R Taylor	53	296	00:20.2
J A Tucknott	55	366	00:18.0
C J Voyce	3	23	00:10.0
E Weatherby	3	23	00:01.4
Y West	3	54	00:01.7
G Brambilla	52	303	00:20.8
V Pruneri	3	39	00:09.9
H Janocha	3	22	00:01.5
H L Offerhaus	56	341	00:21.2
P Millar	3	32	00:02.0
J S Aitchison	3	37	00:06.3
R DeLaRue	3	37	00:01.5
T Krauss	3	37	00:01.5
J S Aitchson	3	37	00:04.5
R A Sammut	3	37	00:02.9
J Caplen	81	412	00:32.5
H G Lewis	3	73	00:00.3
A R Pogosyan	3	25	00:03.1
R Bruni	3	49	00:01.1
D Floreano	2	9	00:00.3
J -D Nicoud	2	9	00:00.2
F Mondada	2	9	00:00.4
Jennifer Nerissa Davis	3	20	00:03.4
Peter Todd	3	37	00:01.8
D Floreano	2	9	00:02.7
J -D Nicoud	2	9	00:00.6
F Mondada	2	9	00:00.4
Peter M Todd	3	37	00:00.3
Peter S Burge	3	28	00:01.5
Max R Daalen	3	41	00:01.4
Barry J P Rising	3	18	00:01.4
Wolfgang Maass	3	22	00:01.3
Christopher M Bishop	3	20	00:03.1
E Sekerinski	2	9	00:00.7
K Sere	2	9	00:00.4
M Waldn	3	25	00:01.5
E Sekerinski	2	9	00:02.8
K Sere	2	9	00:00.4
Quincy Cabell	3	21	00:01.5
Peter T Kirstein	3	22	00:04.7
Theodore Pagtzis	3	14	00:04.3
Lichun Wang	3	21	00:01.4
L Silvestri	3	23	00:04.1
J Carter	3	23	00:02.3
D Parton	3	23	00:01.3
M J Caton	3	27	00:01.6
BH Blott	3	57	00:05.8
G J Daniell	3	31	00:02.0
L Chao	3	23	00:02.3
L Reekie	3	23	00:05.4
L Chao	3	25	00:01.4
L Reekie	3	25	00:01.7
M Ibsen	3	25	00:01.4
Brian Chatters	3	18	00:05.1
Chris Rostron	3	18	00:01.7
N Adachi	3	23	00:00.4
Y Tanaka	3	43	00:01.8
T Takada	3	39	00:00.5
A Vazquez	3	23	00:01.5
M W Cho	3	25	00:06.4
J H Chang	3	23	00:01.6
K W Koh	3	25	00:01.5
S Saeki	3	23	00:05.1
B Jacobs	2	9	00:00.6
J Rutten	2	9	00:00.2
W A Clarkson	3	23	00:00.4
N S Felgate	27	143	00:08.9
E T Claverol	3	28	00:02.2
R C Cannon	3	23	00:01.4
J E Chad	48	302	00:17.9
N E Mastorakis	3	22	00:00.5
M Cole	3	25	00:01.5

Continued on next page

Person	Graphs	Triples	Time
J W Gardner	3	33	00:00.3
A W Y Lim	3	29	00:01.5
P K Scivier	3	37	00:01.5
Michael Conrad	3	34	00:01.4
H Rubin	3	22	00:01.5
D H Wood	3	22	00:01.4
T P Cooper	3	23	00:05.5
P Sloot	2	9	00:00.2
M Bubak	2	9	00:00.4
A Hoekstra	2	9	00:00.4
B Hertzberger	2	9	00:00.4
Hugh Cottam	3	51	00:00.3
Max Bramer	3	22	00:01.4
Ann Macintosh	3	22	00:01.4
Frans Coenen	3	22	00:05.8
TJ STEELE	3	23	00:01.5
T J SLUCKIN	3	30	00:01.5
K Cremer	3	23	00:01.5
S Gruner	3	51	00:05.7
M Nagl	3	29	00:02.8
G Rozenberg	3	22	00:01.4
others	3	22	00:06.8
Nello Cristianini	3	72	00:02.4
Colin Campbell	3	15	00:01.9
G J Crofts	3	40	00:05.7
M Trew	3	40	00:01.6
M J Damzen	3	23	00:01.7
L Crow	3	24	00:07.4
D Fensel	2	9	00:00.4
R Studer	2	9	00:00.4
L R Crow	3	24	00:01.3
M M Fateh	3	25	00:02.2
D Cruickshank	4	219	00:05.1
J A Padget	2	9	00:00.7
J Ctyroky	2	12	00:01.8
J Homola	3	23	00:01.4
P V Lambeck	2	12	00:02.1
S Musa	3	23	00:05.0
H J W M Hoekstra	2	12	00:01.8
B Usievich	3	23	00:01.4
N M Lyndin	3	23	00:03.5
J Cupit	3	47	00:04.3
P Cheng	3	45	00:01.7
D Peebles	3	25	00:01.5
M Swanenberg	3	19	00:05.8
G Tatai	2	9	00:00.2
L Gulyas	2	9	00:00.6
V Foufelle	3	23	00:00.5
S J Russell	3	23	00:00.4
O Hadeler	3	23	00:01.4
E Geinitz	3	23	00:01.6
Y Marchand	3	54	00:05.5
J Hendricks	3	20	00:02.4
E Daran	2	11	00:00.6
D P Shepherd	2	11	00:00.3
T Bhutta	2	11	00:00.3
C Serrano	2	11	00:00.3
N Hampton	3	23	00:01.4
S J Sutton	258	1244	02:05.5
Siegfried Reich	3	65	00:01.3
Niels Olof Bouvin	3	26	00:02.4
Kaj Gronbaek	3	29	00:00.5
Peter Nurnberg	82	466	00:25.7
Lennert Sloth	2	15	00:02.0
Uffe Kock Wiil	2	18	00:03.3
Kenneth Anderson	3	20	00:01.3
Jennifer N Davis	3	20	00:01.3
K Decker	3	26	00:06.4
M Tennenholtz	172	809	01:11.9
UKMAS'98 Contributors	3	21	00:00.6
K F MacDonald	53	399	00:23.8
Pete Duncan	3	23	00:01.2
Richard Morton	3	23	00:00.5
Andy Sandham	3	23	00:00.4

Continued on next page

Person	Graphs	Triples	Time
Hope Caton	3	23	00:00.4
Ellen Duranceau	3	24	00:00.5
R W Eason	3	23	00:01.4
R W Eason	2	11	00:02.3
S Etalle	3	43	00:04.2
M K Durkin	3	81	00:00.4
M A Muriel	3	23	00:02.1
K E Meacham	4	103	00:00.4
J Papay	3	57	00:01.7
G Munde	3	23	00:03.7
A Gramacki	3	59	00:02.2
J Gramacki	3	59	00:00.4
R J Gallimore	3	25	00:01.4
H S Lamba	3	25	00:01.4
C L Mason	3	25	00:01.4
B J Orenstein	3	22	00:01.4
S Galt	3	29	00:01.5
D S Cooke	3	36	00:01.5
N D Hewer	3	33	00:03.5
P Saratchandran	3	22	00:01.7
N Sundararajan	3	23	00:01.4
K R Subramanian	3	22	00:01.4
D M Garner	3	33	00:01.9
J Bonar	3	115	00:00.5
A Blackburn	3	24	00:01.4
F Udrea	3	148	00:02.1
H T Lim	3	32	00:05.3
A Popescu	3	33	00:01.5
P L F Hemment	3	73	00:02.5
W I Milne	3	33	00:05.0
C B E Gawith	118	663	00:56.0
P Hua	18	131	00:05.8
J A Abernethy	32	186	00:11.1
M J Gibney	3	26	00:03.1
N J Vriend	3	21	00:01.9
J M Griffiths	3	21	00:01.8
S J Gilson	3	23	00:02.8
H Gnewuch	2	11	00:01.7
N Zayer	2	11	00:00.6
C N Pannell	2	11	00:04.0
G W Ross	2	11	00:06.1
Adam S Goodie	3	23	00:00.4
Andreas Ortmann	3	23	00:01.4
Jennifer Davis	3	20	00:06.6
Gregory M Werner	3	23	00:02.6
G Gigerenzer	3	22	00:01.7
P M Todd	3	37	00:03.4
S Grange	4	191	00:04.0
J Cooper	3	29	00:03.8
G Jones	3	23	00:05.2
TD Bunker	3	37	00:00.6
Tim Bunker	3	37	00:00.3
Jason Cooper	3	29	00:00.3
Sylvia Waldhausen	3	23	00:00.5
Frank Langlotz	2	9	00:03.5
Lutz Nolte	2	9	00:04.8
D Greenwood	3	29	00:00.6
N Griffiths	3	30	00:01.6
F J Garijo	2	9	00:03.1
M Boman	2	9	00:00.6
K de Kort	3	25	00:01.5
Ying Guo	3	21	00:03.0
Peter L Bartlett	189	938	01:25.1
O Hadeler	3	23	00:01.7
D J Richardson	3	23	00:01.6
J P Dakin	3	23	00:01.5
O Hadeler	3	32	00:01.8
E Ronnekleiv	3	36	00:02.9
D C Hanna	3	23	00:01.5
G J Friel	3	29	00:03.0
A Scammell	3	22	00:01.4
R A Abuknesha	3	28	00:01.4
M Levy	3	24	00:02.2
J Alves-Foss	3	22	00:01.4

Continued on next page

Person	Graphs	Triples	Time
Md R Hashim	3	27	00:01.4
G M Hathaway	3	35	00:09.3
G Wills	240	2158	01:41.5
E Hepworth	3	23	00:03.4
J H P Eloff	2	9	00:00.3
L Labuschagne	2	9	00:00.4
R von Solms	2	9	00:00.4
J Verschuren	2	9	00:04.4
J M N Hey	293	2409	02:06.6
A Wissenburg	3	23	00:02.9
J E Higgins	3	26	00:00.6
P S Huang	3	28	00:00.6
Ping Sheng Huang	3	24	00:02.0
P E Howse	3	24	00:01.4
J Swingler	3	31	00:00.6
M Mckecknie	4	37	00:01.7
P T Gaynor	3	37	00:07.3
L Whitmore	2	46	00:02.1
N M Harrison	3	51	00:00.4
D Harper	3	43	00:02.3
Andrew Hadfield	2	9	00:00.7
Dominic Rainsford	2	9	00:00.4
Tim Woods	2	9	00:00.4
A Fu	3	31	00:01.6
M Ibsen	3	23	00:06.7
R I Laming	3	23	00:01.8
G J Cowle	3	30	00:01.5
M O Berendt	3	23	00:00.5
A Petrosian	3	23	00:05.3
B Woodward	3	23	00:03.6
Balos P A	3	23	00:01.4
M Kaczmarek	3	14	00:01.6
C Yang	3	29	00:01.4
S Tatarkova	3	23	00:01.5
R W Eason	3	31	00:05.9
S Kalenka	3	23	00:00.5
K Korta	3	22	00:01.5
E Sosa	3	22	00:01.4
X Arrazola	3	22	00:01.4
Dave Robertson	3	28	00:05.6
Grigoris Karakoulas	3	28	00:01.9
K Katayama	3	39	00:00.5
P G Kazansky	3	23	00:01.4
H Inouye	3	30	00:01.5
T Mitsuyu	3	28	00:02.9
K Miura	18	156	00:06.3
J Qiu	3	29	00:05.5
K Hirao	56	360	00:25.3
F Starrost	3	28	00:01.6
J Qui	3	28	00:01.7
T M J Kendall	3	26	00:01.5
Y Kilic	3	47	00:06.4
H S Kim	3	25	00:01.8
R P H Haaksman	3	25	00:01.4
D Klein	3	23	00:05.6
J Hofmann	3	23	00:01.4
R McKendrick	3	23	00:00.3
Dieter Roller	2	9	00:00.4
A Klotz	3	31	00:01.5
C Barzen	3	31	00:01.5
Y Kondo	3	23	00:05.2
K Nouchi	3	23	00:05.2
M Watanabe	3	23	00:02.4
Y P Svirko	3	31	00:01.5
J Hatcliff	2	9	00:04.7
T AE Mogensen	2	9	00:00.6
P Thiemann	2	9	00:01.9
M R Dobie	3	71	00:00.5
B S Ellis	3	23	00:01.6
S de Lioncourt	3	21	00:01.4
Y S Liu	3	23	00:06.0
David Lowe	19	143	00:05.3
W MacCormack	3	30	00:03.1
O R Tutty	3	64	00:01.9

Continued on next page

Person	Graphs	Triples	Time
P A Nelson	3	41	00:02.8
P C Macey	3	27	00:01.4
N K Allsopp	3	27	00:02.9
A S Gill	3	27	00:01.4
P C Macey	3	23	00:01.1
J R Wright	3	23	00:06.9
N K Allsopp	3	23	00:01.4
Swapna Banerjee	3	37	00:01.5
R Mani	3	25	00:02.0
V Falanga	3	22	00:04.2
CP Shearman	3	22	00:01.6
D Sandeman	3	22	00:01.4
P A Marsden	16	123	00:04.8
A Malinowski	64	372	00:29.8
M Hopkinson	3	25	00:05.2
R T Harley	3	23	00:02.1
G R Nash	3	27	00:00.6
J Martin	3	31	00:07.5
M Emilia X Mendes	3	53	00:01.0
Rachel Harrison	3	22	00:01.8
V Mikhailov	3	23	00:01.6
R I Killey	3	23	00:03.9
M Durkin	3	23	00:01.4
P Bayvel	3	23	00:01.4
D Milanese	3	31	00:01.5
L N Ng	3	23	00:01.5
A Fu	3	29	00:05.4
C Contardi	3	30	00:03.8
M Ferris	3	33	00:02.0
R M DeLaRue	3	37	00:00.3
T F Krauss	3	37	00:00.3
J D Mills	3	28	00:01.5
C W J Hillman	3	28	00:01.4
B H Blott	3	28	00:08.5
N Milton	3	29	00:00.5
H Cottam	3	51	00:00.3
Feng Ming	3	31	00:00.3
Harris C J	3	560	00:00.5
M Mitchell	3	39	00:03.9
F Cristiano	3	29	00:00.9
P Hemment	3	73	00:00.6
K Sato	3	29	00:00.6
T M Monro	3	26	00:01.5
C M deSterke	3	26	00:01.7
L Poladian	3	26	00:01.6
S Lehmann	3	23	00:04.5
J Bosenberg	3	23	00:00.6
Manuel Serrano	3	23	00:00.7
M C Mowlem	3	24	00:01.7
A R Chambers	3	23	00:01.6
M M Singh	3	23	00:09.3
J P Dakin	3	24	00:01.4
J M Muggleton	3	24	00:01.5
R Allen	3	31	00:03.2
P A Mulheran	3	23	00:04.4
M Naftaly	3	29	00:00.5
A Jha	3	29	00:01.5
J F W Schiz	3	49	00:00.3
Jason M Nash	3	23	00:00.5
Liang Shing Ng	3	23	00:04.6
T Niblock	3	27	00:01.5
J Nilsson	2	11	00:01.2
B Jaskorzynska	2	11	00:00.5
D Floreano	3	18	00:01.5
J -D Nicoud	6	33	00:02.4
F Mondada	6	33	00:04.8
E Tuci	3	24	00:01.8
P M Todd	2	16	00:01.9
H L Offerhaus	3	30	00:01.9
H L Offerhaus	3	25	00:06.9
R Haring	3	29	00:01.5
E Gini	3	25	00:01.6
H Melchior	3	25	00:03.4
U Keller	37	235	00:14.7

Continued on next page

Person	Graphs	Triples	Time
J M Fonseca	3	23	00:01.9
T Onai	3	25	00:05.2
S Tsujikawa	3	23	00:01.7
R Tsuchiya	3	25	00:01.4
H Fukuda	3	23	00:01.5
D Hisamoto	3	23	00:06.0
N Yamamoto	3	25	00:01.5
J Yugami	3	23	00:01.4
K Ichinose	3	23	00:01.4
F Ootsuka	3	23	00:04.0
B Ortega	3	31	00:01.6
L Dong	3	31	00:02.5
P M Frank	3	22	00:01.4
Chris J Parsons	3	23	00:00.7
G K Pasparakis	3	25	00:06.7
T R Payne	3	261	00:00.4
P C-H Cheng	3	45	00:00.3
M Hahn	2	9	00:00.4
S S Stoness	2	9	00:00.3
S Pissadakis	3	36	00:01.7
K Moschovis	3	25	00:01.5
G Kiriakidis	3	27	00:08.5
D M Pooley	3	31	00:00.5
W Banzhaf	2	9	00:00.4
C Reeves	2	9	00:00.4
J P deSandro	3	23	00:01.5
C Simonneau	3	29	00:03.2
P Vidakovic	3	29	00:01.5
J A Levenson	3	29	00:04.5
M Kohno	3	23	00:02.0
K Kuwasaki	3	23	00:01.5
T Takeuchi	3	23	00:01.4
G M Yang	3	25	00:06.8
R H D Rawlings	3	23	00:05.2
L Reekie	3	23	00:00.8
JS Reeve	4	449	00:00.7
M Heath	3	21	00:01.7
R J Selvas-Aguilar	9	94	00:01.3
D J Richardson	3	23	00:07.0
C Riziotis	3	26	00:01.7
M N Zervas	3	26	00:01.4
E Ronnekleiv	3	23	00:01.8
O Hadeler	3	23	00:05.7
G Vienne	3	23	00:01.4
S J Russell	3	23	00:01.4
J P Dakin	3	23	00:01.5
J Sabater	3	37	00:06.6
C Saunders	3	75	00:00.4
A Gammerman	3	25	00:01.9
V Vovk	3	24	00:01.9
R Pillay	3	27	00:07.3
L MacDonald	3	22	00:01.4
M R Luo	3	22	00:01.5
F R de Boer andG Boetiger	3	23	00:05.3
m c schraefel	3	23	00:05.0
S Brodribb	3	22	00:02.2
m c schraefel	190	1191	01:25.9
Blanca Mancila	4	34	00:04.2
John Plaice	3	30	00:01.5
J Seguin	3	23	00:01.4
D Dandurand	3	23	00:01.0
D A Lowther	42	211	00:19.4
S Y Set	2	11	00:00.4
R Girardi	2	11	00:00.4
E Riccardi	2	11	00:02.4
B E Olsson	2	11	00:01.1
M Puleo	2	11	00:00.4
M Ibsen	2	11	00:00.9
R I Laming	2	11	00:03.9
P A Andrekson	2	11	00:00.4
F Cisternino	2	11	00:00.4
H Geiger	2	11	00:00.3
N Cristianini	3	72	00:00.3
K Howker	3	23	00:02.3

Continued on next page

Person	Graphs	Triples	Time
Robert Williamson	4	695	00:01.5
John Shawe-Taylor	3	23	00:02.0
H C Sim	3	23	00:04.2
H C Sim	3	31	00:02.9
J M Sousa	3	23	00:01.6
Sarah V Stevenage	3	28	00:01.7
Kate Vince	3	24	00:04.4
D J Brady	3	23	00:01.4
K Takeda	5	411	00:01.5
N K Allsopp	3	28	00:01.5
J C Hardwick	3	28	00:04.2
P C Macey	3	28	00:01.7
D J Lancaster	3	39	00:06.7
Mota Telma	3	24	00:00.4
Patrick Hellemans	3	24	00:01.4
Gianni Canal	3	24	00:01.6
Patricia Lago	3	32	00:06.7
B C Thomsen	44	296	00:20.0
J D Harvey	3	23	00:01.4
Harry L Trentelman	3	36	00:03.6
A C Tropper	3	23	00:04.1
B Ullrich	3	27	00:02.0
H Sakai	3	27	00:01.4
J Pavelka	2	9	00:00.4
G Tel	2	9	00:00.5
M Bartosek	2	9	00:00.3
A Vonsovici	3	23	00:04.8
C K Tang	3	18	00:06.8
F Namavar	3	23	00:01.5
William Wadge	3	25	00:01.5
C Q Wang	3	25	00:01.5
L Reekie	3	25	00:04.2
Y T Chow	3	25	00:01.4
W A Gambling	3	25	00:04.8
J -S Wang	3	23	00:01.9
Q Gan	3	23	00:01.8
Y Wei	3	23	00:00.5
L Xie	3	23	00:01.4
N J Wayth	3	39	00:03.8
Y D West	3	54	00:00.4
S C Wong	3	25	00:01.8
E Zerz	3	23	00:01.6
D Kinny	3	38	00:03.1
Donghui Wu	3	24	00:03.5
Kristin P Bennett	3	19	00:04.0
J Hu	3	23	00:01.4
T Teshima	3	27	00:07.3
S Yamashita	3	29	00:01.6
G J Cowle	3	29	00:01.4
Z R Yang	3	44	00:06.5
P Zaris	3	29	00:01.6
N K Zayer	3	26	00:01.6
C N Pannell	3	26	00:01.4
M K Durkin	3	26	00:04.2
M N Zervas	3	26	00:04.1
M N Zervas	3	27	00:01.5
R I Laming	3	27	00:02.3
S Sales	3	23	00:01.5
J Zhou	3	25	00:01.6
Q Gan	3	25	00:04.9
A Krzyzak	3	22	00:01.8
C Y Suen	3	17	00:01.4
C H Tan	3	23	00:01.7
Viet Dung Dang	3	63	00:04.8
Ben Deitch	3	29	00:01.4
Irina Ermolina	3	27	00:01.5
S-H Hwang	3	25	00:02.6
V Lematre	9	87	00:07.0
MRR de Planque	4	187	00:00.6
AP Howes	7	76	00:01.4
ME Smith	7	77	00:03.3
R Dupree	3	23	00:04.3
A Watts	3	28	00:01.5
VB Litovski	3	37	00:00.3

Continued on next page

Person	Graphs	Triples	Time
IV Litovski	3	37	00:00.3
Rishad Ahmed Shafik	4	178	00:00.4
Abu Hena Mohammad Razibul Islam	3	23	00:08.9
Fazli Qayyum Yousaf-Zai	3	23	00:02.5
Alma Swan	3	154	00:02.6
X X Wang	3	51	00:06.8
D J Brown	3	33	00:01.5
K -J Won	3	32	00:01.8
A Prugel-Bennett	4	295	00:00.7
A Krogh	3	30	00:02.3
Jing Zhou	3	40	00:01.9
Sanchai Dechanupaprittha	3	25	00:06.1
Issarachai Ngamroo	3	25	00:14.5
Kitsuchart Pasupa	3	35	00:09.5
Jarurote Tippayachai	3	25	00:15.8
Komsan Hongesombut	3	25	00:06.0
Yasunori Mitani	3	25	00:08.9
S M Bohte	3	33	00:01.1
E H Gerding	4	199	00:04.0
J A La Poutre	3	47	00:12.5
M Munster	3	27	00:01.5
D Kim	45	236	00:16.0
N Loucaides	3	24	00:15.5
G E Georghiou	3	56	00:01.0
Michael Luck	3	299	00:03.5
P McBurney	181	921	01:26.2
I Lynce	3	81	00:01.3
Alfonso Troya	3	45	00:01.6
Eckhard Grass	3	51	00:02.5
V Manquinho	3	60	00:00.4
S X Ng	4	498	00:02.5
M S Yee	3	59	00:04.9
C J Rodger	3	14	00:02.0
M Clilverd	3	23	00:01.5
K S Ship	3	44	00:01.8
Rachel Harrison	3	28	00:02.3
Lampros Stergioulas	3	31	00:13.3
Panagiotis Telonis	3	24	00:07.4
Yiannis Manolessos	3	24	00:01.6
Dimitra Pappa	3	24	00:01.4
Michalis Moatsos	3	26	00:01.4
Gheorghita Ghinea	3	30	00:02.1
Kyriakos Mamoukaris	3	24	00:04.1
Constantinos Makropoulos	3	27	00:12.0
D J Swaffield	4	236	00:12.2
J Wang	77	378	00:36.6
F Guo	3	63	00:02.1
S Uppal	3	41	00:02.3
M S A Karunaratne	3	35	00:05.1
A F Willoughby	3	36	00:10.6
Heinrich Stamerjohanns	3	25	00:01.5
Francois Vallieres	3	25	00:02.8
Gingras Yves	3	24	00:02.6
Oppenheim Charles	3	24	00:02.6
N V T D'Halleweyn	3	57	00:00.3
K Mistry	3	29	00:00.6
Matthew Hennessy	3	18	00:02.7
M Khalafalla	3	64	00:04.5
S Uno	3	67	00:10.3
N Koshida	3	54	00:03.5
S Oda	461	2016	03:58.8
T Risse	3	31	00:02.9
K Aberer	3	17	00:05.3
A Wombacher	3	17	00:01.6
S Taylor	3	42	00:01.6
Matthew A Swabey	4	114	00:00.7
Stephen P Beeby	4	720	00:00.7
Andrew D Brown	133	1268	00:53.5
John E Chad	48	302	00:14.8
D Pommerenke	3	24	00:01.6
SMT Al-Modaressi Yasin	3	23	00:02.7
Kyoung-Jae Won	3	32	00:00.7
Anders Krogh	3	30	00:00.5
J Zhang	3	32	00:01.6

Continued on next page

Person	Graphs	Triples	Time
J H Neave	3	23	00:03.6
X B Li	3	23	00:01.4
P F Fewster	3	23	00:04.0
H A W El Mubarek	3	87	00:06.8
I Z Mitrovic	3	25	00:01.6
O Buiu	66	334	00:28.0
B L Yeap	3	89	00:04.6
R G Maunder	4	248	00:00.9
L -L Yang	3	419	00:01.0
Steve Harris	3	90	00:00.6
Daniel A Smith	4	318	00:00.4
Jules Field	4	118	00:00.7
Christoph H Haas	9	92	00:01.6
S X Ng	4	498	00:01.0
Minghua He	3	40	00:02.5
Alan Jeffrey	3	18	00:02.7
M A H Khalafalla	3	64	00:05.0
A K Durrani	3	25	00:03.1
Elena Kukharenka	4	187	00:01.3
Zak Moktadir	4	238	00:08.1
M E Abdelsalam	3	23	00:02.3
C Vale	11	113	00:03.8
M P A Jones	17	149	00:05.0
E A Hinds	57	363	00:23.2
V D Kunz	3	57	00:03.0
C H de Groot	4	426	00:01.8
E Gili	3	42	00:01.7
Jordan B Pollack	4	340	00:00.5
Mark Bedau	60	300	00:25.7
Phil Husbands	3	29	00:03.2
Takashi Ikegami	5	38	00:02.9
J G Rocha	3	25	00:07.3
C G J Schabmueller	48	290	00:23.1
N F Ramos	3	25	00:02.6
S Lanceros-Mendez	3	25	00:00.4
M V Moreira	3	23	00:01.5
R F Wolffenbuttel	3	25	00:00.4
J H Correia	3	25	00:01.4
Matthew Sacker	3	25	00:01.9
Andrew Rushton	3	27	00:04.0
M A Salem	3	38	00:01.6
K Usami	87	390	00:39.2
T Shimada	41	200	00:25.6
S Yamaguchi	3	33	00:01.9
M Ando	3	25	00:01.5
K Takai	30	199	00:10.1
H Fujita	3	27	00:29.5
D Sato	3	15	00:02.0
M Endoh	13	85	00:02.5
M Kurosawa	11	76	00:07.7
H Nohira	3	31	00:02.3
T Hattori	16	100	00:20.2
N Mori	3	37	00:01.5
W Zhang	3	34	00:01.5
A Papakostas	3	37	00:01.6
D Bagnall	4	344	00:00.6
N Zheludev	268	1475	01:59.6
A Wolfgang	3	55	00:02.0
J Kittler	5	30	00:02.9
M Petrou	3	22	00:02.4
Mauricio Varea	2	23	00:03.6
G D Dilliway	3	36	00:05.1
M Karunaratne	3	35	00:00.3
Y Wang	3	49	00:01.7
R Price	3	25	00:01.4
P Ward	10	89	00:02.4
Peter Gething	11	109	00:05.4
Abdisalan Noor	3	26	00:01.6
Dejan Zurovac	3	24	00:05.1
Peter Atkinson	3	52	00:16.8
Simon Hay	15	124	00:06.2
Robert Snow	3	23	00:28.3
LMB Hickey	3	23	00:02.6
V Apostolopoulos	14	123	00:04.8

Continued on next page

Person	Graphs	Triples	Time
RW Eason	392	2063	03:05.5
AA Anderson	3	29	00:04.7
JS Wilkinson	4	734	00:01.5
Milos Krstic	3	45	00:07.5
Ulrich Jagdhold	3	35	00:04.3
A Kukush	34	199	00:12.9
I Markovsky	58	568	00:21.0
S Van Huffel	121	664	00:49.8
Jane Hart	3	58	00:15.5
Royan Ong	3	36	00:02.2
Yee Wai Sim	3	72	00:01.1
V D Blondel	3	22	00:01.5
A Megretsik	3	22	00:01.4
H B Yin	30	232	00:12.0
T Brown	40	242	00:15.7
T Melvin	4	244	00:01.7
E H Gerding	4	199	00:00.5
Mark d'Inverno	3	116	00:00.8
M Georgeff	3	21	00:02.6
Simon Goodall	3	47	00:00.6
Patrick A S Sinclair	3	78	00:02.0
Fabrizio Giorgini	3	31	00:00.6
Matthew J Addis	4	247	00:00.6
Mike J Boniface	3	509	00:00.8
Christian Lahanier	3	35	00:03.3
James Stevenson	3	43	00:01.8
Jonathon S Hare	4	228	00:00.4
Jingtao Yang	3	25	00:01.4
Jessie M N Hey	292	2407	02:02.2
M T McKechnie	30	192	00:10.7
Thomas A Leonard	4	115	00:01.2
S H Olsen	3	33	00:04.1
A G O'Neill	3	27	00:01.6
L S Driscoll	3	17	00:01.5
S Chattopadhyay	3	29	00:01.6
K s K Kwa	3	18	00:03.2
Y T Tang	3	41	00:01.9
Zinovi Rabinovich	3	60	00:01.9
Jeffrey S Rosenschein	3	66	00:03.8
Paul Rosinger	3	73	00:03.1
Nicola Nicolici	3	39	00:01.4
N Momo	3	38	00:01.6
David K Wagg	3	32	00:01.1
T Al-Towaim	3	37	00:01.6
D T S Rijkers	3	34	00:03.4
J I Fletcher	5	50	00:01.7
F Separovic	3	34	00:02.8
Alison Halstead	3	22	00:03.0
Paul Lister	3	22	00:02.5
T Oinn	3	26	00:01.8
J Ferris	3	29	00:00.9
D J Marvin	3	50	00:02.8
M Senger	3	24	00:02.7
T Carver	3	23	00:03.5
M Greenwood	3	35	00:01.5
K Glover	3	26	00:01.7
M R Pocock	3	24	00:03.1
A Wipat	32	264	00:08.4
P Li	3	26	00:01.0
P Pengpad	3	24	00:02.0
K Osman	3	29	00:01.1
N S Lloyd	3	38	00:00.5
J S Hamel	3	39	00:02.7
Y Fu	3	25	00:01.4
M Willander	3	25	00:01.4
Patrick Sinclair	3	78	00:00.3
S Koyama	3	23	00:01.4
K Takashima	30	199	00:09.6
Y Higo	3	23	00:01.7
P M Walker	2	19	00:03.9
L Zhong	3	21	00:01.8
Y Xu	3	29	00:00.5
Robert Thomson	2	11	00:00.1
Paul Bristow	2	11	00:00.4

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Person	Graphs	Triples	Time
Jos Akhtman	3	134	00:02.4
David Hardoon	4	695	00:01.8
Arouna Woukeu	2	32	00:01.7
E Carvalho	3	21	00:04.6
D A Guilhot	3	23	00:01.6
G D Emmerson	54	309	00:28.8
S P Watts	23	147	00:09.1
R B Williams	35	206	00:14.7
N R Harris	5	1417	00:00.7
M Hill	138	693	01:03.7
R G Alamo	3	25	00:03.4
J S Lin	3	23	00:02.7
Michael Leuschel	3	199	00:03.6
DJD Milton	3	29	00:02.9
AD Brown	130	1262	00:53.2
PR Wilson	4	362	00:01.9
A A Roy	4	87	00:00.4
K F Goddard	4	171	00:00.6
D Swatton	3	23	00:05.0
J Brown	3	23	00:04.0
Andrew Tay	3	23	00:04.4
Mahadevan Iyer	3	31	00:01.5
Rao Tummala	3	23	00:07.5
V Kripesh	3	29	00:04.1
E H Wong	3	23	00:02.5
Madhavan Swaminathan	3	23	00:02.6
C P Wong	3	23	00:10.1
Mihai D Rotaru	4	164	00:00.7
Ravi Doraiswami	3	23	00:02.4
Simon Ang	3	23	00:09.8
N N Ahmad	3	37	00:01.5
Chengkang Xie	3	21	00:01.6
Fawaz Alvi	3	27	00:00.5
Zohra Jabeen	3	27	00:00.4
Stephen Beeby	4	720	00:00.6
Graham Ensell	3	188	00:00.4
E A Camargo	3	35	00:08.9
H M H Chong	51	541	00:17.9
R M De La Rue	78	406	00:33.8
Richard M De La Rue	2	9	00:01.3
Pierre Viktorovitch	2	9	00:02.0
Clivia M Sotomayor Torres	2	9	00:01.1
Michele Midrio	2	9	00:01.5
P M Sharkey	3	27	00:00.7
Paolo Terenziani	34	225	00:13.2
Yufeng Dong	3	36	00:04.1
I Mitrovic	3	25	00:04.7
H El-Mubarek	3	87	00:00.4
M Bain	3	18	00:07.1
H S Gamble	3	24	00:01.8
M N Kham	3	30	00:04.0
Ruth Houlihan	3	41	00:07.5
Dong-Hun Kim	45	236	00:13.9
N Loukaides	3	23	00:01.6
G E Georghiou	3	56	00:01.0
Bashir M Al-Hashimi	4	1012	00:02.1
V H K TAN	3	77	00:02.2
Stefania Montani	21	156	00:06.3
Alessio Bottrighi	21	127	00:05.8
Mauro Torchio	22	153	00:34.7
Gianpaolo Molino	22	153	00:10.7
T Iwasa	3	23	00:30.3
A Tanaka	3	40	00:03.3
A Usher	3	34	00:04.7
M Zhu	3	26	00:06.7
A J Matthews	3	25	00:02.4
M Elliott	3	34	00:01.8
W G Herrenden-Harker	3	37	00:09.2
M Y Simmons	3	25	00:06.9
Divakar Yadav	3	21	00:06.2
Rajeev Agrawal	3	18	00:07.3
D S Chauhan	3	17	00:03.6
R C Saraswat	3	41	00:01.5
A K Majumdar	3	17	00:04.1

Continued on next page

Person	Graphs	Triples	Time
R Greef	3	28	00:05.2
S Kanjanachuchai	7	67	00:01.8
Henk Muller	136	758	00:47.5
J J Knapp	3	31	00:02.1
M H Harrison	11	88	00:02.7
Fazly S Abas	3	25	00:01.9
Mohammad F Ahmad Fauzi	3	47	00:00.6
Boniface Mike J	3	23	00:03.1
Grimwood Paul	3	23	00:02.4
G Li	3	55	00:05.4
W Liu	85	557	00:35.4
R T Neal	3	29	00:02.7
M D Charlton	4	269	00:01.4
C E Finlayson	35	206	00:11.4
D M Bagnall	4	344	00:00.4
N I Zheludev	263	1465	01:56.4
M P Temple	3	31	00:31.5
D J Paul	3	19	00:31.5
C Cerrina	3	29	00:31.4
X Li	3	25	00:31.4
A G ONeill	3	27	00:24.4
J F Whidborne	3	51	00:13.3
Dave DeRoure	493	4217	03:48.1
Charles Oppenheim	41	318	00:13.1
George E Georghiou	3	56	00:04.0
Paul L Lewin	4	1039	00:00.8
Andrew C Metaxas	3	45	00:00.5
P Glynne-Jones	84	451	00:37.8
Neil J Grabham	4	164	00:03.1
Steve P Beeby	4	720	00:01.1
Stefan Hallerstede	3	25	00:01.8
CJ Harris	3	560	00:00.8
K L Jerrim	3	41	00:01.7
Sanghee Kim	3	39	00:05.3
R J Falster	3	27	00:04.3
P R Wilshaw	3	35	00:00.8
Marcus T Schmitz	3	39	00:02.1
Petru Eles	3	26	00:03.1
Russel N Torah	4	206	00:05.7
A Lavrinenko	3	23	00:01.6
P I Borel	3	27	00:00.5
L H Frandsen	3	27	00:00.5
M Thorhauge	3	25	00:00.4
A Harpoth	3	25	00:01.4
M Kristensen	3	25	00:08.0
T Niemi	3	23	00:01.4
T B Cook	3	25	00:01.5
L C Anderson	3	25	00:01.4
D Donaghy	22	160	00:10.5
N Goodman	3	23	00:08.7
Stephen Hall	3	106	00:00.6
Octavian Buiu	66	334	00:25.0
James Hendler	221	1057	01:43.3
Stuart E Middleton	4	140	00:02.1
N R Shadbolt	4	1185	00:01.1
D C De Roure	489	4209	03:44.9
Simon Miles	3	70	00:02.4
Masashi Aono	3	23	00:08.0
Yukio-Pegio Gunji	3	16	00:02.4
Yukihiro Kiyota	3	35	00:00.4
Takeo Shiba	3	45	00:00.5
Yalin Zheng	3	38	00:07.9
Robert Allen	3	38	00:01.6
M J Addis	4	247	00:00.6
F Giorgini	3	31	00:00.3
J Stevenson	3	43	00:00.3
P A S Sinclair	3	78	00:00.3
Mohammad Faizal Ahmad Fauzi	3	47	00:04.9
Hessa Al-Junaid	3	43	00:02.2
A H Al-Mazeed	3	24	00:01.5
A Campilho	2	9	00:01.4
M Kamel	2	9	00:03.7
O Alamri	3	72	00:02.2
S Amakawa	3	43	00:01.6

Continued on next page

Person	Graphs	Triples	Time
B Alphenaar	3	23	00:01.4
Alexandru Andrei	3	36	00:01.5
Zebo Peng	3	43	00:11.6
Ethan Munson	2	9	00:04.6
Jean-Yves Vion-Dury	2	9	00:01.2
Apostolos Antonacopoulos	3	52	00:02.0
Dimosthenis Karatzas	3	59	00:01.7
S Marinai	3	22	00:06.4
A Dengel	3	22	00:01.4
Henryk Krawczyk	3	24	00:01.5
Bogdan Wiszniewski	3	24	00:01.5
R Ashri	3	61	00:05.9
T Payne	3	261	00:00.4
D Marvin	3	50	00:00.3
Ronald Ashri	3	61	00:00.3
M S Avila-Garcia	3	25	00:02.6
Michelle Bachler	3	33	00:06.2
Simon Buckingham Shum	3	56	00:02.5
Jessica Chen-Burger	3	23	00:06.6
Jeff Dalton	60	399	00:17.1
Marc Eisenstadt	3	28	00:02.4
Jiri Komzak	3	24	00:01.4
Stephen Potter	3	26	00:06.2
Austin Tate	3	19	00:02.2
M Bahrami	3	30	00:01.4
Paul Baker	3	25	00:05.3
Paul Bristow	3	30	00:02.2
David King	3	25	00:01.2
Robert Thomson	3	19	00:01.6
David Bakewell	3	50	00:02.3
V Bale	3	35	00:02.5
Viktor Bale	3	35	00:03.7
Stephan Weiss	3	225	00:04.4
Alexandru Baltag	3	25	00:03.4
Bob Coecke	3	25	00:02.6
Mehrnoosh Sadrzadeh	3	39	00:06.9
Wibe van der Hoek	2	9	00:02.2
Ayomi Bandara	20	124	00:06.9
Gary Clemo	3	23	00:03.5
L Baramov	3	38	00:01.6
Steve Barker	3	31	00:08.4
N M B Perney	56	385	00:22.2
M D C Charlton	4	269	00:01.5
M Zoorob	94	577	00:38.6
A I Bazin	3	34	00:01.6
S Beeby	4	720	00:01.5
R Torah	4	206	00:02.4
N Grabham	4	164	00:00.6
T O'Donnell	3	54	00:02.2
C Saha	3	18	00:01.5
S Kulkarni	3	44	00:01.7
S Roy	55	283	00:27.8
C Behre	3	24	00:05.7
S Benson	3	24	00:03.0
G Biallas	3	24	00:08.4
J Boyce	3	24	00:02.6
C Curtis	3	24	00:09.0
D Douglas	3	24	00:02.5
HF Dylla	3	24	00:02.5
L Dillon-Townes	3	24	00:07.5
R Evans	3	24	00:02.5
A Grippo	3	24	00:02.6
J Gubeli	3	24	00:02.5
D Hardy	3	24	00:08.0
J Heckman	3	24	00:02.7
C Hernandez-Garcia	3	24	00:08.9
T Hiatt	3	24	00:03.0
K Jordan	3	24	00:09.1
L Merminga	3	24	00:07.9
G Neil	3	24	00:02.5
J Preble	3	24	00:10.1
H Rutt	4	801	00:00.9
M Shinn	3	24	00:02.7
T Siggins	3	24	00:04.6

Continued on next page

Person	Graphs	Triples	Time
H Toyokawa	3	24	00:09.1
DW Waldman	3	24	00:02.8
R Walker	3	24	00:02.5
N Wilson	3	24	00:02.5
B Yunn	3	24	00:08.2
S Zhang	3	24	00:02.7
R A Belecheanu	3	27	00:02.6
M Jacyno	3	34	00:01.9
J Domingue	3	18	00:11.8
L Cabral	3	33	00:03.5
Motta E	3	80	00:00.5
G Jawaheer	3	23	00:06.0
A Hoskins	3	23	00:05.9
J McCann	3	23	00:02.5
S Benkner	20	163	00:02.9
G Berti	17	116	00:06.1
G Engelbrecht	11	82	00:02.5
J Fingberg	3	27	00:00.5
G Kohring	3	25	00:04.0
R Schmidt	8	62	00:02.9
M Brian Blake	3	14	00:03.7
Simon Parsons	3	119	00:02.4
C Braghin	3	22	00:01.4
D Gorla	3	26	00:01.7
Christopher Brewster	3	46	00:06.2
Yorick Wilks	303	1595	02:21.0
M Bu	3	45	00:03.0
B Husband	3	39	00:01.5
J Wilkinson	4	734	00:01.4
Chris Buckley	4	461	00:06.7
Netta Cohen	3	26	00:02.1
Stefan Schaal	2	9	00:01.5
Auke Jan Ijspeert	2	9	00:04.4
Aude Billard	2	9	00:06.2
Sethu Vijayakumar	2	9	00:01.2
John Hallam	2	9	00:01.4
Jean-Arcady Meyer	2	9	00:01.5
M Bugliesi	82	422	00:26.0
G Castagna	3	23	00:04.8
S Crafa	3	32	00:00.9
R Focardi	3	14	00:03.1
S Bussmann	3	33	00:01.6
Stephane Lo Presti	3	26	00:05.2
Phillip Turner	3	52	00:03.6
Christian Jensen	2	9	00:02.3
Stefan Poslad	2	9	00:01.4
Theo Dimitrakos	2	9	00:01.4
Liliana Cabral	3	33	00:00.5
John Domingue	3	18	00:01.4
Enrico Motta	3	80	00:00.4
Farshad Hakimpour	3	23	00:04.0
Bernardo Silva Carmo	3	26	00:00.4
Y H Pauline Ng	3	23	00:01.4
Guang-Zhong Yang	3	23	00:01.4
Guillermo Power	3	41	00:00.6
Christopher Bailey	3	77	00:00.9
John Cartlidge	3	28	00:04.7
J J Castro-Schez	3	23	00:03.1
X Luo	3	53	00:00.8
N Shadbolt	4	1185	00:01.1
F Cattaneo	3	28	00:06.8
Jeremy Baumberg	3	67	00:01.4
Chun-Ming Chang	3	29	00:00.7
Neil J Ross	3	137	00:00.5
Y Sun	3	25	00:05.8
Victor Chang	3	39	00:02.1
O Charlon	3	29	00:01.5
N Chen	3	25	00:01.8
A L Garner	3	27	00:03.3
J Kolb	3	14	00:01.4
R J Swanson	3	25	00:01.4
S Beebe	3	27	00:05.8
R P Joshi	3	25	00:01.4
K H Schoenbach	3	25	00:01.4

Continued on next page

Person	Graphs	Triples	Time
Liming Chen	3	27	00:03.9
Feng Tao	2	44	00:02.1
Carole Goble	3	49	00:06.2
Colin Puleston	3	19	00:01.6
E S Chng	3	57	00:01.9
Z R Yang	2	9	00:06.6
R Everson	2	9	00:01.2
H J Yin	2	9	00:01.4
Z R Yang	2	9	00:01.2
R Everson	2	9	00:08.7
H J Yin	2	9	00:30.0
Richard M De La Rue	2	9	00:03.2
Pierre Viktorovitch	2	9	00:01.3
Clivia M Sotomayor Torres	2	9	00:08.5
Michelle Midrio	2	9	00:01.2
Y L Chong	3	48	00:00.5
Y F F Ho	3	48	00:01.6
H Miyake	3	27	00:01.8
H Nakama	3	23	00:01.5
J-Y Chung	3	23	00:02.5
H Wei	3	52	00:01.7
J Y Chung	3	43	00:27.7
J Admek	2	9	00:02.3
S Milius	2	9	00:01.8
Dirk Pattinson	3	38	00:02.4
Philippa Gardner	2	9	00:01.4
Nobuko Yoshida	2	9	00:01.2
A M Coddington	3	28	00:01.6
R M Coehoorn	3	23	00:02.5
Ray Cooke	3	23	00:02.6
D P J Cotton	25	191	00:10.3
A Cranny	50	546	00:32.7
Simon Cox	3	34	00:01.8
Stephen Harris	3	90	00:00.5
Stephen-John Craig	3	29	00:01.9
Yukiyoshi Kameyama	2	9	00:01.8
Peter J Stuckey	2	9	00:01.4
Yee-Wai Sim	3	72	00:00.3
Jadwiga Indulska	3	14	00:05.6
DA Crutchley	3	35	00:01.4
J-D S Marsters	3	27	00:01.4
V D Dang	3	63	00:00.7
R K Dash	3	94	00:00.3
S D Ramchurn	4	192	00:00.6
Juan A Rodrguez-Aguilar	3	22	00:06.8
Peyman Faratin	3	65	00:00.4
Bo Hu	3	65	00:01.7
Hugh Lewis	3	73	00:00.5
Maud Poissonnier	3	24	00:05.9
RA Bacon	3	21	00:01.6
LA Carr	396	3776	02:52.5
SA White	4	448	00:00.9
Yolanda Gil	3	27	00:03.3
David Basin	2	9	00:01.2
Michael Rusinowitch	2	9	00:09.1
Elizabeth Dicke	3	23	00:15.6
Andrew Byde	3	25	00:00.6
Paul Layzell	3	25	00:01.5
A J Ispeert	2	9	00:04.5
M Murata	2	9	00:02.1
N Wakamiya	2	9	00:01.4
Hubert Dietl	3	39	00:00.5
G D M Dillaway	3	23	00:01.4
N E B Cowern	3	33	00:01.4
L Xu	3	25	00:07.2
P J McNally	3	35	00:00.4
C Jeynes	3	33	00:00.5
E Mendoza	3	25	00:01.4
Cem Direkoglu	3	30	00:01.8
Hasan Demirel	3	29	00:06.9
Huseyin Ozkaramanli	3	29	00:02.9
Mustafa Uyguroglu	3	28	00:02.5
Ahmet M Kondoz	3	24	00:02.5
J A Dominguez-Lopez	3	33	00:02.2

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Person	Graphs	Triples	Time
R M Crowder	4	435	00:00.7
Y Dong	3	36	00:00.5
Carsten Gollasch	32	205	00:10.9
R Dorey	3	25	00:03.3
R Whatmore	3	25	00:02.6
E A Draffan	4	188	00:01.7
A James	3	25	00:02.5
A Fawcett	2	9	00:04.7
Venketech Dubey	46	300	00:12.9
Siegfried Handshuh	2	9	00:01.4
Thierry Declerck	2	9	00:01.2
Z A K Durrani	3	113	00:00.4
T Kamiya	3	53	00:06.8
Partha S Dutta	3	41	00:01.9
Steve R Gunn	4	517	00:00.7
M Dymkov	3	46	00:00.8
I Gaishun	3	35	00:04.4
David W Eccles	3	23	00:02.8
Paul T Groth	4	109	00:02.2
C B Excelente-Toledo	3	1305	00:01.7
S Fatima	3	66	00:05.8
Abbas Fazly	3	25	00:01.3
Andres Flores	3	21	00:02.5
Juan Carlos Augusto	3	21	00:06.0
Macario Polo	3	14	00:02.6
I Foster	3	138	00:00.6
C Kesselman	2	12	00:07.8
David W Fowler	4	115	00:00.5
Derek Sleeman	3	26	00:01.5
Terry Lyon	3	23	00:01.4
David Knott	3	31	00:04.2
Daniel W Franks	3	46	00:02.1
C Freeman	4	342	00:00.6
J Hatonen	3	60	00:01.9
T Harte	3	45	00:01.5
C T Freeman	4	342	00:04.1
J J Hatonen	3	60	00:00.5
C Xie	3	21	00:01.3
A Megretski	3	23	00:02.5
Jeremy Frey	3	91	00:01.4
Gareth Hughes	3	71	00:05.7
Hugo Mills	53	390	00:20.3
Graham Smith	3	38	00:02.9
Simon J Cox	2	9	00:02.2
M Fu	3	61	00:02.0
X Liu	3	21	00:01.6
P W Garratt	3	112	00:00.4
C Dawes	3	23	00:01.9
E Yilmaz	3	29	00:08.0
A Rushton	3	27	00:00.9
Paul William Garratt	3	112	00:00.3
Esat Yilmaz	3	29	00:00.4
L F GAUNT	2	46	00:01.6
T Oda	2	9	00:01.5
MS Gaur	3	37	00:01.5
J Bows	3	23	00:01.5
D C Dibben	3	23	00:07.3
R Ehlers	3	23	00:01.4
A C Metaxas	3	45	00:00.3
D J A Somefun	3	27	00:01.5
J A La Poutre	3	47	00:03.1
M Gallegati	3	22	00:09.4
A P Kirman	3	22	00:01.5
M Marsili	3	22	00:11.1
D C Donaghy	22	160	00:04.4
M Gindila	3	35	00:04.4
R Houlihan	3	41	00:00.3
W Redman White	161	1474	01:10.9
M V Gindila	3	35	00:00.3
Sam Chapman	3	23	00:02.1
Fabio Ciravegna	3	29	00:04.2
Alexei Dingli	26	190	00:06.8
Christopher Bussler	3	13	00:04.5
John Davies	5	28	00:01.8

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Person	Graphs	Triples	Time
A Golfarelli	3	37	00:05.9
M Zagnoni	2	24	00:14.8
P Proli	3	29	00:03.1
S Callegari	3	37	00:05.4
A Talamelli	3	31	00:03.2
E Sangiorgi	3	17	00:03.1
M Tartagni	3	35	00:02.8
C O Gollasch	32	205	00:08.8
S Eriksson	30	190	00:10.0
M Trupke	3	38	00:01.5
Jorge Gonzalez-Palacios	3	23	00:02.6
S Goodall	3	47	00:00.4
P Lewis	4	755	00:00.5
P Sinclair	3	78	00:00.4
M Addis	4	247	00:01.9
C Lahanier	3	35	00:00.4
Thore Graepel	3	32	00:05.5
Ralf Herbrich	3	43	00:02.3
Sebastian Thrun	4	27	00:02.5
Lawrence Saul	4	27	00:05.9
Bernhard Scholkopf	113	644	00:50.9
GB WILLS	243	2164	01:42.6
C BAILEY	3	77	00:00.4
L CARR	403	3790	02:51.6
D WARWICK	3	23	00:01.5
Antonio Ramos	3	33	00:01.8
D R Griffiths	3	29	00:03.1
L Grigore	3	26	00:00.5
P Groth	4	109	00:01.4
L Moreau	385	2459	02:58.8
K Grujic	3	22	00:03.4
O G Helleso	2	18	00:03.7
J P Hole	3	53	00:02.7
I M Guyon	8	86	00:03.5
A Ben-Hur	8	86	00:03.4
G Dror	3	24	00:05.1
M Hadef	3	35	00:01.8
T Matsumoto	3	23	00:02.8
David R Hardoon	4	695	00:01.5
Gerhard Widmer	3	25	00:05.0
Yves Gingras	21	140	00:12.1
Eberhardt Hilf	3	23	00:02.8
M Santiago-Delefosse	3	23	00:06.3
RN Torah	4	206	00:00.3
Steven Harris	3	90	00:00.4
D J Hart	3	25	00:02.9
P N Taylor	3	29	00:01.6
D E Wood	3	27	00:04.7
T J Harte	3	45	00:05.9
J D Ratcliffe	3	70	00:02.7
M He	3	40	00:00.4
Robert John Walters	4	220	00:00.4
Isabel Seruca	2	9	00:02.4
Joaquim Filipe	2	9	00:01.6
Slimane Hammoudi	2	9	00:01.4
Jose Cordeiro	2	9	00:03.8
Massimo Merro	3	19	00:06.7
Nobuko Yoshida	3	24	00:01.9
J Herveg	3	23	00:02.6
F Crazzolara	3	23	00:09.7
Y Poullet	3	23	00:02.6
S J Hettrick	3	39	00:01.9
C Li	3	27	00:02.7
JJ Hawkes	3	29	00:08.1
David Holmes	3	84	00:01.9
Becky Neal	3	23	00:01.5
Mairi E Sandison	3	31	00:03.3
J Siripitayanon	3	23	00:03.7
F J Davis	3	19	00:05.5
Ruth Houliham	3	41	00:00.4
H T How	3	18	00:01.5
R Tanner	3	22	00:01.6
B Hu	3	35	00:02.8
P Hua	2	19	00:03.7

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Person	Graphs	Triples	Time
G Proll	3	32	00:08.2
J Tschmelak	3	32	00:01.9
M A Jackson	3	37	00:01.7
R Nudd	3	32	00:03.4
J Kaiser	3	32	00:01.9
P Krammer	3	37	00:01.6
W Hua	3	45	00:03.5
V Aspostoloupoulos	3	28	00:04.0
T D Huynh	4	128	00:01.3
Trung Dong Huynh	4	128	00:00.3
Karen A Huyser	3	23	00:01.4
Kevin H Knuth	3	23	00:01.4
Domhnull Granquist-Fraser	3	23	00:01.4
Arsen R Hajian	3	23	00:02.6
R Fischer	2	9	00:01.5
V Dose	2	9	00:08.6
Mehdi Jafaripanah	3	18	00:02.4
M Jiang	3	52	00:02.0
Audun Josang	3	24	00:03.0
Christian Jensen	2	9	00:01.5
Stefan Poslad	2	9	00:01.8
Theo Dimitrakos	2	9	00:01.2
Marco Schorlemmer	42	254	00:12.3
Chris Walton	3	21	00:01.4
Mike Uschold	3	23	00:06.0
Amit Sheth	3	75	00:03.5
Stefan Staab	4	45	00:03.0
G R Malcolm	3	22	00:01.7
Nishan C Karunatillake	3	39	00:01.8
T H Liu	3	23	00:02.7
K S Kiang	3	23	00:01.8
B Damrongsak	3	23	00:06.5
D H Kim	45	236	00:14.2
C L Koh	3	38	00:04.6
A Krishna	3	23	00:03.2
S Miles	3	70	00:00.3
Y C Kuang	3	31	00:02.7
P Jarman	56	293	00:21.8
M Kwiatkowska	3	25	00:08.9
R Milner	3	23	00:02.5
D Gow	3	27	00:01.8
A Muzumdar	3	22	00:02.3
Dan Ladley	3	30	00:02.7
M Dorigo	2	9	00:02.5
M Birattari	2	9	00:06.6
L M Blum	2	9	00:01.4
F Mondada	2	9	00:01.5
T Stutzle	2	9	00:02.3
P Lappas	3	23	00:03.0
Richard Lawley	3	33	00:00.5
Jamie Lawrence	3	27	00:08.2
Terry Payne	3	261	00:01.0
Fred Mesnard	2	9	00:01.5
Jesper Jrgensen	3	33	00:02.9
Wim Vanhoof	2	13	00:03.3
Maurice Bruynooghe	3	20	00:03.6
Kevin Feeney	3	26	00:04.1
Simon Courtenage	3	27	00:09.2
C Lhoussaine	6	55	00:02.5
SF Liang	3	38	00:03.3
S M Lima	3	23	00:01.5
A Steimacher	3	23	00:01.4
A N Medina	3	23	00:01.4
M L Baesso	3	23	00:08.9
M N Petrovich	64	382	00:27.4
M Andrejevic	3	30	00:01.7
V B Litovski	3	37	00:06.7
M Anderejevic	3	30	00:00.4
P M Petkovic	3	23	00:02.5
F Lopez y Lopez	3	46	00:02.0
Fabiola Lopez y Lopez	3	23	00:10.8
G Lindemann	3	22	00:01.5
D Moldt	3	22	00:01.4
M Paolucci	3	22	00:02.5

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Person	Graphs	Triples	Time
Steve Munroe	3	67	00:01.9
A MacFarlane	3	24	00:07.2
Lit Ho Chong	3	31	00:02.2
Thanyalak Maneewatthana	3	25	00:04.3
Arthur Stutt	3	12	00:06.0
Nick Gibbins	118	979	00:49.8
David Martin	3	25	00:01.7
Massimo Paolucci	3	65	00:00.8
Sheila McIlraith	3	25	00:02.0
Mark Burnstein	3	37	00:01.8
Drew McDermott	3	15	00:08.1
Deborah McGuinness	3	21	00:02.9
Bijan Parsia	3	21	00:03.5
Marta Sabou	3	21	00:01.7
Monika Solanki	3	21	00:04.0
Naveen Srinivasan	3	31	00:01.8
Katia Sycara	3	115	00:02.4
G Masanovich	3	27	00:01.5
G Reed	3	37	00:03.0
V Passaro	3	31	00:04.5
W Headley	3	27	00:00.5
M Josey	3	23	00:01.4
R Atta	3	23	00:01.9
Naoki Matsumaru	3	34	00:00.5
Florian Centler	3	30	00:00.5
Peter Dittrich	3	22	00:01.6
G R Raidl	3	22	00:03.4
S Cagnoni	3	22	00:04.8
J Branke	3	22	00:01.5
D Corne	3	22	00:01.4
R Drechsler	3	22	00:01.8
Y Jin	3	22	00:01.4
C G Johnson	3	22	00:01.4
P Machado	3	22	00:04.6
E Marchiori	3	22	00:02.4
F Rothlauf	3	22	00:01.5
G D Smith	3	22	00:01.5
G Squillero	3	22	00:02.6
Liz McDowell	3	23	00:02.6
Michael J McGuffin	3	23	00:08.3
K E Meacham	4	103	00:00.9
D Mehdi	3	27	00:01.5
O Bachelier	3	27	00:01.9
G P Mendes	3	21	00:01.8
R Berry	3	45	00:01.6
Mairi Sandison	3	31	00:01.7
A Watts	3	19	00:01.4
F P Mezzapesa	3	25	00:01.5
C Corbari	3	25	00:02.3
O Deparis	3	36	00:01.5
Juri Papay	3	57	00:06.3
Keith Decker	3	26	00:01.4
G Milicia	3	27	00:00.7
David C De Roure	492	4215	03:45.3
Mark K Thompson	3	54	00:07.8
Y Furuta	3	55	00:04.3
Y T Tan	3	61	00:01.6
C Gollasch	32	205	00:08.7
G Vijaya Prakash	3	38	00:03.0
Alena Kukharenka	4	187	00:00.4
M Jones	17	149	00:03.7
M Powell	3	23	00:02.3
E Hinds	57	363	00:20.0
G V Prakash	3	38	00:00.3
Syd Chapman	3	23	00:07.3
Andreas Schreiber	3	23	00:02.5
Rolf Hempel	3	23	00:03.0
Omer Rana	3	35	00:04.9
Laszlo Varga	3	25	00:03.2
Ulises Cortes	3	23	00:13.8
Steven Willmott	3	23	00:02.5
F Bergenti	3	16	00:03.5
M -P Gleizes	3	16	00:01.6
F Zambonelli	3	25	00:01.4

Continued on next page

Person	Graphs	Triples	Time
Mike Luck	3	299	00:08.9
Federico Bergenti	3	16	00:01.5
Marie-Pierre Gleizes	3	16	00:01.3
Franco Zambonelli	3	25	00:00.3
Mairi S Sandison	3	31	00:01.5
Gabriel Mendes	3	21	00:01.3
Richard Berry	3	45	00:05.3
Anthony Watts	3	19	00:01.6
S D Mowbray	3	25	00:00.5
M Nickles	3	40	00:03.5
M Rovatsos	3	40	00:04.9
G Weiss	3	13	00:02.6
A Murgia	2	13	00:02.0
P J Myerscough	3	33	00:04.2
Peter J Myerscough	3	33	00:00.3
J Y Chung	3	43	00:00.4
T D Nguyen	3	43	00:00.6
S Davy	3	25	00:02.8
D W Franks	3	46	00:00.3
S Schaal	3	22	00:05.6
A J Ijspeert	3	22	00:06.0
A Billard	3	22	00:04.1
S Vijayakumar	3	22	00:02.5
M de Pinedo	3	30	00:01.6
J Pollack	4	340	00:00.7
M A Bedau	60	300	00:26.7
P Husbands	3	29	00:02.5
T Ikegami	5	38	00:02.0
R A Watson	4	340	00:00.4
T J Norman	3	65	00:00.7
A Preece	3	40	00:01.3
S Chalmers	3	40	00:00.5
V D Dang	3	63	00:00.4
V Deora	3	28	00:01.3
J Shao	3	21	00:01.8
A Gray	3	50	00:01.1
N Fiddian	3	50	00:01.3
C Goble	3	49	00:00.4
E O'Dea	3	23	00:09.3
M D Paine	3	24	00:02.6
S Gabriel	3	24	00:02.7
A S Schwanecke	46	342	00:19.2
S L Prosvirnin	48	315	00:18.7
W Paszke	3	72	00:01.2
S Paurobally	3	43	00:01.5
J Cunningham	3	33	00:01.5
Ora Lassila	2	11	00:02.3
C B Pearce	3	17	00:01.5
A Ahmed	3	17	00:01.4
C D Johnson	3	30	00:01.4
Alexandra S Penn	4	189	00:02.2
Inman Harvey	11	71	00:03.6
Ivan R Perch-Nielsen	3	23	00:06.2
Anders Wolff	3	23	00:02.8
A Ikiades	3	31	00:01.5
A K Sheridan	2	19	00:01.5
C Y Tai	3	43	00:01.8
N P Sessions	3	33	00:01.9
R Pongvuthithum	3	31	00:03.1
S M Veres	3	50	00:04.2
Christopher M Poulton	3	23	00:02.8
B Deitch	3	29	00:00.4
M K Thompson	3	54	00:00.3
D C de Roure	484	4182	03:43.1
L Godo	3	25	00:00.8
Al Riddoch	3	43	00:04.6
C Riley	3	23	00:01.4
A Michaelides	3	23	00:01.4
K Hoffer	3	23	00:01.4
D Griffiths	3	29	00:00.8
A P Robinson	3	29	00:01.4
Peter von Tessin	3	23	00:02.5
J D Rogers	11	101	00:09.1
Yvonne Rogers	3	34	00:02.1

Continued on next page

Person	Graphs	Triples	Time
Sara Price	4	108	00:00.4
Geraldine Fitzpatrick	3	47	00:02.4
Rowanne Fleck	3	24	00:01.5
Eric Harris	3	90	00:00.4
Hilary Smith	4	145	00:01.2
Cliff Randell	3	24	00:02.3
Claire O'Malley	3	25	00:01.7
Dane Stanton	3	37	00:05.7
Mark Thompson	3	54	00:00.3
J Rousu	3	25	00:01.8
S Szedmak	3	42	00:00.4
M A Salem	3	38	00:01.2
M E Sandison	3	31	00:01.3
G Mendes	3	21	00:01.3
H Morgan	144	1418	01:07.8
G Paun	3	22	00:03.4
G Rozenberg	3	22	00:04.1
A Salomaa	3	22	00:01.6
M Wirsing	2	9	00:01.2
R Ronchaud	2	9	00:01.4
Alun Preece	3	23	00:02.6
David Robertson	35	276	00:09.6
Derek Sleeman	3	28	00:05.3
W A Gray	3	50	00:00.4
N J Fiddian	3	50	00:00.3
G Shercliff	3	32	00:02.2
P J Stockreisser	3	33	00:01.7
P M D Gray	3	61	00:01.2
N Oren	3	32	00:04.1
J Patel	3	33	00:02.2
W T L Teacy	4	108	00:02.6
A K Sheridan	3	25	00:03.1
J A Milton	3	24	00:02.5
J S Wilkinson	3	25	00:02.5
P N Bartlett	3	42	00:02.4
P Ngamukot	3	26	00:02.9
Eric Silverman	3	24	00:02.7
Jordan Pollack	3	20	00:04.6
Phil Husbands Takashi Ikegami	3	20	00:02.4
Dimitris Karagiannis	2	9	00:02.3
Ulrich Reimer	2	9	00:01.5
Andy Edmunds	4	86	00:00.4
Ian Johnson	3	28	00:01.4
Jan Jurgens	2	9	00:01.4
Robert France	2	9	00:04.2
P Sobocinski	35	349	00:10.9
S M Bohte	3	33	00:00.6
P Faratin	5	34	00:01.5
D C Parkes	5	34	00:01.4
J A Rodriguez-Aguilar	5	34	00:01.4
W E Walsh	5	30	00:01.7
Sofoklis Sotiriou	3	24	00:05.9
Michalis Orphanakis	3	24	00:04.0
Stavros Savas	3	24	00:02.5
Costas Tsolakidis	3	24	00:01.5
Menelaos Sotiriou	3	24	00:01.4
Evaggelos Tsiopoulos	3	24	00:01.6
Didoe Prevedourou	3	24	00:01.8
Sotiris Mpithas	3	24	00:01.4
Georgios Prevedouros	3	24	00:01.5
Elena Tavlaki	3	24	00:04.8
George Agapiou	3	24	00:06.4
Anastasios Nikoyiannis	3	24	00:05.1
A Srivastava	3	23	00:01.5
P Matsudaira	3	23	00:01.6
D Ehrlich	3	23	00:01.5
K Subari	3	24	00:01.5
C H Shadle	3	83	00:07.6
A Barney	3	46	00:00.6
V R Sule	3	28	00:01.6
B Sulikowski	3	71	00:00.7
D M Sun	12	126	00:01.2
W B Guo	3	23	00:02.2
C X Liu	6	56	00:01.6

Continued on next page

Person	Graphs	Triples	Time
G D Wang	6	56	00:01.2
X Yan	3	23	00:01.3
B K Xu	3	23	00:02.0
W Y Chen	6	56	00:01.2
R M Sunderland	3	25	00:05.3
G Denker	3	14	00:01.4
S J Taylor	3	42	00:00.4
John Chad	48	302	00:14.7
D Zhang	2	9	00:06.5
A N Jain	2	9	00:01.4
Sheridan Brown	23	165	00:07.7
C Y Tai	2	11	00:01.3
C Grivas	2	11	00:02.3
CY Tai	3	43	00:00.3
B Unal	3	20	00:01.6
MA Ghanem	3	24	00:01.5
PN Bartlett	3	42	00:00.4
Graeme Pound	3	49	00:10.3
Fenglian Xu	3	16	00:04.7
Sim Cox	1275	8006	10:24.8
C Tibenderana	3	33	00:00.9
R N Torah	4	206	00:00.7
T Nagami	51	248	00:19.4
Kung-Kiu Lau	3	22	00:02.9
G V Veres	38	321	00:09.8
Layla Gordon	3	24	00:00.5
P Vytelingum	4	122	00:10.7
R K Dash	3	94	00:00.3
E David	3	41	00:01.9
Deeber Azada	2	9	00:01.4
P Walker	2	19	00:01.4
D Hasko	3	27	00:01.8
P Wang	23	243	00:06.4
Y Z Wei	3	31	00:08.0
Yan Zheng Wei	3	31	00:12.8
A M Weld	11	112	00:11.0
A Irons	3	17	00:01.5
S Alexander	3	22	00:02.5
R Wilcock	3	42	00:01.5
G M Williams	3	27	00:00.5
M LeBlanc	3	27	00:07.9
Simon Kampa	3	30	00:01.8
Dimitris Karagiannis	2	9	00:01.4
Ulrich Reimer	2	9	00:01.4
A Ong	3	26	00:01.9
Grainne Conole	3	57	00:02.0
EC Cooke	4	91	00:00.4
A I Wilmer	3	25	00:00.4
Chris Wroe	3	17	00:01.7
Mark Greenwood	3	35	00:30.3
Phillip Lord	3	26	00:03.4
Yan Xie	12	114	00:02.8
Hakki Eres	3	43	00:01.5
T Yan	3	35	00:01.8
B Jones	3	23	00:01.8
J Astrup	3	23	00:01.4
R Rakowski	3	39	00:01.5
B E Jones	3	23	00:01.3
R T Rakowski	3	39	00:00.3
J Yang	3	23	00:18.6
B-L Yeap	3	89	00:00.5
E-L Kuan	3	34	00:01.3
Li Zhang	665	3002	05:40.2
Michael Bieber	3	24	00:07.5
Vincent Oria	3	14	00:02.5
A V Zayats	3	35	00:05.2
E M Wright	3	23	00:01.5
Carlos Hulot	3	23	00:02.5
L G Samaraweera	3	24	00:01.5
B van Es	3	23	00:02.9
Th J M Tromp	3	23	00:09.2
B Borstner	3	19	00:06.6
J Richardson	3	25	00:01.5
R Lucas	3	23	00:02.3

Continued on next page

Person	Graphs	Triples	Time
R A Salami	3	51	00:00.4
PH Lewis	4	755	00:00.9
RJ Wilkins	3	35	00:00.4
SR Griffiths	3	29	00:04.6
C Garagate	3	25	00:06.6
Z Mrcarica	3	25	00:02.5
T J Kazmierski	4	374	00:00.7
Brown A D	127	1256	00:52.5
I T Moneva	3	23	00:03.2
J Wood	3	23	00:02.5
S Abu Sharkh	2	16	00:01.5
R M Crowder	3	23	00:02.5
P H Chappell	3	23	00:03.4
J Amin	2	11	00:07.3
B Dussardier	2	11	00:00.4
T Schweizer	2	11	00:00.1
M Hempstead	2	11	00:00.5
C J Davies	3	37	00:01.5
C E Vandoni	2	9	00:01.4
T Johnsson	2	9	00:02.7
H W Lau	3	25	00:02.5
R Greef	3	25	00:02.5
M Holling	3	23	00:12.0
H McEvoy	3	24	00:01.7
M Hermenegildo	2	9	00:01.2
S D Swierstra	2	9	00:02.5
M Melly	3	23	00:02.5
J Williams	3	29	00:01.9
J Woodard	3	33	00:01.8
A E Davies	3	191	00:00.4
A R Haydarlou	3	24	00:01.9
C L Jones	3	29	00:04.2
W G Herrenden-Harker	3	37	00:01.8
R Shepherd	3	29	00:01.5
T S Cheng	3	27	00:03.1
C T Foxon	3	27	00:02.5
G Brightwell	3	42	00:03.2
N A Bridgett	3	37	00:02.7
J Brandt	3	31	00:08.2
J Wigger	3	23	00:04.6
Jon Hallett	3	21	00:02.5
A E Mahdi	3	39	00:00.5
G Jordan	3	23	00:08.0
Y Wilcox	3	23	00:02.6
FM Shipman	2	9	00:01.7
R Furuta	2	9	00:01.5
DM Levy	2	9	00:01.4
A Pember	3	25	00:03.6
S Griffiths	3	29	00:00.3
Robert J Wilkins	3	35	00:00.3
R S Doyle	3	23	00:08.2
J C S Cheung	3	30	00:05.9
Y Li	9	83	00:02.6
D J Mills	3	47	00:02.0
Y K Tong	3	27	00:01.6
D M German	3	25	00:01.6
D Chandler	3	23	00:02.5
S Dehghan	3	23	00:04.2
A Collard	3	23	00:04.8
D De Roure	481	4193	03:40.4
E S Chng	3	57	00:04.7
ASAM Halepota	3	23	00:01.7
Afzal Rehman	3	23	00:08.5
J Whitehead	3	23	00:08.4
H Ahlfeldt	3	23	00:14.1
J Webjorn	3	23	00:06.5
P A Thomas	3	23	00:07.9
S J Teat	3	23	00:03.0
J Amin	2	11	00:06.5
W H Loh	2	11	00:01.8
M Hempstead	2	11	00:01.8
M A Arain	3	23	00:09.0
M Brown	3	23	00:04.4
D M Atkin	3	37	00:01.5

Continued on next page

Person	Graphs	Triples	Time
P J Roberts	3	29	00:01.9
R J R Back	3	45	00:03.8
B Mller	2	9	00:01.5
A Ralston	3	23	00:01.6
K P O'Donnell	3	33	00:01.5
P C Smith	3	25	00:03.0
P Wright	3	20	00:19.1
B Cockayne	3	29	00:08.6
P J Wright	3	20	00:01.3
A Bahaj	3	23	00:01.4
S D R Jones	3	23	00:01.5
K Scott	3	23	00:02.2
S Barcelos	3	53	00:02.8
R Kashyap	3	23	00:02.6
P F McKee	3	23	00:02.5
F Sladen	3	23	00:02.4
B Wojciechowicz	3	23	00:02.5
S Barcelos	3	23	00:02.9
M N Zervas	3	23	00:03.7
J Russell P St	3	23	00:02.5
A Barney	3	23	00:02.5
ND Beitner	3	21	00:01.5
CA Goble	3	49	00:00.4
L V Bennett	3	25	00:03.4
H M Collins	3	23	00:02.5
K B Haley	3	23	00:03.8
S J Branch-Evans	3	23	00:02.5
A P Varga	3	23	00:03.7
R G White	3	23	00:02.5
T J Shepherd	3	25	00:02.8
G Wylangowski	3	23	00:02.5
R S Blacker	3	25	00:01.4
D C Bassett	3	67	00:00.4
R N Hampton	3	25	00:01.4
D S Lovering	3	23	00:04.1
G C W Jones	3	23	00:01.8
A B Neilson	3	25	00:01.5
Thony Ph	3	23	00:02.6
A C Large	3	27	00:03.0
P Thony	3	23	00:01.4
B Jaquier	3	33	00:02.3
G R Irwin	2	9	00:01.5
K Warwick	2	9	00:02.4
K J Hunt	2	9	00:01.4
K J Hunt	2	9	00:01.5
G R Irwin	2	9	00:02.4
K Warwick	2	9	00:01.5
G Brady	3	33	00:02.7
K Kalli	3	28	00:04.8
D J Webb	3	28	00:05.9
D A Jackson	3	27	00:03.6
L Reekie	3	28	00:15.8
J L Archambault	3	28	00:02.5
G P Brady	3	33	00:00.4
B D Keplicz	3	19	00:01.4
Z Abed	3	23	00:01.6
R S Brown	3	25	00:03.0
W S Brocklesby	3	25	00:02.5
W L Barnes	3	23	00:03.5
J E Townsend	3	25	00:02.8
H T Bull	3	22	00:01.7
M J Lorrimer-Roberts	3	23	00:01.7
C I Pulford	3	25	00:03.6
W Smith	3	22	00:01.4
P Sunderland	3	23	00:01.4
Peter de Bourcier	2	9	00:01.9
Ronald Lemmen	2	9	00:01.4
Adrian Thompson	2	9	00:01.5
C C Morgan	3	23	00:02.5
S Girard	3	25	00:02.5
D Caffey	3	23	00:06.3
W A Clarkson	3	23	00:03.0
D Esteve	3	23	00:02.6
P Camy	3	35	00:01.5

Continued on next page

Person	Graphs	Triples	Time
A Beguin	3	29	00:05.6
C Lerminiaux	3	37	00:02.6
C Prel	3	27	00:09.9
J E Roman	3	41	00:02.0
J C van der Plaats	3	31	00:01.5
F W Willems	3	31	00:01.5
A M J Koonen	3	20	00:01.6
P Laborde	3	29	00:02.5
Leslie A Carr	399	3782	02:56.4
A F Murray	3	22	00:02.5
K Alkadhimi	3	27	00:03.6
Y Q Chen	3	41	00:04.3
Y Q Chen	3	21	00:02.6
Y Cheng	3	23	00:02.5
J T Kringlebotn	3	27	00:02.5
W S C Chiu	3	23	00:02.5
W S C Chiu	3	25	00:05.2
G Gibson	3	47	00:00.5
R L Koch	3	23	00:01.4
A P Coleman	3	27	00:01.5
M Nieuwenhuyzen	3	23	00:02.5
K R Seddon	3	23	00:02.9
M A Arbib	3	22	00:04.8
N P Major	3	21	00:02.9
B R Gaines	2	9	00:02.3
M Musen	2	9	00:01.4
M A Bramer	2	9	00:04.4
J L Nealon	2	9	00:01.7
R Milne	2	9	00:01.5
C N Pannell	3	23	00:01.5
J P Dakin	3	23	00:02.5
M G Xu	3	39	00:02.6
J Levy	3	22	00:02.6
D Bairaktaris	3	22	00:08.8
J Bullinaria	3	22	00:03.0
J Cairns	3	22	00:05.9
M D Evans	3	23	00:03.2
J R Thorpe	3	21	00:02.9
M A Tranchant	3	26	00:02.6
S D Wood	3	31	00:03.8
Carlos Domingo	3	14	00:02.0
J L Archambault	3	33	00:02.6
E R Taylor	3	23	00:03.2
M P Roe	3	23	00:04.2
M G Xu	3	29	00:03.8
R S Doyle	2	11	00:01.5
E Obermeier	2	9	00:01.5
H Trankler	2	9	00:01.5
O Naim	22	135	00:05.6
D Nicole	5	411	00:04.4
P Durham	3	25	00:02.5
S J Shennan	3	25	00:02.6
J Wilcock	2	9	00:05.6
K Lockyear	2	9	00:01.4
B Dussardier	3	23	00:01.5
H Tate	3	23	00:01.9
A Hatziapostolou	3	23	00:01.5
N C Eaton	3	23	00:03.0
R C Drew	3	23	00:07.1
H Geiger	3	23	00:02.6
M J Elliot	3	21	00:02.1
P J Bussey	2	9	00:01.4
I G Knowles	2	9	00:02.2
W A Pender	3	29	00:05.9
R P Chamberlin	3	39	00:02.6
A N Evans	3	23	00:04.7
Z J Chen	3	33	00:08.1
W A Gambling	3	25	00:02.7
D W Hewak	3	25	00:03.1
H Geiger	3	23	00:02.6
J P Dakin	3	23	00:06.1
N C Eaton	3	27	00:02.9
C Zaldo	3	27	00:01.4
T J Smedley	3	14	00:07.9

Continued on next page

Person	Graphs	Triples	Time
I A Goncharenko	3	25	00:01.5
C H Pratten	3	27	00:03.2
W H Loh	3	23	00:05.9
A Grunseit	3	23	00:02.8
D Lupton	3	23	00:02.4
V Hlavac	2	9	00:07.4
R Sara	2	9	00:01.5
D G Haigh	3	23	00:02.5
L Dempsey	2	9	00:01.5
D Law	2	9	00:02.3
I Mowlat	2	9	00:01.4
H Morowitz	2	9	00:01.4
L Steels	3	22	00:01.4
R Brooks	3	22	00:01.7
B Gorayska	3	22	00:06.4
J L Mey	3	22	00:02.5
V Honavar	3	22	00:02.5
L Uhr	3	22	00:02.4
A Okerson	3	22	00:02.4
J O'Donnell	3	22	00:01.4
N D Matthews	3	23	00:06.9
J M Roberts	3	23	00:02.7
R Wilson	3	36	00:01.5
D J Schiffrin	3	41	00:05.7
R D Harris	3	25	00:02.5
M A Pasha	3	27	00:05.8
P Soper	3	42	00:03.6
M Hempstead	3	23	00:02.7
A M Koonen	3	20	00:01.3
R Ries	3	23	00:09.0
C C Ye	3	25	00:08.5
I Wolton	5	411	00:03.9
J Allwright	3	23	00:01.5
E Martins	3	23	00:08.4
F Moya	3	25	00:02.5
R Hoffman	3	29	00:02.6
G Klein	3	23	00:04.8
K Hsu	3	23	00:04.0
C M Miller	3	23	00:06.0
J T Kringlebotn	3	23	00:02.4
Z W Hu	3	23	00:02.9
P A Thomas	3	23	00:02.7
J Webjorn	3	23	00:03.9
J Huang	3	23	00:01.5
J Fox	3	23	00:04.0
K J Hunt	3	21	00:02.5
R Haas	3	21	00:02.5
M Brown	3	21	00:05.6
M M Huntbach	3	21	00:16.2
G A Ringwood	3	21	00:30.5
I Laresgoiti	3	29	00:01.6
I R Johnston	3	27	00:01.5
S Jordery	3	25	00:01.4
J Hart	2	9	00:01.7
M Kaczmarek	3	29	00:02.5
R W Eason	3	29	00:03.1
A A Anderson	3	23	00:02.5
D Rytz	3	27	00:03.2
M Kaczmarek	2	11	00:01.4
G W Ross	2	11	00:01.6
R W Eason	2	11	00:01.4
P M Jeffrey	3	23	00:02.4
R Ramos-Garcia	3	23	00:03.8
R Troth	3	23	00:05.4
O Sugihara	3	23	00:01.8
L Dong	3	27	00:01.4
P G Kazansky	3	25	00:02.9
J Russell P St	3	25	00:03.1
C N Pannell	3	26	00:01.8
A R Smith	3	31	00:01.9
P Rodden	3	23	00:02.5
J Kremeskotter	3	27	00:04.1
N Robinson	3	27	00:03.7
P L Scrivener	3	25	00:02.4

Continued on next page

Person	Graphs	Triples	Time
B Lanaspre	3	25	00:03.5
T Johnsson	2	9	00:02.7
C R Lavers	3	23	00:02.5
S Hao	3	23	00:04.3
K O'Dwyer	3	23	00:02.4
M Brust	3	23	00:02.5
A J Lawrence	3	23	00:02.5
A H Hartog	13	120	00:04.1
A Leach	9	94	00:03.3
Lennart H Bjerring	3	21	00:01.5
Jane Hall	3	21	00:01.4
Steven R Griffiths	3	29	00:00.3
D Lloyd-Lucas	3	23	00:03.9
R Pechstedt	3	23	00:03.6
T A Birks	3	23	00:02.4
J Russell P St	3	23	00:02.5
W H Loh	3	25	00:08.2
R I Laming	3	25	00:03.0
Y Gu	3	25	00:03.5
M C Farries	3	23	00:06.5
V Koren	3	23	00:02.9
A V Luchnikov	3	23	00:04.8
I V Melnikov	3	23	00:03.5
J P Bowen	2	9	00:01.4
M G Hinchey	2	9	00:02.4
J A Madeiros-Neto	3	23	00:01.4
D W Hewak	3	23	00:01.4
H Tate	3	23	00:01.4
J A Madeiros-Neto	3	33	00:03.0
E Tarbox	8	79	00:03.5
P D Maton	3	23	00:02.5
G M Roba	3	23	00:03.5
B E Kinsman	3	23	00:02.5
R Hanney	3	23	00:02.6
Nigel Major	3	23	00:00.4
J Hallam	2	9	00:01.5
E Martins	3	23	00:03.8
M Duarte	3	23	00:02.4
N D Vieira	3	23	00:02.5
I V Mel'nikov	3	23	00:02.5
I V Mel'nikov	3	23	00:02.5
I V Mel'nikov	3	23	00:02.5
P G Kazansky	3	23	00:02.4
J Russell P St	3	23	00:02.4
M Minden	3	23	00:03.0
H Bruesselbach	3	23	00:03.2
C Gaeta	3	23	00:02.4
A Kost	3	23	00:04.1
T Hasenberg	3	23	00:02.4
D Rockwell	3	23	00:02.9
R Allen	3	23	00:03.3
U Keller	3	23	00:02.4
T H Chiu	3	23	00:02.9
G Ball	52	303	00:17.7
R I Laming	3	23	00:04.0
G G Vienne	3	31	00:02.9
C Marsh	3	53	00:00.6
T P Monks	3	23	00:02.5
J Alarc	3	21	00:03.4
R Halstead	2	9	00:01.4
T Ito	2	9	00:05.5
C Queinnec	2	9	00:01.7
J R Davy	2	9	00:01.5
P M Dew	2	9	00:01.4
A Nadesakumar	3	23	00:01.4
K Washio	3	23	00:03.6
N Homma	3	23	00:02.5
L Priese	3	26	00:01.8
K M McConkey	3	23	00:02.5
D Nunn	3	23	00:07.6
R H Olley	3	33	00:01.6
V A A Banks	3	25	00:04.6
D G Roberts	3	23	00:01.6
R D Pechstedt	3	25	00:02.5

Continued on next page

Person	Graphs	Triples	Time
J Russell P St	3	25	00:05.8
T A Birks	3	25	00:05.9
F D Lloyd-Lucas	3	23	00:02.5
D Pelenc	3	23	00:02.5
I Chartier	3	23	00:04.7
C Wyon	3	25	00:02.5
A Piper	3	23	00:02.5
V Wright	3	25	00:05.0
L Reekie	3	23	00:02.6
M C Rogers	3	23	00:01.4
D M Spirit	3	23	00:03.5
X Huang	3	25	00:02.4
S Nouh	3	23	00:02.4
A Royset	3	29	00:02.5
S Y Set	3	29	00:06.0
I A Goncharenko	3	29	00:03.9
R I Laming	3	29	00:02.7
J Russell P St	3	23	00:02.5
T A Birks	3	23	00:04.5
G A Hutchings	3	23	00:01.4
J R Wilson	2	9	00:03.3
E N Corlett	2	9	00:01.4
C Scully	3	28	00:02.8
W Y Leong	3	25	00:01.4
C J Gibbins	3	21	00:06.4
Metka Shawe-Taylor	3	23	00:03.3
D P Shepherd	3	23	00:04.0
F N Timofeev	3	23	00:02.5
P Bayvel	3	25	00:04.5
J E Midwinter	3	25	00:02.5
R N Timofeev	3	23	00:02.4
A C Tropper	3	23	00:03.4
A C Tropper	3	23	00:02.5
D C Hanna	3	23	00:02.8
G G Vienne	2	11	00:06.0
J E Caplen	2	11	00:04.1
Z J Chen	2	11	00:04.6
L Dong	2	11	00:01.4
J D Minelly	2	11	00:02.0
J E Townsend	2	11	00:01.5
B Wacogne	3	25	00:02.5
C N Pannell	3	23	00:04.0
M P Roe	3	25	00:05.3
T J Pattinson	3	25	00:02.6
G P Liu	3	23	00:01.4
J Wang	2	11	00:05.3
D J Brinck	2	11	00:01.8
R S Brown	2	11	00:01.3
W S Brocklesby	2	11	00:01.4
D N Payne	2	11	00:04.3
GR Leach	3	23	00:02.5
Andrew G R Patterson	3	23	00:03.8
C E W Sundberg	3	23	00:02.5
BP Woolf	3	23	00:02.5
C C Ye	2	11	00:06.0
D W Hewak	2	11	00:01.3
M Hempstead	2	11	00:01.5
B N Samson	2	11	00:01.4
D N Payne	2	11	00:01.4
Jieyu Zhao	3	20	00:01.4
Z G Zhao	3	25	00:01.4
N I Zheludev	3	23	00:03.3
P J Bennett	3	23	00:02.4
W H Loh	3	23	00:13.1
S V Popov	3	23	00:03.6
I R Shatwell	3	23	00:03.1
P Svirko	3	23	00:02.6
V E Gusev	3	23	00:05.7
V F Kamalov	3	23	00:02.5
E V Slobodchikov	3	23	00:02.7
G D Asensi	3	33	00:04.0
R R Merino	3	27	00:04.5
P G Savvidis	3	49	00:01.8
R M Stevenson	3	38	00:01.6

Continued on next page

Person	Graphs	Triples	Time
A I Tartakovskii	3	38	00:01.6
M S Skolnick	3	29	00:02.0
J S Roberts	3	52	00:03.6
D M Whittaker	3	58	00:05.1
V Dubey	46	300	00:13.5
Hans Fangohr	3	31	00:01.7
Andrew Price	3	31	00:00.7
Geoffrey J Daniell	3	31	00:01.4
Alexa M Robinson	3	23	00:02.5
Peter de Groot	180	1072	01:19.6
K Taniguchi	3	33	00:00.4
John Owen	17	135	00:02.4
Richard Lee	102	556	00:39.4
Omer F Rana	3	35	00:02.5
D Wu	3	23	00:02.9
K P Bennett	3	19	00:03.7
Carla Ferreira	3	43	00:01.9
W Grieskamp	2	9	00:01.6
T Santen	2	9	00:01.4
B Stoddart	2	9	00:04.3
S W Christensen	3	25	00:01.4
E A Starke	5	30	00:01.4
T H Sanders	5	30	00:01.4
W A Cassada	5	30	00:01.4
Ashish Darbari	3	44	00:01.6
D Patel	3	31	00:04.3
Jim Ballantyne	3	21	00:03.7
J Pliquett	3	25	00:02.3
M Molinari	3	38	00:04.5
SJ Cox	1262	7991	10:17.3
Andrew R Price	3	31	00:00.4
Simon J Cox	1253	7973	10:17.0
Peter A J de Groot	181	1074	01:19.0
P G Savvids	3	49	00:00.4
R H Istepanian	3	78	00:00.4
Christopher Jones	3	42	00:03.2
Douglas Tudhope	3	37	00:04.2
Richard L Shell	3	22	00:02.6
Ernest L Hall	3	22	00:06.6
M El-hami	3	38	00:01.5
EP James	3	50	00:01.4
N Taghizadeh Irenji	3	26	00:02.6
Z Durrani	3	113	00:04.4
A Irvine	3	29	00:00.9
G Evans	3	33	00:01.5
M Moshrefi-Torbati	3	30	00:01.5
AJ Keane	3	35	00:01.9
SJ Elliott	3	35	00:01.6
MJ Brennan	3	35	00:01.5
N Nicolici	3	23	00:05.9
Don A G Pedder	3	29	00:00.3
J Neil Ross	3	137	00:03.4
Alan C Williams	3	29	00:01.4
I Stirling	3	25	00:02.2
D C De Roure	491	4213	03:45.6
S G Blackburn	3	24	00:05.6
P Misra	3	23	00:02.5
W Shu	3	16	00:02.3
V N Astratov	3	28	00:02.2
M Emam-Ismail	3	32	00:01.6
J D Quayle	3	23	00:05.4
G W Rice	3	23	00:01.8
Ulrich Ultes-Nitsche	3	104	00:00.4
Tommaso Bolognesi	2	9	00:04.1
Diego Latella	2	9	00:01.5
M Rupp	3	33	00:01.8
D Crutchley	3	35	00:00.3
S M Abu-Sharkh	2	16	00:01.3
Z F Hussien	3	24	00:04.7
Maria E Montiel	3	57	00:00.7
Jose Borbinha	2	9	00:01.5
Thomas Baker	2	9	00:01.4
Z A Baidas	3	25	00:04.9
L Baptista	3	18	00:01.6

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Person	Graphs	Triples	Time
R Dechter	2	9	00:01.2
M M R Meagher	3	23	00:01.5
N Cariou-Saintemarie	3	23	00:06.6
J G Head	3	31	00:01.5
J V Champion	3	33	00:00.6
S J Dodd	3	68	00:01.8
Y Zhao	3	37	00:07.0
A K Samingan	3	40	00:02.7
J Head	3	31	00:00.3
J M Generowicz	3	43	00:01.6
B P Hiett	3	40	00:01.7
D H Beckett	3	37	00:03.5
Paul T Gonciari	3	53	00:00.6
H Graoui	3	25	00:06.7
A Nejim	3	23	00:01.5
L Riley	3	29	00:00.5
J Domingo-Ferrer	2	9	00:01.6
A Watson	2	9	00:06.3
Y F F Ho	3	48	00:00.4
R N Hampton	3	27	00:01.3
S Hobdell	3	25	00:01.5
S J Suttun	3	27	00:00.4
David J Hurley	31	234	00:10.1
R L Huynh	3	23	00:09.6
F A Hamid	3	31	00:01.5
D S Lockyer	3	29	00:02.2
J C Vardaxoglou	3	29	00:07.3
R Dechter	2	9	00:01.6
D J D Milton	3	29	00:00.3
A Lamb	3	45	00:00.9
A D Harris	3	33	00:01.5
T V Papakostas	3	28	00:06.0
T Markvart	3	31	00:01.6
W He	3	23	00:02.7
M Sacker	3	25	00:00.3
Y L Sam	3	30	00:01.7
Karl J Sharman	3	25	00:07.9
Jamie D Shutler	3	39	00:00.8
Chris J Harris	3	560	00:12.4
A J Power	3	33	00:00.4
M K Al-Mosawi	3	21	00:02.0
Andrew Tatem	3	22	00:06.6
S Reich	2	9	00:01.6
K M Anderson	2	9	00:01.6
G Hathaway	3	35	00:00.3
SJ Braithwaite	3	67	00:00.4
RD Stewart	3	49	00:00.6
B Xi	3	31	00:08.1
M Dillinger	3	23	00:01.4
B M Al-Hashim	4	1012	00:00.7
P Brusilovsky	2	9	00:03.0
O Stock	2	9	00:01.4
C Strapparava	2	9	00:01.6
N J Grabham	4	164	00:00.6
J P Cathie	3	23	00:09.1
D Sargeant	3	23	00:05.8
Ken S Thomas	4	184	00:02.6
S M Abu-Sharkh	3	24	00:02.8
M R Harris	3	24	00:02.7
T M Kemp	3	23	00:03.1
D Lancaster	3	39	00:00.6
D Pooley	3	31	00:00.4
Robert Tansley	3	23	00:03.4
P J Allen	3	23	00:05.7
R Vaccaro	3	24	00:03.1
G Presutti	3	24	00:02.5
Andrew Currie	3	67	00:02.7
Thierry Massart	3	35	00:00.8
Andrew J Currie	3	67	00:01.0
Andrew M Gravell	4	242	00:00.4
Gopal Gupta	2	9	00:01.4
I V Ramakrishnan	2	9	00:01.2
CH Wong	3	31	00:01.4
PJ Cherriman	3	95	00:00.4

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Person	Graphs	Triples	Time
Helko Lehmann	3	29	00:02.8
John LLoyd	2	9	00:01.9
John Lloyd	2	9	00:03.2
Andreas Podelski	3	25	00:01.5
C R Ramakrishnan	3	25	00:01.4
C L Tan	3	65	00:03.2
Simon St James	3	26	00:09.6
Stephanie Teufel	3	37	00:00.4
Hans Robert Hansen	2	9	00:01.5
Martin Bichler	2	9	00:02.2
Harald Mahrer	2	9	00:01.4
P R Wilson	4	362	00:00.6
Simon Arridge	2	9	00:05.2
Andrew Todd-Pokropek	2	9	00:01.9
RA Lambert	3	29	00:02.2
M A Brown	3	92	00:01.4
L A Dissado	3	37	00:04.0
P A Norman	3	37	00:00.5
Stephen Cox	3	23	00:02.6
M Farina	3	25	00:02.4
G Parker	189	1697	01:24.7
Graham Moore	4	34	00:02.6
J I Seeger	3	25	00:07.0
J Xuesong	3	25	00:02.6
B E Boser	3	25	00:09.1
H Sehr	3	31	00:01.6
A L Takeda	3	24	00:02.9
A J Payne	3	24	00:10.0
Phillip J Turner	3	52	00:00.4
Tom Wagner	2	9	00:01.5
Omer Rana	2	9	00:07.6
M Yu	3	23	00:01.7
X Cao	3	25	00:01.5
C Qiu	3	23	00:13.4
M Brittin	3	25	00:04.1
Jon Read	3	24	00:01.6
S Diehl	3	26	00:01.8
P Sestoft	3	25	00:02.0
D M Garner	3	23	00:02.6
Y Chen	3	23	00:02.5
L Sabesan	3	23	00:02.6
J Clark	3	24	00:03.0
S S Sekiariapuram	3	23	00:02.5
M J Bennion	3	23	00:01.8
Z Kostic	3	24	00:02.5
K B Letaief	3	24	00:02.5
Zhuoan Jiao	3	23	00:01.1
Donna Bergmark	3	24	00:02.1
Carl Lagoze	2	12	00:02.7
Lopez-Alcantud J A	3	23	00:01.5
Kazmierski T	4	374	00:01.4
S Vlahoyiannatos	3	31	00:01.6
S Perry	3	15	00:01.6
GJ Daniell	3	31	00:01.3
Thomas Papakostas	3	23	00:02.6
D L Leslie	15	106	00:04.8
M A Lee	20	132	00:06.8
Jasmin L Wason	3	24	00:02.7
Andrew J Keane	3	24	00:02.8
Robert Allen	2	9	00:01.8
Kerstin Kleese	2	9	00:01.2
Tony Dodd	3	23	00:04.5
S Stefanou	3	25	00:01.4
P Baine	3	15	00:01.5
B M Armstrong	3	21	00:02.5
Hal Varian	3	23	00:01.6
Bob Parks	3	23	00:03.2
Ioannis Antoniou	3	21	00:03.2
Mike Reeve	3	39	00:01.1
Vic Stenning	3	21	00:02.5
BR Baker	3	23	00:05.6
Margaret Cecil-Wright	3	23	00:02.6
Doncaster CP	3	23	00:02.7
Pound GE	3	23	00:02.5

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Person	Graphs	Triples	Time
Cox SJ	1265	7997	10:31.3
J Kim	13	101	00:07.7
J Whittemore	10	83	00:03.9
T Kisu	3	23	00:03.0
M Kato	3	20	00:03.4
T Sakata	3	23	00:01.4
Mark Toller	3	29	00:02.7
NJ Grabham	4	164	00:00.7
Neil J Henderson	2	18	00:01.9
J Domingo-Ferrer	2	9	00:02.4
A Watson	2	9	00:01.2
M Whitehorn	3	24	00:02.5
David P Dupplaw	4	146	00:00.8
Minerva M Yeung	2	9	00:01.5
Boon-Lock Yeo	2	9	00:01.5
Charles A Bourman	2	9	00:01.5
G Guib	3	25	00:02.2
Minerva M Yeung	2	9	00:01.2
Boon-Lock Yeo	2	9	00:01.4
Charles A Bourman	2	9	00:02.3
Anne Seba	3	23	00:02.7
X Wang	3	23	00:01.4
Gary Brian Wills	246	2120	01:43.8
P Cousot	5	30	00:01.7
E Goubault	6	42	00:01.5
J Gunawardena	5	30	00:01.5
M Herlihy	5	30	00:05.9
M Raussen	4	613	00:01.7
U Montanari	3	22	00:02.5
V Sassone	3	22	00:02.5
J C Abanulo	3	17	00:07.6
A M Tjoa	2	9	00:01.7
R R Wagner	2	9	00:01.4
A Al-Zobaidie	2	9	00:01.5
O F Rana	3	35	00:00.4
D Bunford-Jones	3	25	00:00.4
D W Walker	3	75	00:03.6
K Harwick	3	23	00:04.8
L Adhianto	3	199	00:00.5
B Chapman	3	38	00:02.4
E Rogrers	4	1153	00:01.5
M Eugenia Montiel	3	57	00:00.4
A Chin	11	120	00:01.2
Peter J Halls	2	9	00:01.6
K MacDonald	55	403	00:19.2
H Offerhaus	56	341	00:22.7
A Rode	16	175	00:05.1
K Hoh	3	23	00:01.8
M Fujishima	3	23	00:06.4
A Anedda	3	24	00:02.6
C M Carbonaro	3	24	00:02.6
A Serpi	3	24	00:02.8
N Chiodini	3	24	00:02.7
F Morazzoni	3	23	00:05.1
A Paleari	3	24	00:02.5
R Scotti	3	24	00:02.5
G Spinolo	3	24	00:02.6
A M Tjoa	2	9	00:08.5
R R Wagner	2	9	00:01.4
A Al-Zobaidie	2	9	00:01.5
P A Atanasov	3	26	00:02.6
R I Tomov	3	26	00:02.6
J Perriere	3	24	00:02.6
R W Eason	3	26	00:11.0
N Vainos	3	24	00:02.6
A Klini	3	24	00:04.0
A Zherikhin	3	26	00:02.6
E Millon	3	24	00:02.5
E A Austin	3	24	00:02.6
J P Dakin	3	24	00:02.9
E A Austin	3	26	00:02.7
J P Dakin	3	26	00:03.2
A P Strong	3	26	00:03.8
R Aylett	3	16	00:06.1

Continued on next page

Person	Graphs	Triples	Time
K Dautenhahn	3	21	00:03.2
J Doran	3	23	00:02.1
S Moss	3	34	00:02.0
B H B H Blott	3	57	00:00.4
S J Barrington	3	24	00:07.2
R W Eason	3	24	00:02.5
F Gringoli	3	24	00:03.3
R Lambert	3	29	00:00.3
Ayhan Demiriz	2	15	00:02.1
T Bhutta	3	26	00:06.4
D P Shepherd	3	27	00:02.7
C Serrano	3	26	00:04.2
E Daran	3	27	00:02.6
R A Bourne	3	40	00:00.9
C B Excelente-Toledo	3	1305	00:06.4
A J Boyland	2	11	00:00.4
S Mailis	2	11	00:00.4
I E Barry	2	11	00:00.3
R W Eason	2	11	00:00.4
K Kaczmarek	2	11	00:00.4
M Ferraris	3	33	00:00.3
R T Bratfalean	3	25	00:01.5
V I Emelyanov	31	292	00:05.5
S M Brien	3	14	00:02.7
G D'Alessandro	3	24	00:12.7
A D Fitt	3	24	00:02.5
Heather Brown	3	21	00:01.5
Peter Brown	3	21	00:01.5
Wendy Milne	2	11	00:04.1
D T Jones	3	19	00:01.4
Mark A Bedau	2	9	00:01.4
John S McCaskill	2	9	00:14.9
Norman Packard	2	9	00:01.6
Steen Rasmussen	2	9	00:01.5
C W Chan	3	31	00:01.5
W C Chan	3	31	00:01.9
K C Cheung	3	25	00:02.6
A D Channon	3	32	00:01.4
J A Chaos	3	23	00:01.5
V Pruneri	3	23	00:01.4
J Gonzalo	3	23	00:01.4
C N Afonso	3	23	00:01.7
J L Chen	3	27	00:01.5
R P Myers	3	23	00:03.3
R N Gunn	3	33	00:00.7
T F Yao	3	45	00:01.4
H Reichel	2	9	00:04.1
M Klusch	2	9	00:03.2
L Kerschberg	2	9	00:01.4
Ian Health	3	86	00:00.4
K Hindriks	3	22	00:03.9
J P Bowen	2	9	00:07.7
S Dunne	2	9	00:01.5
A Galloway	2	9	00:01.5
S King	2	9	00:01.4
R L B French	3	37	00:01.7
T W Scutt	3	41	00:00.6
M O Gore	3	27	00:01.5
S R Harnad	4	938	00:07.8
Alastair de Watteville	3	25	00:07.4
C M deSterke	13	120	00:04.8
S Dhanjal	3	27	00:12.5
S Hoogland	3	37	00:02.0
J Roberts	30	262	00:11.3
Ezequiel A Di Paolo	47	347	00:19.3
Mark A Bedau	60	300	00:24.3
John S McCaskill	3	22	00:01.4
Norman Packard	3	22	00:01.4
Steen Rasmussen	3	22	00:01.4
T J Dodd	3	35	00:31.5
C Ramirez	3	24	00:32.5
A J Boyland	3	25	00:31.6
Samhaa El-Beltagy	3	23	00:32.5
D Faccio	3	28	00:31.5

Continued on next page

Person	Graphs	Triples	Time
P Kazansky	3	58	00:31.4
P Buckle	3	23	00:32.5
J Foss	3	23	00:31.4
K Garcha	3	23	00:31.3
P Turner	3	52	00:30.3
Cs Szepesvari	3	35	00:30.8
J Aracil	3	22	00:02.0
F Gordillo	3	22	00:02.5
M Mohammadian	3	22	00:01.5
A E Popescu	3	33	00:00.5
K Sheng	3	44	00:03.9
P Glasson	3	23	00:01.7
S Erfurt Andesen	3	23	00:02.3
V Dotsenko	3	23	00:01.8
W Bailey	3	23	00:01.6
A Kristensen	3	23	00:02.4
H Gnewuch	3	24	00:01.8
N K Zayer	3	24	00:03.2
C N Pannell	3	24	00:01.8
G W Ross	3	24	00:03.7
M Nagl	2	9	00:02.7
A Schrr	2	9	00:01.5
M Mnch	2	9	00:02.0
M Kurt	3	25	00:03.8
M Anderson	2	9	00:03.3
P Cheng	2	9	00:01.2
V Haarslev	2	9	00:01.5
G Taentzer	3	23	00:02.5
R Heckel	2	9	00:01.4
A Corradini	2	9	00:03.4
others	2	9	00:01.4
P Albertos	2	9	00:01.5
A Sala	2	9	00:01.5
O Hadeler	3	24	00:02.7
M N Zervas	3	24	00:02.7
F Morier-Denoud	3	25	00:02.7
J S Roberts	30	262	00:07.4
K Sinha	3	22	00:01.4
M M Gupta	3	22	00:01.4
M Henini	3	23	00:02.8
J I Mackenzie	3	28	00:01.7
D Shepherd	324	1670	02:29.2
A K Mairaj	3	37	00:02.1
Y W West	3	54	00:00.3
D Lancaster	12	111	00:07.3
W Horn	2	9	00:05.3
Janet Ho	3	23	00:02.6
Mark Chignel	3	22	00:02.8
J Hothi	3	27	00:06.4
T Sly	3	21	00:08.3
T R Ilic	3	23	00:01.4
K M Zarkovic	3	23	00:01.4
P O'Brien	3	27	00:01.5
B Odgers	3	23	00:01.5
J L Alty	3	18	00:06.0
Y Lesperance	3	24	00:01.5
P -S Chan	3	23	00:01.4
Alexander J Smola	3	21	00:09.9
Bernhard Schlkopf	3	77	00:03.5
Dale Schuurmans	3	21	00:03.3
M Key	3	24	00:03.4
I G Hughes	3	24	00:05.9
W Rooijakkers	3	24	00:02.5
B E Sauer	3	26	00:01.5
T L Lenox	3	29	00:01.9
S Hahn	3	27	00:05.5
M Lewis	3	30	00:02.1
K Sycara	3	115	00:00.4
Terri L Lenox	3	29	00:00.3
Susan Hahn	3	27	00:00.3
Michael Lewis	3	30	00:00.3
Zisen Li	3	23	00:05.2
J S Moodera	3	29	00:04.5
P Light	3	32	00:03.3

Continued on next page

Person	Graphs	Triples	Time
E Nesbitt	13	94	00:03.9
V Light	13	94	00:06.3
R Joiner	3	22	00:01.5
Huma Lodhi	3	33	00:01.6
S Longhi	3	30	00:04.0
M Marano	3	30	00:03.4
P Laporta	3	30	00:02.6
B Agofliati	3	24	00:06.0
M Belmonte	3	26	00:02.8
D Scarano	3	28	00:02.6
V Pruneri	3	30	00:02.6
B Agogliati	3	26	00:02.5
O Svelto	3	24	00:16.6
B Luther-Davies	3	24	00:01.5
I Nee	3	24	00:02.5
M Muller	3	24	00:04.5
K Buse	3	24	00:04.3
A Mairaj	3	37	00:00.9
P Jander	3	24	00:02.0
R S Britton	3	23	00:02.5
J F Manslow	3	29	00:01.4
S Lek	3	22	00:04.6
J F Gugan	3	22	00:03.5
A Marino	3	23	00:01.4
S M Maughan	3	24	00:02.5
T M Monro	3	24	00:02.6
W Belardi	3	36	00:04.7
K Furusawa	3	93	00:03.6
T M Monro	4	244	00:00.9
T-H Kim	3	23	00:01.4
C Tanaka	3	23	00:04.9
Dan Joyce	3	32	00:00.4
Dave Millard	279	2255	01:50.2
Robert Tansley	3	20	00:03.7
H O Muller	3	65	00:00.3
L N Ng	3	27	00:01.5
C Knight	3	22	00:02.5
M Studdert-Kennedy	3	22	00:02.5
J Hurford	3	22	00:03.3
J -A Meyer	3	34	00:02.6
A Berthoz	3	22	00:05.5
H Roitblat	3	22	00:01.4
S W Wilson	6	36	00:02.5
HJ Strangeways	3	23	00:07.4
Jeni Tennison	24	181	00:05.8
Rose Dieng	2	9	00:01.5
Olivier Corby	2	9	00:03.3
N Amann	3	26	00:03.5
H -C Peng	3	23	00:02.6
Q Gan	3	23	00:02.5
H S Kim	3	24	00:04.5
P C Teh	73	415	00:34.2
H Pillai	3	24	00:01.6
S Pissadakis	2	11	00:01.2
L Reekie	2	11	00:01.4
M N Zervas	2	11	00:01.4
K Moschovis	2	11	00:05.6
G Kiriakidis	2	11	00:01.2
John C Platt	3	14	00:02.7
E V Podivilov	3	24	00:03.8
B I Sturman	3	24	00:02.5
G F Calvo	3	24	00:03.5
F Agullo-Lopez	3	24	00:03.3
M Carrascosa	3	24	00:02.6
V Pruneri	3	24	00:03.9
V Pruneri	3	24	00:01.4
S Longhi	3	24	00:06.4
O Rana	3	35	00:00.3
K Bernstein	3	23	00:02.6
Seigfied Reich	3	65	00:00.3
Uff K Wiil	2	18	00:01.4
Peter J Nuernberg	82	466	00:25.7
Kaj Groenbaek	3	29	00:00.9
Kenneth M Anderson	3	20	00:01.4

Continued on next page

Person	Graphs	Triples	Time
Joerg M Haake	3	23	00:01.4
S J Russell	3	24	00:03.3
K R C Brady	3	24	00:02.5
J P Dakin	3	24	00:02.6
H A Tan	3	41	00:01.6
A O Rybaltovskii	3	26	00:01.6
Y S Zavorotny	3	25	00:03.1
P V Chernov	3	27	00:01.5
V N Bagratashvili	3	27	00:04.5
S I Tsypina	3	27	00:01.5
P G Kazansky	3	24	00:01.4
Matthias Rychetsky	3	21	00:01.5
Manfred Glesner	3	14	00:03.0
H Brown	3	21	00:04.8
G Donald	3	21	00:02.5
P Halson	3	31	00:01.6
Alex Smola	3	21	00:01.4
Michael Milton	3	21	00:04.6
G Schreiber	86	665	00:34.2
H Akkermans	89	475	00:39.8
R de Hoog	9	78	00:20.0
J Tennison	24	181	00:10.0
H Howells	3	23	00:02.5
P T McCabe	2	9	00:01.2
M A Hanson	2	9	00:01.5
S A Robertson	2	9	00:01.4
Peter J Bartlett	187	934	01:14.9
Bernard Schlkopf	3	77	00:02.8
Alex J Smola	3	21	00:03.0
Colin Bird	3	21	00:01.5
Fionn Murtagh	95	531	00:35.5
T K Kabadjova	3	23	00:02.5
S Tonchev	3	23	00:04.4
M Kaneva	3	23	00:04.1
S Urwin-Wright	3	31	00:01.5
B Uzunoglu	3	26	00:03.7
M Tan	3	26	00:02.8
W G Price	3	26	00:04.2
H J Zhang	3	23	00:03.2
L Zhu	3	23	00:04.6
X L Meng	3	23	00:02.5
H Wibowo	3	22	00:00.6
J S Wilkinson	3	14	00:02.6
U Oberst	3	23	00:01.4
J F Whidborn	3	51	00:03.8
J Well	3	41	00:01.5
I Bradley	3	33	00:01.5
F Zambonelli	3	19	00:02.9
P Zaris	3	23	00:08.4
M N Zervas	3	24	00:02.5
M N Zervas	3	24	00:04.6
Z Zhao	3	23	00:01.4
S Kaya	3	31	00:01.5
J Watling	3	45	00:01.5
J Barker	3	42	00:01.8
M Palmer	3	48	00:02.0
T Whall	3	68	00:00.4
E Parker	3	69	00:00.4
M Passot	3	25	00:02.6
P N Robson	3	25	00:02.6
M G Stubbs	3	23	00:04.7
A P O Foss	3	23	00:02.5
D P D Whitworth	3	23	00:03.5
C R Stanley	3	23	00:01.4
R L Heimann	3	24	00:02.8
R A Snowdon	3	29	00:01.5
V Anagnostopoulos	3	21	00:04.8
S Chatzis	10	76	00:02.5
C Lalos	3	23	00:01.4
A Doulamis	122	541	00:59.1
D Kosmopoulos	13	96	00:15.8
T Varvarigou	3	54	00:01.5
H Neuschmied	3	21	00:01.4
G Thallinger	3	23	00:01.4

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Person	Graphs	Triples	Time
S E Middleton	4	140	00:01.3
E Bustos	3	21	00:01.4
C Arus	3	27	00:01.5
B Celda	3	27	00:03.4
H Gonzalez-Velez	18	137	00:05.0
M Lluch-Ariet	18	130	00:04.0
M Mier	3	28	00:01.7
A Peet	25	161	00:30.0
M Robles	3	26	00:01.4
Arsenia Chorti	3	27	00:01.7
Joern Werner	3	23	00:01.4
Jack Hale	3	19	00:01.5
Artur Jaworski	3	20	00:01.6
Guan Meng	3	41	00:01.5
Tom Dyakowski	3	19	00:01.4
MN Hamidon	3	25	00:02.6
V Skarda	3	25	00:17.5
F Krispel	3	25	00:02.5
P Krempl	3	25	00:06.1
M Binhack	3	25	00:02.5
W Buff	3	25	00:02.5
R Townsend	3	53	00:06.0
Taban Panahi	3	49	00:01.5
X X Wang	2	11	00:01.5
D Lowe	2	11	00:01.6
X X Wang	2	11	00:00.3
D Lowe	2	11	00:00.2
X X Wang	2	11	00:00.4
X Hong	2	11	00:00.1
A Demenko	33	157	00:11.1
Aiman El-Maleh	60	303	00:23.8
Syed Saqib Khursheed	4	124	00:01.6
Sadiq M Sait	13	106	00:03.8
M F A Fauzi	3	47	00:02.8
K Fill	3	32	00:02.8
R Ottewill	3	23	00:02.5
MZ Hayat	3	27	00:01.4
CJ Boutle	3	40	00:01.7
S C Higgins	3	31	00:01.5
Tamas Kifor	3	23	00:01.4
Javier Vazquez-Salceda	3	23	00:06.9
Sergio Alvarez	3	23	00:01.5
Loredana Laera	3	26	00:02.5
Valentina Tamma	3	16	00:08.3
Jerome Euzenat	3	26	00:02.5
Trevor Bench-Capon	3	73	00:03.3
A S Vaughan	4	617	00:00.6
Y Zhang	3	25	00:01.5
J Akhtman	3	134	00:01.2
Kosuke Takenaka	3	24	00:02.5
Yuichi Setsuhara	3	24	00:09.6
Kazuaki Nishikawa	3	23	00:02.5
Akinori Ebe	3	24	00:02.5
Shinya Sugiura	3	38	00:01.7
Kazuo Takahashi	3	24	00:02.5
Koichi Ono	3	24	00:02.5
EE Ambroggio	3	23	00:02.7
MA Villarreal	3	23	00:02.5
GG Montich	3	23	00:23.4
DTS Rijkers	3	34	00:01.0
GD Fidelio	3	23	00:02.5
L L Barre	3	28	00:00.4
Arthur Sale	3	24	00:06.7
Chawki Hajjem	4	938	00:00.8
N L Geard	4	245	00:01.1
H Gonzalez-Velz	18	137	00:03.4
Nadim A Haque	3	27	00:05.4
F A Montjen	3	23	00:01.8
Maria Karam	3	34	00:01.9
P M Mitchinson	4	111	00:05.3
P L Lewin	4	1039	00:01.7
T ODonnell	3	54	00:00.3
H Loder	3	23	00:01.5
J Tudor	4	407	00:00.4

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Person	Graphs	Triples	Time
J C Tan	3	29	00:03.7
S A Tsipas	3	27	00:01.5
J A Curran	3	24	00:05.5
S Paul	3	26	00:01.5
T W Clyne	3	45	00:01.8
G Gherbaz	3	27	00:01.4
N Abd Rashid	3	24	00:07.5
X X Wang	2	11	00:00.4
S A White	4	448	00:00.7
Janet Carter	3	27	00:01.6
Stephan Jamieson	3	26	00:06.6
Nick Efford	3	26	00:01.4
Tony Jenkins	3	27	00:01.4
J Wu	2	11	00:05.8
G Li	2	11	00:01.5
J Chu	2	11	00:01.5
Nor Aniza Abdullah	3	32	00:01.6
Y Kawata	3	38	00:01.7
M A H Khalafalla	3	64	00:00.7
Matthias Klusch	3	23	00:01.6
Michael Rovatsos	3	23	00:01.4
E Koukarenko	4	187	00:06.7
T Saha	3	23	00:01.6
S Kulkani	3	44	00:00.3
A Kyprianou	3	27	00:01.4
V Efthimiou	3	23	00:03.0
A Stavrou	3	27	00:01.5
M Manoharan	37	189	00:13.5
M A Rafiq	3	42	00:01.9
M R Rodrigues	3	25	00:01.6
Sue Slattery	3	24	00:03.2
P Vanichchanunt	3	23	00:04.1
K Woradit	3	23	00:11.0
S Nakpeerayuth	3	23	00:05.3
L Wuttisittikulkij	3	23	00:02.9
H Mohamod	3	23	00:04.8
A Livingstone	3	29	00:01.6
C L Dennis	3	27	00:01.5
J F Gregg	3	27	00:02.7
S M Thompson	3	27	00:04.8
Luigi Dilillo	3	28	00:01.5
Patrick Girard	3	26	00:01.9
O Kullmann	3	21	00:02.9
J Marques-Silva	4	455	00:00.7
S-H Liu	3	14	00:05.6
W-H Xu	3	14	00:01.5
Ines Lynce	3	81	00:02.1
Antonio Jose Morgado	3	25	00:01.5
X Liu	3	44	00:01.6
Y An	3	23	00:03.4
J J Holt	3	23	00:03.4
G R Mitchell	3	37	00:00.4
Ali Ejlali	21	157	00:06.5
Marcus Schmitz	3	39	00:04.4
Seyed G Miremadi	3	14	00:02.6
Zia Hayat	3	28	00:01.4
Chris Boutle	3	40	00:00.3
Osamu Kaneko	3	17	00:05.0
Gary T Leavens	3	55	00:03.0
Jean-Raymond Abrial	3	25	00:02.4
Don Batory	3	83	00:00.4
Alessandro Coglio	3	21	00:01.4
Kathi Fisler	3	21	00:02.4
Eric Hehner	3	21	00:01.4
Cliff B Jones	3	42	00:03.3
Dale Miller	3	21	00:01.5
Simon Peyton-Jones	3	21	00:03.1
Murali Sitaraman	3	21	00:03.7
Douglas R Smith	11	117	00:01.7
Aaron Stump	3	21	00:01.4
Arun Mahindrikar	3	23	00:02.5
Shodhan Rao	3	29	00:04.7
Ravi Banavar	3	23	00:03.1
Sara Merchant	3	23	00:02.3

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Person	Graphs	Triples	Time
David Muir	3	23	00:05.8
A Plati	3	23	00:01.8
R Persoons	3	23	00:01.4
K van Acker	3	23	00:01.5
Amit Shabtay	3	23	00:03.1
M Wald	50	601	00:17.9
B R Davidson	3	23	00:01.9
Laurent Voisin	3	22	00:01.6
Zhiming Liu	2	9	00:03.1
Jifeng He	2	9	00:01.4
Adrian N Evans	3	24	00:02.6
Xin U Liu	3	38	00:01.9
P Garcia-Sanchez	3	25	00:02.2
A Ramos	3	33	00:02.5
NG Green	4	385	00:00.4
Quintin Gee	3	38	00:01.6
T D Huynh	4	128	00:01.9
P Padhy	3	33	00:01.6
A Elsaify	3	27	00:01.4
G Zou	3	27	00:01.4
A Riddoch	3	43	00:01.3
H L R Ong	3	21	00:02.6
S Matsuda	3	25	00:05.9
S Saito	29	151	00:10.1
T Arai	29	151	00:12.6
Y Kimura	3	23	00:01.4
Richard Morris	3	24	00:04.5
Graham J Hitch	3	24	00:01.4
Neil Beagrie	3	24	00:01.4
J Ogi	3	31	00:01.5
N Mono	3	23	00:01.4
B Pruvost	3	34	00:05.2
Jonathan M Cooper	3	23	00:03.3
Arumugam Paventhan	3	27	00:01.6
Kenji Takeda	5	411	00:02.4
Alexandru Baltag	3	21	00:02.5
Timothy Brody	4	177	00:04.5
H -J Cheong	3	17	00:01.5
D Hippo	3	34	00:01.6
D Kunz	3	23	00:01.5
M M A Hakim	38	385	00:15.2
K Urakawa	3	29	00:01.9
Jingook Kim	3	23	00:02.5
Seungyong Baek	3	23	00:03.2
Jongbae Park	3	23	00:04.0
Mahadevan K Iyer	3	31	00:01.0
Joungho Kim	3	23	00:02.5
Vidit Bansal	5	31	00:02.7
Kamalakar Karlapalem	5	31	00:03.6
K Faith Lawrence	3	36	00:02.2
Michael O Jewell	3	26	00:00.5
m c schraefel	187	1185	01:24.6
Timothy Lewy	3	23	00:02.6
B L Luk	2	11	00:01.2
K P Liu	2	11	00:01.5
A A Collie	2	11	00:01.4
D S Cooke	2	11	00:02.1
Guantiang Meng	3	41	00:00.3
Jamie Shutler	3	39	00:00.3
Harold MH Chong	51	541	00:17.8
Richard M De La Rue	78	406	00:42.5
Liam O'Faolain	3	17	00:02.6
Thomas F Krauss	3	17	00:02.9
Nadia Belabas	3	23	00:02.6
Arial Levenson	3	23	00:02.5
Fabrice Raineri	3	23	00:03.2
Rama Raj	3	23	00:02.5
Isabelle Sagnes	3	23	00:02.5
Dominique Coquillat	3	31	00:01.6
Magali Astic	3	23	00:02.5
Philippe Delaye	3	23	00:03.0
Philippe Lalanne	3	23	00:02.5
Robert Frey	3	23	00:02.5
Gerald Roosen	3	23	00:02.5

Continued on next page

Person	Graphs	Triples	Time
K Matsui	3	23	00:04.1
Matthew Collins	3	22	00:01.5
Rajdeep K Dash	3	94	00:00.8
M R R de Planque	3	23	00:02.4
K H Fisher	3	23	00:04.3
R M Berry	3	45	00:00.4
Venketesh Dubey	46	300	00:12.7
N Lukyanchikova	3	33	00:00.8
N Garbar	3	33	00:01.5
A Smolanka	3	31	00:01.5
M Lokshin	3	31	00:02.8
K Mallik	4	136	00:01.5
Max L Wilson	3	61	00:00.8
Daniel Alexander Smith	4	318	00:00.4
C W Trowbridge	3	35	00:01.6
Ryen W White	12	90	00:03.5
Bill Kules	3	23	00:02.4
Steven M Drucker	3	23	00:01.7
I J Youngs	3	23	00:01.4
David J Bakewell	3	50	00:01.6
P Rainger	3	24	00:03.3
A F W Willoughby	3	36	00:03.7
L Fiore	3	23	00:02.6
R Petralia	3	23	00:02.7
C Alemanni	3	23	00:02.5
A Messina	3	23	00:05.0
J C Willems	47	256	00:16.7
B De Moor	227	1237	01:49.3
P Cherriman	3	95	00:00.6
K Ogawa	3	23	00:02.9
K Tomiyama	3	23	00:01.4
Y Tan	3	61	00:00.4
M Doan	3	23	00:02.0
Y Bin	3	23	00:01.6
D -L Kwong	3	23	00:01.4
S Yamada	3	23	00:04.2
J Cole	3	23	00:01.3
Y Katayama	3	23	00:01.4
Beining Chen	3	21	00:02.6
Robert F Harrison	2	12	00:05.1
Peter Willett	3	24	00:04.0
David J Wilton	3	23	00:02.5
David J Wood	3	21	00:02.6
R Y S Tee	3	510	00:02.4
F C Kuo	3	23	00:02.9
LH Chong	3	31	00:00.3
CH de Groot	4	426	00:00.6
R Kersting	3	23	00:01.4
Geoffrey Miller	3	22	00:04.6
Jeremy G Frey	3	91	00:00.4
Michael B Hursthouse	496	2492	04:18.1
Mark E Light	231	1287	02:00.2
Andrew J Milsted	3	32	01:07.9
Christopher J Gutteridge	4	191	00:01.0
Hugo R Mills	53	390	00:18.1
Ken E Meacham	4	103	00:05.9
Michael Surridge	3	77	00:00.4
Elizabeth Lyon	3	21	00:01.5
Rachel Heery	3	22	00:01.4
Monica Duke	3	22	00:04.4
Michael Day	3	22	00:01.5
S J Dodd	3	68	00:01.1
K I Wong	3	28	00:01.4
G S Galitonov	3	17	00:01.6
Abu Hena Razibul Islam	3	23	00:05.7
J B Song	3	23	00:02.5
V I Zadorozhnii	3	24	00:02.5
A N Vasilev	3	24	00:03.6
V Yu Reshetnyak	3	24	00:02.5
T J Sluckin	3	24	00:02.5
Sumit Kundu	3	24	00:06.4
Saswat Chakrabarti	3	24	00:02.6
E Rowland Watkins	3	32	00:01.7
S Abu-Sharkh	3	24	00:04.0

Continued on next page

Person	Graphs	Triples	Time
RJ Arnold	3	24	00:01.4
J Kohler	3	24	00:02.4
R Li	3	24	00:01.4
K Steemers	3	24	00:01.4
P Wilson	4	362	00:02.9
R Yao	3	24	00:01.4
A E Markaki	3	24	00:03.1
S Leung	3	24	00:02.5
D DiBiase	3	23	00:04.8
A Nelson	3	24	00:02.4
Kun Guo	30	206	00:09.3
Robert Robertson	30	206	00:09.1
Malcolm Young	34	219	00:13.5
S H Hwang	3	25	00:00.6
S Krause	3	23	00:01.4
W Moritz	3	23	00:01.4
H Talabani	3	23	00:01.4
M Xu	3	23	00:01.4
A Sabot	3	23	00:06.1
M Rastello	3	21	00:01.7
P Premoli	3	23	00:01.5
A Fragaki	3	24	00:01.5
D J A Somefun	3	27	00:03.4
Gerald Weber	15	131	00:04.8
Niall Haslam	15	160	00:04.0
Nava Whiteford	16	173	00:05.4
Jonathan Essex	16	143	00:04.5
Cameron Neylon	24	216	00:07.5
M E Kiziroglou	3	62	00:03.5
A A Zhukov	97	520	00:42.6
X Li	2	20	00:01.7
D C Gonzalez	3	54	00:02.4
M Abdelsalam	3	30	00:01.5
P N Bartlett	61	338	00:25.9
P A J De Groot	182	1076	01:17.9
C H De Groot	4	426	00:00.6
S Hafeez	3	22	00:00.7
D Prideaux	3	33	00:01.5
R Lowe	3	35	00:01.2
P H Lewis	4	755	00:00.7
Arash Ahmadi	3	39	00:01.6
S Ahmed	3	51	00:01.9
M Ahsant	3	21	00:04.3
T A Leonard	4	115	00:00.6
A Krishna	4	187	00:00.3
O Mulmo	3	21	00:01.5
C Y Wei	3	23	00:01.5
Thomas Keller	5	30	00:01.6
Jerzy Baranowski	3	23	00:03.0
Hend S Al-Khalifa	24	167	00:08.4
N Wu	3	36	00:01.6
Ben O'Neil	3	25	00:01.7
M Y Alias	3	33	00:05.8
T Keller	2	10	00:01.2
S E Middleton	4	140	00:01.1
Paul Andr	4	190	00:01.3
Martin Chapman	3	26	00:03.5
Alex Frazer	3	46	00:02.1
Alex Hayton	3	23	00:06.8
Gavin Willingham	3	23	00:02.6
Patrick Hung	2	9	00:20.1
David Bridson	3	23	00:09.7
Horst Bunke	3	22	00:16.0
A L Spitz	3	22	01:06.5
V Apostolopoulos	3	28	00:02.9
L M B Hickey	3	27	00:02.6
D A Sager	3	27	00:05.9
J S Wilkinson	3	28	00:02.5
Peter A Appleby	3	32	00:02.5
Carles Sierra	3	35	00:01.5
Juan Antonio Rodriguez Aguilar	3	23	00:10.9
Pablo Noriega	3	20	00:05.5
N Azam	3	23	00:07.8
M J Boniface	3	509	00:06.2

Continued on next page

Person	Graphs	Triples	Time
M Ghanem	3	23	00:02.5
P Baldan	100	493	00:38.5
A Corradini	189	861	01:23.7
T Heindel	9	74	00:01.7
B Knig	30	196	00:14.5
L Aceto	2	9	00:01.9
A Inglfsdttir	2	9	00:01.5
Alex I Bazin	3	34	00:00.4
Trevor Cole	3	21	00:02.7
Brian Kett	3	21	00:02.5
George Bebis	2	9	00:06.8
R M Beales	4	88	00:00.8
S Roberts	15	123	00:10.1
Roxana Belecheanu	3	27	00:00.3
Tim Miller	3	27	00:01.6
Peter McBurney	181	921	01:12.5
Michal Pechoucek	3	22	00:01.5
I Brandic	10	63	00:03.5
Danny Weitzner	3	27	00:01.9
James A Hendler	216	1047	01:29.7
Daniel J Weitzner	3	27	00:00.4
Harish Pillai	3	24	00:01.5
B Blankenburg	3	23	00:01.4
M Klusch	3	18	00:01.7
J Bockniak	3	26	00:01.6
A Kummert	2	21	00:03.3
S C Phillips	3	23	00:02.0
M J Boniface	3	509	00:02.2
J Ferris	2	11	00:01.3
M Ghanem	2	11	00:02.0
N Azam	2	11	00:01.4
Stephen Phillips	3	23	00:01.4
M B Boreland	3	26	00:01.6
I BOUCHRIKA	3	40	00:01.5
PR Boulain	10	224	00:03.3
MB Parker	13	120	00:02.8
DE Millard	274	2235	01:48.7
Justin Bradley	3	23	00:01.7
Christopher Brown	3	23	00:01.5
Bryan Carpenter	3	23	00:01.5
Jodi Crisp	3	23	00:01.4
Steven Newhouse	3	17	00:01.5
Gary Li	3	23	00:01.5
Claire Walker	3	23	00:01.4
Aaron Wookey	3	23	00:03.2
G Brambilla	3	28	00:02.3
G S Murugan	2	14	00:02.5
J Bryden	3	23	00:05.6
L M Rocha	5	34	00:03.2
L S Yaeger	5	34	00:02.1
R L Goldstone	5	34	00:01.4
A Vespignani	5	30	00:01.5
Alan Grafen	3	22	00:02.5
Mark Ridley	3	22	00:03.1
L M Rocha	2	9	00:01.2
L S Yaeger	2	9	00:02.8
M A Bedau	2	9	00:01.3
D Floreano	2	9	00:02.2
R L Goldstone	2	9	00:01.8
A Vespignani	2	9	00:01.5
Tom Smith	3	22	00:01.6
Jon Bird	3	22	00:01.4
M Bundgaard	3	21	00:02.0
Alexander Romanovsky	3	24	00:06.3
Elena Troubitsyna	37	242	00:10.2
G Merendino	3	25	00:02.5
A Rossetti	3	25	00:02.5
J W McDonald	3	23	00:01.5
Tim Champion	3	23	00:01.5
R Chadha	3	21	00:04.0
D Macedonio	3	26	00:02.4
H Q Du	3	22	00:01.6
X Hong	2	11	00:04.1
S Tan	3	134	00:00.3

Continued on next page

Person	Graphs	Triples	Time
S Benedetto	3	23	00:01.4
P Dubamet	3	23	00:01.4
Y Chen	35	238	00:14.4
X Wang	3	23	00:05.8
Shahanara Banu	17	146	00:06.0
A S Schwanecke	46	342	00:14.7
F Choi	3	25	00:02.8
J Hearn	3	21	00:01.4
C Mangos	3	21	00:01.5
J Admek	2	9	00:02.8
S Milius	2	9	00:01.5
David Claudio Gonzalez	3	54	00:00.3
Michail Kiziroglou	3	62	00:00.4
Xiaoli Li	2	20	00:02.1
A A Zhukov	98	522	00:39.6
P A J de Groot	180	1072	01:17.5
P N Bartlett	61	338	00:22.0
P N Barttlet	3	28	00:03.6
Kenton O'Hara	3	22	00:05.3
Barry Brown	3	22	00:01.4
Janice Smith	3	24	00:02.9
Martin Oliver	3	14	00:01.5
John Cook	3	25	00:02.2
Susan A White	4	448	00:01.1
Mike Sharples	3	24	00:02.6
Niall Sclater	3	39	00:03.3
K Daly	3	24	00:01.5
K Gladstone	3	25	00:02.2
Will M Davies	3	28	00:01.8
Richard De La Rue	78	406	00:28.5
Marco Gnan	3	17	00:02.6
Nigel Johnson	23	176	00:07.7
Iraklis Ntakis	3	23	00:01.4
Pierre Pottier	3	23	00:01.4
Marc Sorel	14	111	00:03.8
Ahmad Md Zain	15	131	00:05.1
Hua Zhang	3	23	00:02.4
Edilson Camargo	3	35	00:00.4
Chongjun Jin	3	17	00:02.2
Mario Armenise	3	23	00:02.3
Caterina Ciminelli	3	23	00:01.7
Jeremey Frey	3	91	00:00.8
Waleed W Smari	2	9	00:01.6
William McQuay	2	9	00:01.6
York Sure	4	29	00:03.1
Nishadi De Silva	3	44	00:01.5
Hala Skaf-Molli	3	25	00:02.6
Sebastian Uchitel	2	9	00:02.2
Steve Easterbrook	2	9	00:02.7
Stan Jarzabek	2	9	00:01.2
Douglas C Schmidt	2	9	00:05.5
Todd L Veldhuizen	2	9	00:02.7
Charanpal Dhanjal	3	25	00:01.6
B M Hashimi	4	1012	00:00.7
G Bebis	2	9	00:01.2
S Patnaik	3	22	00:01.5
L C Jain	3	22	00:01.7
S G Tzafestas	3	27	00:00.3
G Resconi	3	22	00:01.5
A Konar	3	22	00:01.5
M Jameson	3	22	00:02.5
P S Dutta	3	41	00:00.4
M El-Hajjar	43	278	00:19.8
Edith Elkind	3	39	00:01.6
Leslie Ann Goldberg	138	673	00:57.7
Paul W Goldberg	3	25	00:04.8
Joan Feigenbaum	2	9	00:01.9
John C -I Chuang	2	9	00:01.3
David M Pennock	2	9	00:01.4
Peter G B Enser	3	43	00:01.6
Christine J Sandom	3	39	00:01.6
D Evagorou	3	25	00:02.2
V Efthymiou	3	25	00:01.6
D G Evans	3	25	00:01.8

Continued on next page

Person	Graphs	Triples	Time
P Blenkhorn	3	25	00:03.5
K Miesenberger	2	9	00:03.1
J Klaus	2	9	00:01.5
W L Zagler	2	9	00:02.6
A I Karshmer	2	9	00:01.6
Neil Evans	3	23	00:04.5
Tobias Nipkow	2	9	00:01.6
Jayadev Misra	2	9	00:05.1
Emil Sekerinski	2	9	00:01.7
W Fang	3	39	00:05.1
S S Fatima	3	66	00:00.4
Eric S Fraga	3	23	00:01.5
Michael Fairweather	3	23	00:02.1
Tony Perris	3	23	00:02.0
A-M Hughes	4	210	00:01.1
J H Burridge	172	842	01:25.2
A Ilchmann	3	28	00:02.8
E P Ryan	3	23	00:20.2
B Cichy	3	43	00:05.7
J Lam	2	23	00:01.5
Jose-Soler Garrido	3	25	00:02.5
Robert Piachocki	3	25	00:04.9
Darren McNamara	3	25	00:02.5
Shady Gawad	3	43	00:01.7
Tao Sun	3	38	00:02.0
J Wiles	93	542	00:31.0
L M Rocha	5	34	00:03.0
L S Yaeger	5	34	00:01.4
M A Bedau	60	300	00:25.7
R L Goldstone	5	34	00:09.1
D C K Yuen	3	28	00:03.0
Peyman Faratin	5	34	00:01.4
Juan A Rodriguez-Aguilar	5	34	00:01.4
Onjira Sitthisak	3	33	00:01.6
Chu Wang	3	32	00:00.5
V D Kunz	3	57	00:00.3
M M A Hakim	39	387	00:14.8
C H de Groot	4	426	00:00.6
G Gluszko	3	23	00:02.6
L Lukasiak	3	23	00:02.5
M Gnan	3	17	00:01.4
G Bellanca	3	23	00:03.1
P Bassi	3	23	00:02.5
Oscar Corcho	3	23	00:01.5
Pinar Alper	3	30	00:03.0
Katy Wolstencroft	3	24	00:05.3
Antoon Goderis	3	25	00:01.9
Duncan Hull	3	25	00:02.1
Jun Zhao	3	23	00:01.5
Khalid Belhajjame	3	23	00:04.4
Daniele Turi	3	24	00:02.5
Robert Stevens	3	17	00:02.6
Christopher Baker	3	22	00:01.4
Kei-Hoi Cheung	3	22	00:01.4
A V Goncharev	3	23	00:09.7
V V Metlushko	3	23	00:04.7
G Bordignon	3	40	00:03.6
J Unguris	3	23	00:02.5
W C Uhlig	3	23	00:06.2
G Karapetrov	3	28	00:03.9
B Ilic	3	23	00:03.4
A Gonzalez	3	41	00:00.5
A Castellanos	3	28	00:01.6
M Hennessy	3	23	00:10.0
C Wang	3	32	00:00.4
L Gilbert	99	1003	00:39.9
YW Sim	3	72	00:00.5
E Gardner	3	23	00:01.4
K Grujic	2	11	00:01.5
J P Hole	2	11	00:02.7
O G Helleso	2	11	00:01.8
Katarina Grujic	3	22	00:02.6
J Patrick Hole	3	53	00:00.4
Olav Gaute Helleso	2	18	00:01.3

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Person	Graphs	Triples	Time
David Roure	495	4221	03:47.5
B Guo	3	42	00:01.8
J D B Nelson	40	276	00:11.2
Angel Nevado	3	24	00:01.6
M Pulgarin	3	24	00:01.4
Malcom Young	34	219	00:12.8
John Halloran	3	35	00:14.3
Eva Hornecker	3	35	00:02.2
Don G Cruickshank	4	219	00:00.4
L Hao	4	180	00:00.8
D Hardoon	4	695	00:01.6
Xue Li	2	9	00:02.3
Osmar Zaiane	2	9	00:07.2
Zahnhuai Li	2	9	00:02.9
Edward Y Chang	2	9	00:01.5
Alan Hanjalic	2	9	00:01.9
Nicu Sebe	2	9	00:01.5
Peter G B Enser	3	43	00:00.3
Paolo Bouquet	2	9	00:00.1
Roberto Brunelli	2	9	00:03.3
Jean-Pierre Chanod	2	9	00:01.8
Claudia Niedere	2	9	00:01.7
Heiko Stoermer	2	9	00:08.8
Keith Jeffrey	2	9	00:01.5
N Jacobs	3	22	00:01.4
Itiel Dror	3	25	00:07.5
J K Hart	3	58	00:11.9
R Ong	3	36	00:00.5
K C Rose	3	23	00:02.5
Jane K Hart	3	58	00:00.8
G I Hawe	3	36	00:01.6
Xudong Luo	3	53	00:01.0
L Hladowski	3	21	00:05.3
X Hong	2	11	00:01.5
D-S Huang	2	9	00:02.0
K Li	2	9	00:01.5
G W Irwin	2	9	00:04.3
R Hu	3	28	00:04.9
S Huang	3	36	00:01.7
Yongjian Huang	3	47	00:00.6
A M Hughes	4	210	00:00.3
J Burridge	173	844	01:20.2
P Chappell	4	333	00:00.7
P Lewin	4	1039	00:01.8
A H M R Islam	3	27	00:03.7
Mohammad Imrul Hassan	3	25	00:06.4
Ju Bin Song	3	27	00:06.3
Mohammad Shahriar Rahman	3	29	00:06.0
A C Cohn	3	23	00:02.6
M Fox	3	23	00:03.4
D Long	3	23	00:02.1
M M Luck	3	299	00:03.5
D T Michaelides	4	303	00:00.7
S J Munroe	3	67	00:00.4
R Morris	3	22	00:02.6
L Taressenko	3	22	00:02.6
M Kenward	3	22	00:02.9
F C Guo	3	63	00:00.3
Ming Jiang	3	52	00:00.3
N P Johnson	23	176	00:04.7
A Z Khokhar	3	26	00:02.7
S McMeekin	15	132	00:04.9
Mathew Jones	3	23	00:02.3
D Kacprzak	3	24	00:01.7
D Kalofonos	3	21	00:02.9
N Karunatillake	3	39	00:00.5
C Reed	3	37	00:01.9
S Wells	3	21	00:03.0
N C Karunatillake	3	39	00:00.3
I Rahwan	3	49	00:02.0
S D Ramchurn	4	192	00:00.6
M Khalafallah	3	27	00:01.7
Hajo Broersma	3	22	00:02.6
Stefan Dantchev	3	22	00:03.6

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Person	Graphs	Triples	Time
Matthew Johnson	3	22	00:02.5
Stefan Szeider	3	22	00:02.5
J Kliewer	4	75	00:00.5
Chiaki Kojima	13	80	00:02.9
Kiyotsugu Takaba	19	106	00:09.6
F-C Kuo	3	23	00:03.3
Stephen Lack	3	24	00:07.0
F Lahoz	3	27	00:04.1
I R Martin	5	51	00:31.4
M A Hassan	3	34	00:05.2
P Lappas	3	24	00:00.5
W S Lau	3	33	00:00.6
V Laxmi	3	23	00:01.4
CY Lee	3	26	00:03.0
K C Lee	3	24	00:04.4
J Chun	3	24	00:01.5
Selwyn Leeke	3	21	00:02.6
Dan Elphick	3	27	00:02.3
German Puebla	2	9	00:02.6
Marc Fontaine	3	21	00:01.7
D C Gonzalez	3	54	00:00.4
M E Kiziroglou	3	62	00:00.4
Muhammad K Husain	25	282	00:09.0
Yaozhong Liang	3	31	00:03.6
Antonis Loizou	3	27	00:01.5
Panchit Longpradit	3	24	01:07.5
C Rouff	5	34	00:01.4
M Hinchey	7	44	00:01.5
J Rash	5	34	00:02.0
W Truszkowski	5	34	00:01.4
D Gordon-Spears	3	22	00:01.4
J Gonzalez-Palacios	3	21	00:01.7
R Bordini	3	22	00:02.0
M Dastani	3	22	00:01.4
J Dix	3	22	00:01.5
A El Fallah Segrouchni	3	22	00:01.5
R W -P Luk	3	51	00:00.4
Milos Kristic	3	45	00:00.3
D Makola	3	23	00:01.4
SAW Grange	4	191	00:00.6
Daniele Malleo	3	26	00:01.4
D Di Carlo	3	24	00:01.4
J T Neville	3	24	00:01.4
L P Lee	3	24	00:01.4
C H deGroot	4	426	00:01.0
E Manisterski	3	21	00:02.5
S Kraus	3	108	00:02.2
Emil Marais	3	15	00:01.4
Basie von Solms	3	23	00:01.6
U Minnaar	4	34	00:01.6
Sabine Van Huffel	121	664	00:42.8
I Lirkov	3	22	00:01.9
S Margenov	3	22	00:01.6
J Wasniewski	3	22	00:01.4
Alistair Riddoch	3	43	00:00.8
A Stevenson	3	43	00:00.4
S Wright	3	22	00:02.5
Jimson Matthew	3	24	00:02.5
Dhiraj Pradhan	3	24	00:02.5
Iain McCulloch	28	208	00:09.9
Martin Heeney	3	27	00:00.5
Clare Bailey	12	102	00:03.7
Kristijonas Genevicius	3	23	00:01.4
Iain MacDonald	3	23	00:01.4
Maxim Shkunov	3	33	00:01.7
David Sparrowe	3	25	00:01.4
Steve Tierney	19	151	00:05.8
Robert Wagner	3	23	00:01.4
Weimin Zhang	3	25	00:02.0
Michael L Chabinyc	3	23	00:01.4
Joseph R Kline	3	23	00:01.4
Michael D McGehee	3	23	00:03.2
Michael F Toney	3	23	00:01.4
Duncan McRae-Spencer	3	22	00:02.6

Continued on next page

Person	Graphs	Triples	Time
L Dyadshuka	3	24	00:02.5
A Weld	11	112	00:03.5
H Yin	30	232	00:09.8
A Adam	3	23	00:02.5
S Jaiswal	2	15	00:01.9
K Boudakos	3	23	00:02.5
D C Smith	3	23	00:02.4
J J Baumberg	11	93	00:02.7
F Booy	3	29	00:02.6
Geoff V Merrett	4	177	00:00.4
Nick R Harris	5	1417	00:00.7
T Miles-Board	4	219	00:01.0
G Power	3	41	00:01.2
M Stenning	3	36	00:01.4
Karl Doody	3	22	00:01.3
Gary Will	239	2156	01:42.9
Swapna Chennupati	3	28	00:02.7
Ehtesham-Rasheed Jam	4	99	00:00.4
Martin Ross	3	22	00:02.5
Benedicto Rodriguez-Castro	4	163	00:02.7
Rob Mills	3	74	00:00.6
P M Mitchinson	4	111	00:00.4
K Nishiguchi	3	17	00:01.4
A Mohd Ariffin	3	31	00:02.6
A J Keane	3	35	00:00.3
S J Elliott	3	35	00:00.3
M J Brennan	3	35	00:00.3
D K Anthony	3	23	00:01.5
M Mowlem	3	29	00:03.8
Giuseppe Benazzi	3	35	00:02.1
V Chavagnac	3	24	00:01.4
C Hass	3	23	00:01.4
P Statham	3	24	00:03.8
P Burkhill	3	24	00:01.5
Stephen Muggleton	5	32	00:04.3
Y Panitchob	3	15	00:01.7
E J Tull	3	25	00:02.5
V Narayanan	3	23	00:01.4
D Nguyen	3	23	00:04.9
S G Thompson	3	29	00:01.7
V Dang	3	63	00:00.4
P M D Gray	3	61	00:00.4
P J Stockreisser	3	33	00:00.4
W A Gray	3	50	00:00.6
N J Fiddian	3	50	00:00.4
Nicholas Nguyen	3	23	00:01.4
L O'Faolain	3	17	00:04.4
X Yuan	3	23	00:05.1
D McIntyre	3	23	00:04.2
S Thoms	3	23	00:02.4
H Chong	51	541	00:21.8
T F Krauss	3	17	00:02.2
Hugh / C Davis	3	679	00:04.1
David / E Millard	273	2243	01:47.0
Su / A White	4	448	00:01.6
Taban Panhi	3	49	00:00.3
f hafezian	3	22	00:02.5
R Sun	3	22	00:01.4
Marlon Parker	13	120	00:05.2
Cornell Stofberg	3	23	00:02.4
Retha De la Harpe	3	26	00:05.9
Isabella Venter	3	23	00:02.4
V Moleshe	3	23	00:06.1
R De la Harpe	3	26	00:00.3
S Xu	2	20	00:00.3
A Paventhan	3	27	00:00.4
Roger S Barga	3	22	00:01.4
Xiaofang Zhou	3	22	00:01.7
Esther David	3	41	00:00.4
Matthew Sharifi	3	31	00:01.4
Ralf Peeters	3	25	00:01.4
Ben Hanzon	3	22	00:04.6
Michiel Hazewinkel	3	22	00:01.4
A Q Pham	20	154	00:06.9

Continued on next page

Person	Graphs	Triples	Time
Anna Pierri	3	24	00:04.4
Ioannis Christou	2	12	00:01.5
Sofia Tsekeridou	3	33	00:02.0
Bill Vassiliadis	3	24	00:02.8
P Cunningham	3	22	00:01.7
M Cunningham	3	22	00:01.4
B Hanzon	3	22	00:02.9
M Hazewinkel	3	22	00:01.4
D Pitzalis	3	24	00:01.7
G Aitken	3	24	00:00.4
A Russell	4	169	00:00.5
D A Smith	4	318	00:00.3
Lindsay Groves	3	24	00:02.5
Nadim Madhavji	3	22	00:05.5
Juan Fernandez-Ramil	3	22	00:02.5
Dewayne Perry	3	22	00:02.6
Jun He	3	24	00:03.1
Xue Z Wang	2	9	00:01.9
Rui Fa Li	2	9	00:01.4
Adrian Quayle	3	23	00:02.5
M Rafiq	3	42	00:02.5
W Milne	3	33	00:00.4
Hidayah Rahmalan	3	23	00:03.0
Jeffrey Reeve	4	449	00:01.5
Kosala Amarasinghe	3	21	00:01.4
Marco Remondino	9	66	00:01.5
Xianqiang Ren	3	26	00:03.2
Steve Reece	3	35	00:01.5
Stephen Roberts	3	37	00:01.5
P M Zaris	3	29	00:03.2
Wiebe van der Hoek	2	9	00:01.5
Michael Wooldridge	2	9	00:01.1
Giacomo Bonanno	2	9	00:01.4
Michele Zagnoni	2	24	00:01.4
A Sanei	3	37	00:01.5
David Karger	72	328	00:29.0
Tacha Serif	3	27	00:03.4
Nasib Ahmed Adnan	3	23	00:02.5
Mohammad Sajedul Islam	3	23	00:03.1
Abu Hena Mohhamad Razibul Islam	3	23	00:02.7
Nabil Shovon Ashraf	3	23	00:02.4
AHM Razibul Islam	3	23	00:03.0
A K Sheridan	2	11	00:01.6
P Ngamukot	2	11	00:01.5
P N Bartlett	2	11	00:04.0
Y W Sim	3	72	00:00.4
Freddy Choi	3	25	00:00.3
Martin Doerr	63	571	00:23.3
Daniel Prideaux	3	33	00:00.8
A D Smith	3	29	00:01.4
Barbara Dunin-K?plicz	2	9	00:02.5
Andrea Omicini	2	9	00:01.2
Julian Padget	2	9	00:04.0
Hideo Iizuka	3	25	00:02.5
A Surawijiya	3	23	00:03.2
Neil Jacobs	3	25	00:02.5
Martin Szomszor	24	168	00:10.6
L Xu	3	30	00:03.9
G Yamahata	3	36	00:06.2
Jiayu Tang	3	26	00:01.5
R Y S Tee	3	510	00:02.0
T D Nguyen	3	26	00:02.4
SP Stacey	3	23	00:01.4
LA Kuznetsova	3	23	00:01.4
KAJ Borthwick	3	23	00:05.1
WT Coakley	3	29	00:01.4
RJ Townsend	3	53	00:00.4
D Wenn	3	24	00:01.4
D Brennan	3	27	00:01.4
F Ramirez-Martinez	3	28	00:08.3
E A Curtis	3	28	00:01.4
J P Ashmore	3	28	00:02.4
JJ Baumberg	3	67	00:02.3
R Furukawa	3	24	00:02.5

Continued on next page

Person	Graphs	Triples	Time
T Suto	3	23	00:01.5
T Maruizumi	3	23	00:02.7
Y Shiraki	3	25	00:01.4
Stefan Artmann	8	69	00:06.8
Auke Jan Ijspeert	3	22	00:01.4
Toshimitsu Masuzawa	3	22	00:01.4
Shinji Kusumoto	3	22	00:02.8
Shu-Hui Tu	3	23	00:02.5
N Ross	3	22	00:07.4
Chun-Ming Chang	3	23	00:02.4
Ajay Chakravarthy	3	27	00:01.4
Nigel R Shadbolt	4	1185	00:04.7
Mischa M Tuffield	4	203	00:01.5
Dave E Millard	271	2239	01:51.9
S R Turnock	3	28	00:01.5
C Pashias	3	24	00:05.1
K N Bourdakos	3	36	00:01.6
D C Smith	27	164	00:09.0
E Vargas-Rodriguez	3	32	00:03.7
GV Veres	38	321	00:10.0
MS Nixon	455	3444	03:34.6
JC Carter	3	23	00:03.5
A M Sykulski	6	138	00:04.3
N R Jennings	3	1305	01:07.0
Han La Poutre	3	22	00:07.9
Norman Sadeh	3	17	00:02.6
Sverker Janson	3	22	00:02.6
P Vytellingum	4	122	00:00.4
Robert J Walters	4	220	00:00.4
Philip Bernnett	3	23	00:01.6
X-J Wang	2	11	00:02.6
J Wu	2	11	00:01.5
W-H Xu	2	11	00:02.5
X-L Wang	2	11	00:01.7
Daniel Weinreich	3	17	00:01.5
John Wakeley	3	25	00:01.7
W Wei	3	23	00:02.6
P Boher	3	23	00:04.6
M Elias	3	23	00:02.6
J Frohn	3	23	00:02.6
S Sotiropoulou	3	23	00:03.8
I Liccardi	3	48	00:00.9
CJ Hooper	4	147	00:00.5
TP Griffith	3	21	00:01.4
Alastair Irons	3	17	00:01.9
Andrew McGettrick	2	9	00:01.4
Gerry McAlister	2	9	00:01.5
J S Wilkinson	3	24	00:02.6
Steve Jeyes	34	222	00:09.3
Robert Sherratt	40	281	00:08.4
Gavin Willingham	3	24	00:02.8
Bashir Al Hashimi	4	1012	00:00.8
S-H Won	3	53	00:02.2
Sylvia C Wong	3	26	00:02.3
Ulrich Reimer	2	9	00:03.8
Dimitris Karagiannis	2	9	00:01.9
David F Brailsford	2	9	00:02.8
X-H Xu	3	23	00:02.7
J Wu	2	11	00:03.5
G Li	2	11	00:01.6
J Chu	2	11	00:02.0
Armin Wuertemberger	3	23	00:03.0
Krishnendu Chakrabarty	3	27	00:03.3
Z Xu	3	14	00:01.6
Wei Fang	3	39	00:00.3
Jang Yoo	3	24	00:03.1
D Hwang	4	34	00:01.5
D Yuen	3	28	00:00.5
A Byde	36	299	00:11.0
R J Wood	3	23	00:02.6
P L Roach	3	33	00:10.9
Noohul Basheer Zain Ali	3	25	00:04.6
Peter Harrod	3	33	00:01.6
N Zamanan	3	26	00:01.6

Continued on next page

Person	Graphs	Triples	Time
A K Al-Othman	21	142	00:06.6
Soren Brunak	3	24	00:01.9
Andrew Phillips	3	24	00:01.5
Ehud Shapiro	3	25	00:02.4
J M Zhang	13	114	00:01.5
Sanjay Vivekanandan	3	23	00:04.7
Z Zhou	3	26	00:01.6
Juho Rousu	3	25	00:02.6
Y L Chong	3	48	00:00.9
Stephan Trenn	3	24	00:04.9
Claire Lefebvre	3	22	00:01.7
Henri Cohen	3	22	00:02.7
Mehdi Jafaipanah	3	18	00:01.6
A M Macdonald	25	186	00:09.7
P Wyeth	3	30	00:11.1
Elena Martines	3	23	00:01.6
Kris Seunarine	3	23	00:07.5
Nikolaj Gadegaard	3	23	00:01.4
Chris DW Wilkinson	3	23	00:01.5
Mathis O Riehle	3	17	00:07.2
M Nitsun	3	23	00:01.8
M Ryan	3	23	00:01.5
H Mason	3	23	00:05.8
Ishan Pendharkar	3	27	00:01.6
Harish K Pillai	3	27	00:01.9
Osnat Shapira	3	21	00:05.4
Nicholas M Spencer	3	25	00:01.7
G Shroeder	3	31	00:02.2
RJK Wood	3	24	00:01.7
E Koukharenko	3	23	00:02.2
M Kraft	3	23	00:01.7
G Ensell	3	23	00:01.5
N Hollinshead	3	23	00:02.0
B L Luk	3	39	00:02.6
D S Cooke	3	36	00:00.6
A A Collie	3	26	00:00.6
A Morgado	3	25	00:01.0
S Takahashi	3	26	00:01.4
C A R Hoare	3	17	00:06.1
A E Abdallah	2	9	00:01.6
C B Jones	2	9	00:01.6
J W Sanders	2	9	00:03.9
Mahmoud Hadef	3	35	00:01.5
Markus Rupp	3	33	00:00.8
Barbara Hammer	3	14	00:02.7
Alessandro Sperduti	3	23	00:02.8
T C Illingworth	3	27	00:08.0
P Maier	3	36	00:01.9
R Armstrong	3	36	00:01.7
M H Ng	3	36	00:01.7
C D Green	4	76	00:03.5
Victor Tan	3	77	00:01.2
Weijian Fang	3	37	00:01.8
Alexander A Zhukov	98	522	00:39.7
Michail E Kiziroglou	3	62	00:00.8
A V Goncharov	26	183	00:09.9
R Boardman	3	30	00:01.6
M A Ghanem	3	26	00:03.1
V Novosad	3	26	00:02.7
Yashwant Gupta	3	26	00:03.1
Dipanjan Mitra	3	26	00:03.1
D Green	3	24	00:02.7
J G Frey	3	91	00:00.7
M B Hursthouse	498	2777	03:56.4
M E Light	239	1321	01:49.3
D J Marvin	3	50	00:00.6
G C Conole	3	25	00:02.9
Rachel Hardy	17	171	00:05.0
H -J Chong	3	17	00:03.1
S -Y Huang	3	36	00:01.0
W I Milne	3	33	00:00.4
Nicholas Spencer	3	25	00:00.4
A Surawajiya	3	23	00:01.5
Zhuoran Wang	3	23	00:07.2

Continued on next page

Person	Graphs	Triples	Time
Ting Liu	3	15	00:02.6
J Zhang	3	24	00:02.5
G R Jones	3	24	00:05.7
J W Spencer	3	24	00:02.7
I J Kemp	3	24	00:02.5
Z Wang	3	31	00:01.6
R K Aggarwal	3	24	00:04.3
Vaidyanathan Kripesh	3	29	00:00.5
Seung Wook Yoon	3	23	00:02.7
V P Ganesh	3	23	00:05.7
Navas Khan	3	23	00:02.5
Wang Fang	3	23	00:04.1
Jayanthi Sivaswamy	3	23	00:01.5
S Ni	3	34	00:04.5
Y Kurokawa	3	29	00:01.8
S Higashijima	3	31	00:02.4
M Okamoto	3	20	00:01.4
Leran Wang	28	230	00:09.4
Larysa Dyadyusha	3	24	00:02.7
Huabing Yin	30	232	00:12.9
Supriya Jaiswal	2	15	00:05.0
Tom Brown	40	242	00:12.7
Jeremy Baumberg	11	93	00:02.4
Frank Booy	3	29	00:00.7
F Bacchus	2	9	00:02.2
T Walsh	2	9	00:01.5
M N Mneimneh	3	22	00:02.8
Z S Andraus	3	22	00:05.8
F Bacchus	2	9	00:01.5
T Walsh	2	9	00:01.8
Michal Penn	37	218	00:10.3
Maria Polukarov	4	119	00:02.4
Moshe Tennenholtz	172	809	01:07.8
D -W Gu	3	23	00:01.4
J Trant	2	9	00:04.7
D Bearman	2	9	00:01.4
Muan Yong Ng	3	31	00:01.8
Shamim Ripon	3	21	00:02.5
Mario Bravetti	2	9	00:06.0
Lela Kloul	2	9	00:01.3
Gianluigi Zavattaro	2	9	00:01.5
N Perney	56	385	00:17.0
P Ayliffe	3	33	00:04.5
Anne Trefethen	3	35	00:01.7
V Gergely	3	23	00:02.7
D Lowther	42	211	00:13.1
J Bradshaw	3	14	00:01.9
M Breedy	3	35	00:05.0
L Bunch	3	31	00:01.6
M Johnson	3	38	00:01.6
S Kulkarni	3	14	00:02.6
J Lott	3	26	00:03.0
N Suri	3	21	00:02.3
A Uszok	3	45	00:01.9
James D B Nelson	41	278	00:15.0
Fred Neumann	3	24	00:05.3
Pierluigi Ritrovato	3	24	00:01.6
S Antoranz Contera	3	28	00:02.1
J F Ryan	21	150	00:04.8
H Gamble	3	24	00:02.3
Andrew Nowakowski	3	23	00:01.6
G Meng	3	41	00:00.6
S Rwifa	3	23	00:01.5
Qinglai Ni	3	25	00:01.6
D Thukaram	3	23	00:04.8
H P Khincha	3	23	00:02.5
V H Pakka	7	68	00:01.6
Celia A Glass	3	25	00:03.0
J Gurd	3	23	00:08.0
T Hey	3	23	00:02.5
J Papay	3	23	00:02.6
G Riley	3	23	00:04.9
H Hu	3	23	00:01.9
J Zhu	3	14	00:01.4

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Person	Graphs	Triples	Time
Y Zhao	3	23	00:01.7
J Voeckler	3	23	00:06.0
M Wilde	3	23	00:01.9
M Temple	3	31	00:00.9
A G ONeill	3	27	00:01.4
D J Norris	3	40	00:02.3
A G Cullis	3	37	00:03.9
Melike Sah	3	27	00:02.5
Degtiarev Konstantin Y	3	23	00:02.5
John Fitzgerald	2	9	00:01.5
Ian Hayes	2	9	00:06.1
Andrzej Tarlecki	2	9	00:01.6
Paul Theo Gonciari	3	53	00:00.4
H A W El-Mubarek	3	87	00:01.2
Danae Stanton Fraser	3	24	00:01.7
Jonathan W Essex	16	143	00:02.8
Peter L Roach	3	33	00:04.3
Mark Bradley	3	28	00:03.0
A Miller	3	23	00:02.1
M Cappellini	3	23	00:02.6
L Serni	3	23	00:01.7
R Rimaboschi	3	23	00:05.7
A S Aguado	2	11	00:00.3
M E Montiel	2	11	00:01.2
Hend Al-Khalifa	24	167	00:07.8
O R Alamri	3	72	00:01.8
Peter Appleby	3	32	00:00.6
Piet Kommers	2	9	00:01.5
Griff Richards	2	9	00:01.3
M P Atkinson	168	930	01:14.3
G Fox	3	33	00:06.1
N W Paton	3	21	00:03.3
S Newhouse	3	17	00:01.7
S Parastatidis	3	23	00:05.6
A E Trefethen	3	35	00:00.3
P Watson	3	30	00:02.4
J Webber	3	23	00:00.8
A Avila-Rosas	3	21	00:01.4
M Pechoucek	2	9	00:04.9
P Petta	2	9	00:01.3
L Varga	2	9	00:01.7
N Sessions	3	33	00:00.5
Richard Banach	3	20	00:02.0
Czeslaw Jeske	3	15	00:05.0
Susan Stepney	3	15	00:01.8
John Fitzgerald	2	9	00:01.2
Ian Hayes	2	9	00:01.6
Andrzej Tarlecki	2	9	00:05.7
D Beauquier	2	9	00:01.5
E Boerger	2	9	00:01.2
A Slissenko	2	9	00:05.1
Gerasim Galatinov	3	23	00:01.5
Nikolay Zheludev	270	1479	02:00.9
C Bartolini	3	30	00:01.7
C Priest	3	29	00:01.5
R Choren	3	24	00:01.9
A Garcia	97	484	00:42.1
C Lucena	3	20	00:00.8
A Ramonovsky	3	22	00:01.8
S Mahnkopf	3	24	00:01.5
J R Lincoln	3	16	00:01.6
P J Ayliffe	3	33	00:00.3
S L Jaiswal	5	51	00:07.6
Anil K Jain	2	9	00:05.2
Nalini K Ratha	2	9	00:03.5
S Beco	3	21	00:01.6
B Cantalupo	3	22	00:01.5
L Giammarino	3	21	00:01.6
N Matskanis	3	23	00:01.7
Dave De Roure	489	4209	03:45.7
F French	5	1445	00:03.9
J Bochniak	3	27	00:01.7
PJ Boltryk	3	24	00:02.6
S J Taylor	3	42	00:00.5

Continued on next page

Person	Graphs	Triples	Time
L Finlay	3	23	00:07.9
D McCorry	3	23	00:01.7
P Wilken	3	23	00:03.1
K N Bourdakos	3	36	00:02.2
G Dilliway	3	36	00:18.4
D C Smith	27	164	00:24.4
Christopher Brewster	3	23	00:32.4
Barny Haughton	3	23	00:02.6
F Gadducci	85	413	00:33.7
M Abadi	2	9	00:31.4
L de Alfaro	2	9	00:31.4
Peter J Bentley	2	9	00:31.4
Mathieu Capcarrere	2	9	00:31.4
Alex A Freitas	2	9	00:31.4
Colin G Johnson	2	9	00:31.4
Jon Timmis	2	9	00:31.4
M Merro	3	19	00:31.3
M Burford	3	23	00:32.4
T Kazmierski	4	374	00:30.6
Cliff Jones	3	42	00:00.5
Barbara Cantalupo	3	24	00:01.3
Ludovico Giammarino	3	24	00:01.4
Fabrizio Silvestri Silvestri	3	24	00:01.4
Turgay Celik	3	25	00:02.4
Paul H Chappell	4	333	00:00.7
M B Charlton	4	269	00:01.3
N M Perney	56	385	00:17.0
X Z Liu	3	21	00:02.7
L S Zhong	3	21	00:01.4
S H Loi	3	23	00:01.4
C H Tham	3	24	00:01.4
D S Huang	2	9	00:01.4
X -P Zhang	2	9	00:02.4
G -B Huang	2	9	00:01.4
L Wang	2	9	00:01.4
K Chen	2	9	00:01.4
Y S Ong	2	9	00:01.4
X C Yang	3	26	00:01.4
X -C Chen	3	23	00:01.4
Alberto Ciaffaglione	3	23	00:01.4
John Cole	3	23	00:02.4
M College	3	23	00:02.5
T Megaw	3	23	00:03.3
M Powis	3	23	00:02.4
Justin Keen	3	23	00:03.0
S Coles	343	1998	02:35.0
S Peppe	3	31	00:02.7
H R Mills	53	390	00:24.6
G Smith	3	38	00:00.7
H Stockinger	3	22	00:02.0
R Buyya	3	22	00:01.4
R Perrott	3	22	00:01.3
Neil Ross	3	137	00:00.4
G Conforti	3	24	00:01.8
G Conole	3	57	00:01.9
Q Gee	3	38	00:03.1
A Woukeu	2	32	00:01.3
K A Copren	3	23	00:02.4
D Coquillat	3	31	00:00.5
J Torres	3	24	00:01.3
M Le Vassor d'Yerville	3	28	00:01.6
R Legros	3	24	00:02.4
J P Lascaray	3	24	00:02.4
C Liu	3	14	00:03.1
I M Watson	3	14	00:01.5
R W Martin	3	14	00:01.5
D P J Cotton	25	191	00:09.6
P H Chappell	4	333	00:00.6
S P Beeby	4	720	00:01.0
DPJ Cotton	25	191	00:10.0
PH Chappell	4	333	00:00.8
Amy Felty	3	22	00:04.0
G Ainslie	2	9	00:01.8
JL Dennis	2	9	00:01.4

Continued on next page

Person	Graphs	Triples	Time
Chi-Sheng Chen	2	9	00:03.4
Joaquim Filipe	2	9	00:01.4
Isabel Seruca	2	9	00:01.5
Jose Cordeiro	2	9	00:01.4
C R Adsett	3	17	00:01.4
T Soonklang	3	28	00:01.7
Edwin De Jong	4	340	00:00.4
Dirk Thierens	3	43	00:03.3
N De Silva	3	44	00:00.5
B X Du	3	15	00:02.7
D S Dong	3	23	00:04.9
Y Liu	3	15	00:01.5
Y H Lu	3	23	00:03.5
G Z Wei	3	23	00:03.7
John Riedl	2	9	00:01.3
Michael J Kearns	2	9	00:02.0
Michael K Reiter	2	9	00:01.3
S Erikson	30	190	00:07.8
H F Powell	3	29	00:03.8
D Sahagun	12	126	00:01.4
C D J Sinclair	3	23	00:01.5
Berndt Farwer	3	23	00:03.7
Karen E Fill	3	29	00:01.5
Grinne Conole	3	57	00:00.3
Samual Y Leung	3	23	00:01.4
Sally Priest	3	24	00:01.7
A J M Frood	3	23	00:01.4
J C Fothergill	3	32	00:02.1
Gerasim Galitonov	3	17	00:01.5
G Jank	3	23	00:02.4
Craig Gallen	3	23	00:01.4
E R Jam	4	99	00:00.5
LF GAUNT	2	46	00:01.3
JF Hughes	4	593	00:02.7
SC Higgins	3	31	00:00.5
K Willadsen	15	108	00:03.7
H Abbass	43	205	00:14.4
T Bossamaier	8	40	00:02.6
Quintin H Gee	3	38	00:00.4
Matt Stenning	3	36	00:01.4
G Lewis	13	112	00:03.7
Rainer W Lienhart	2	9	00:01.4
Norboru Babaguchi	2	9	00:31.1
Edward Y Chang	2	9	00:04.6
W -K Leow	2	9	00:01.1
M S Lew	2	9	00:01.4
T -S Chua	2	9	00:01.7
M -Y Chaisorn	2	9	00:01.5
L Bakker	2	9	00:01.1
Sun Tao	3	38	00:01.7
Weijan Fang	3	37	00:02.0
Olav Gaute Helles	6	47	00:02.5
J Nelson	41	278	00:11.3
Jonathan Hallam	3	24	00:32.5
Adam Prgel-Bennett	3	24	00:02.5
B Han	3	33	00:00.4
Z D Wang	3	31	00:00.5
N Haque	3	27	00:00.4
Nadim Haque	3	27	00:00.3
Daniel Grosu	2	9	00:01.4
Jonathan Shapiro	2	9	00:04.8
Rainer W Lienhart	2	9	00:06.0
Noburu Babaguchi	2	9	00:01.4
Edward Y Chang	2	9	00:01.4
C Boutle	3	40	00:06.6
H La Poutr	5	30	00:02.2
N Sadeh	3	17	00:11.9
J Sverker	5	30	00:31.4
J P Hole	2	11	00:30.4
K Grujic	2	11	00:30.3
O G Helleso	2	11	00:30.3
F J Davis	3	19	00:02.8
H M T Griffith	4	38	00:01.3
Vania Dimtrova	3	23	00:02.4

Continued on next page

Person	Graphs	Triples	Time
Pragya Agarwal	3	23	00:02.4
Clare Huggett	3	21	00:02.5
Kolin Paul	3	21	00:10.3
M Huhns	3	23	00:04.8
M Singh	461	2154	03:49.6
M Burstein	3	37	00:30.3
E Durfee	403	1774	03:54.0
T Finin	3	117	00:01.3
L Gasser	3	24	00:01.8
H Goradia	3	21	00:02.1
K Lakartaju	3	23	00:01.5
H Nakashima	3	22	00:01.4
V Parunak	3	59	00:02.3
J Rosenschein	3	66	00:00.9
A Ruvinsky	3	23	00:01.3
G Sukthankar	3	21	00:02.8
S Swarup	3	24	00:01.4
M Tambe	3	135	00:02.4
T Wagner	3	14	00:01.4
L Zavala	3	23	00:02.4
AGR Evans	3	443	00:01.8
Guangtian Meng	3	41	00:00.4
Rajiv Khosla	2	9	00:02.1
Robert J Howlett	2	9	00:01.6
Lakhmi C Jain	2	9	00:01.4
C Jin	3	17	00:01.4
A S Jugessar	3	23	00:01.3
S Day	3	23	00:02.5
D Gallagher	3	23	00:01.4
C W A Johnson	3	35	00:01.4
M G Gore	3	24	00:02.4
Dave Reynolds	3	23	00:02.5
N C Karunatillake	3	39	00:00.8
Jong-Woo Choi	3	23	00:01.4
Tae-Young Kim	3	23	00:01.4
Paul Kitchin	3	23	00:02.6
Andrew Woods	2	9	00:01.4
Mark Bolas	2	9	00:01.9
John Merritt	2	9	00:01.4
Ian McDowall	2	9	00:01.4
P Kittidachachan	3	25	00:01.4
T Markvart	3	25	00:01.4
R Greef	3	25	00:01.4
D Bagnall	3	25	00:01.4
B Klin	3	24	00:01.9
CL Koh	3	38	00:00.4
K Krukow	27	177	00:07.0
R Lawley	3	33	00:00.3
P Le Boeuf	3	23	00:01.6
T D Lee	18	162	00:04.0
Ali Adibi	2	9	00:01.4
Shawn-Yu Lin	2	9	00:01.1
Axel Scherer	2	9	00:01.4
Yih-Jiun Lee	3	21	00:02.5
Tom Lenaerts	5	39	00:32.5
Dominique Chu	5	39	00:32.4
German Vidal	3	23	00:32.4
Mooly Sagiv	2	9	00:01.1
Kevin Carey	3	24	00:01.4
Kai-Wen Lien	3	25	00:03.8
M Andrejevi?	3	24	00:01.4
C Liu	3	25	00:01.3
C H Ta	3	25	00:01.3
S Redif	3	23	00:04.4
T Cooper	3	23	00:02.4
J G McWhirter	3	23	00:02.8
Lampe L	2	9	00:03.0
S Lo Presti	3	26	00:00.3
C Booth	3	24	00:00.3
R Falcone	3	22	00:01.4
S Barber	3	22	00:02.7
J Sabater	3	22	00:01.8
M Singh	3	22	00:01.8
O Shehory	3	23	00:01.4

Continued on next page

Person	Graphs	Triples	Time
S Willmott	3	23	00:03.5
E Merelli	4	34	00:01.4
C E Rogerson	3	23	00:01.5
C Adsett	3	17	00:01.6
R Pintelon	3	25	00:01.6
Bart L M de Moor	223	1156	01:26.3
Dominique Borrione	2	9	00:02.2
Wolfgang Paul	2	9	00:02.5
M G Martini	3	23	00:01.4
M Mazzotti	3	23	00:01.3
M Chiani	3	23	00:04.4
G Panza	3	23	00:01.3
C Lamy-Bergot	3	23	00:01.3
J Huusko	3	23	00:01.3
G Jeney	3	23	00:01.3
G Feher	3	23	00:02.8
C D Metcalf	4	156	00:01.3
V Yule	3	38	00:02.9
Jane Burridge	174	846	01:20.9
Victoria Yule	3	38	00:00.7
Alessandro Beda	3	20	00:02.7
F P Mezzapesa	2	11	00:05.2
I C S Carvalho	2	11	00:00.6
C Corbari	2	11	00:00.3
P G Kazansky	2	11	00:00.8
G Chen	2	11	00:00.9
Alex A Buss	3	21	00:01.6
Rajiv Khosla	2	9	00:01.7
Robert J Howlett	2	9	00:01.9
Lakhmi C Jain	2	9	00:02.3
Iain Tulloch	3	25	00:02.2
Rowin Young	3	29	00:03.2
Feng (Barry) Tao	2	44	00:01.6
Biswajit Mishra	3	32	00:01.9
Simon Burton	3	21	00:02.1
S Munroe	3	67	00:00.8
S Roberts	3	41	00:00.7
F Tauser	3	23	00:03.0
A Zach	3	23	00:02.5
G Flinn	3	23	00:01.9
F Lison	3	23	00:01.4
Hamid R Arabnia	2	9	00:01.4
Jun Ni	2	9	00:03.7
Tieniu N Tan	3	23	00:02.6
Rama Chellappa	3	23	00:03.8
David Nunn	3	140	00:01.9
Andrew Huang	3	23	00:01.4
Michael Rycroft	3	26	00:01.5
Victor Trakhtengerts	3	23	00:02.6
Robin Mansell	3	30	00:04.5
Brian S Collins	3	27	00:01.5
N S Othman	3	134	00:00.5
N S Othman	3	134	00:00.3
Ippokratis Pandis	3	24	00:03.9
Nikos Karousos	3	14	00:03.9
S Thompson	3	29	00:00.5
Jigar Patel	3	33	00:01.0
W T Luke Teacy	4	108	00:00.7
Stuart Chalmers	3	40	00:00.5
Nir Oren	3	32	00:00.5
Timothy J Norman	3	65	00:00.4
Alun Preece	3	40	00:03.6
Peter M D Gray	3	61	00:00.8
Gareth Shercliff	3	32	00:00.7
Patrick J Stockreisser	3	33	00:00.7
Jianhua Shao	3	21	00:01.5
W Alex Gray	3	50	00:00.8
Nick J Fiddian	3	50	00:02.1
Simon Thompson	3	29	00:02.3
Gillian Lovegrove	3	23	00:03.4
S Paurobaly	3	43	00:00.5
Matt Sharifi	3	31	00:01.8
Y K Penya	3	24	00:01.8
R Pongvthithum	3	31	00:03.3

Continued on next page

Person	Graphs	Triples	Time
R Ponvuthithurn	3	23	00:02.8
Guillermo Power	3	21	00:01.8
Alexandra I Cristea	3	14	00:02.1
Craig Stewart	3	14	00:01.7
Helen Ashman	3	14	00:03.3
Dhiraj K Pradhan	3	21	00:02.5
Magdy S Abadir	3	55	00:02.4
M Praeger	3	37	00:02.8
A M De'Paula	3	14	00:01.5
J Frey	3	27	00:01.5
T Rahwan	4	132	00:00.9
R Mansell	3	22	00:01.7
B S Collins	3	22	00:01.8
A Gonzlez	3	31	00:05.6
J Ratcliffe	3	70	00:02.3
L V Duinkerken	3	23	00:03.0
D Owens	465	2271	03:45.1
J Schiff	3	26	00:02.9
S Saha	3	23	00:01.5
A Bouffioux	3	23	00:05.4
Y Ammar	3	23	00:03.2
M Marzenki	3	23	00:09.1
P Fayet	3	23	00:01.6
T Rudge	6	65	00:09.7
S Uppal	3	29	00:01.5
Konstantin Y Degtiarev	3	22	00:07.1
S Saleh	3	24	00:08.9
A Chik	3	24	00:08.1
MN Dalimin	3	24	00:07.7
m c schraefel	3	23	00:08.4
Craig Harris	3	22	00:08.5
Alistair Russel	4	169	00:06.3
M Schuermans	3	26	00:01.8
P Wentzell	3	23	00:07.3
N Sclater	3	39	00:07.2
E Boyle	3	24	00:02.3
J Bull	3	31	00:01.8
C Church	3	24	00:02.5
P Craven	3	24	00:22.6
R Young	3	29	00:02.5
M Danson	3	32	00:04.1
M Halliday	5	50	00:01.5
L Howie	5	50	00:01.4
J X Kelly	3	24	00:01.5
S Lay	3	24	00:03.7
M Massey	3	24	00:01.6
M McAlpine	3	24	00:02.3
M McDonald	3	24	00:01.4
S Rogers	3	24	00:01.5
Peter Sewell	3	14	00:02.9
James J Leifer	3	14	00:02.7
Keith Wansbrough	3	29	00:02.8
Francesco Zappa Nardelli	3	21	00:03.6
Mair Allen-Williams	3	25	00:02.7
Pierre Habouzit	3	21	00:02.6
Viktor Vafeiadis	3	21	00:02.6
John R Wilson	3	22	00:02.3
Nigel E Corlett	3	22	00:01.5
E T A Rogers	4	1153	00:01.6
Yanqiu Shao	4	34	00:02.8
Jiqing Han	4	34	00:02.6
J S Shawe-Taylor	4	695	00:01.6
A Meng	3	24	00:02.6
G S Ng	3	15	00:02.3
Richard Simms	3	23	00:01.4
A C B Silva	3	23	00:03.9
J B S Oliveira	3	23	00:02.8
F T M Mano	3	23	00:02.5
T B Silva	3	22	00:02.5
L L Meirelles	3	14	00:02.6
F R Meneguzzi	13	86	00:09.3
F Giannetti	3	26	00:04.4
Y W Sim	3	72	00:01.0
L A Carr	392	3768	02:46.7

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Person	Graphs	Triples	Time
H C Davis	3	679	00:06.5
D E Millard	271	2086	01:48.6
G B Wills	244	2166	01:43.2
Adrian Pillinger	3	23	00:01.9
Daniela Fina	3	23	00:01.4
Giorgio Da Bormida	3	23	00:03.3
B Skellett	13	96	00:06.7
B Cairns	3	23	00:01.5
N Geard	4	245	00:00.6
B Tonkes	13	99	00:02.9
H -G Beyer	3	22	00:04.2
Paul R Smart	4	361	00:06.0
monica c schraefel	197	1205	01:30.9
Ashley Smith	3	29	00:06.3
Erik Kamsties	2	9	00:02.0
Vincenzo Gervasi	2	9	00:02.1
Pete Sawyer	2	9	00:05.6
C Jones	3	42	00:01.2
A Romanovsky	3	24	00:00.7
E Troubitsyna	37	242	00:06.7
Sven van den Berghe	3	24	00:06.5
Paul Needham	3	25	00:01.7
Steve Probets	3	25	00:01.4
Adrienne Muir	3	25	00:02.0
Ann OBrien	7	55	00:01.5
Fytton Rowland	3	25	00:04.7
A C H Tan	3	31	00:01.4
T Meurers	3	38	00:02.4
S M Veres	3	50	00:00.5
G Aglietti	3	55	00:01.1
Kieron Taylor	3	24	00:02.8
Rob Gledhill	3	23	00:01.6
Jonathan W Essex	3	14	00:01.5
H von Knel	3	23	00:01.4
Edward Thomas	3	23	00:06.5
G Schroeder	3	31	00:00.5
E A Hinds	57	363	00:19.2
E Kukharenka	4	187	00:02.1
J Riedt	3	28	00:01.6
P Kraemmer	3	37	00:00.6
L Brzaga	3	24	00:02.6
M Jackson	3	37	00:00.4
D Barcelo	3	32	00:06.3
S Rodriguez-Mozaz	3	28	00:01.7
M Lopez de Alda	3	33	00:01.4
F Sacher	3	28	00:03.4
J Stien	3	28	00:04.4
J Slobodnik	3	28	00:01.4
P Oswald	3	28	00:01.5
H Kozmenko	3	26	00:07.8
E Korenkov	3	24	00:02.8
L Tthov	3	24	00:02.6
Z Krascsenits	3	26	00:01.4
L Barzaga	3	15	00:03.3
M J Lopez de Alda	3	33	00:01.3
E Korenkova	3	15	00:04.2
H Kozmenkoi	3	25	00:01.4
L Tothova	3	25	00:01.4
Neil Ross	3	23	00:03.9
S Wang	3	20	00:01.8
Bayrum Unal	3	20	00:01.4
Chao-Y Tai	3	43	00:01.0
David P Shepherd	315	1640	02:24.6
Nicolas M B Perney	56	385	00:22.6
Caterina Netti	3	14	00:15.6
Gregory J Parker	186	1544	01:35.7
Shigeyasu Uno	3	67	00:01.7
Nobuya Mori	3	37	00:01.8
Kazuo Nakazato	3	117	00:07.5
Nobuyoshi Koshida	3	54	00:05.5
D VARGHESE	3	25	00:02.6
J N ROSS	3	137	00:02.7
T Kanade	2	9	00:24.5
A K Jain	2	9	00:19.3

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Person	Graphs	Triples	Time
N K Ratha	2	9	00:31.4
A Vinokourov	3	31	00:17.4
A N Soklakov	3	24	00:02.1
C J Saunders	3	75	00:00.6
Michel Verleysen	2	9	00:22.6
T Wagner	3	24	00:04.5
L Gasser	3	24	00:10.4
J Odell	3	24	00:31.3
T Carrico	3	24	00:11.9
T Ernst	3	25	00:02.5
H Achard	3	23	00:01.8
S Deleonibus	3	25	00:01.5
Keith Bain	3	32	00:01.5
Qian Wang	3	25	00:10.0
Gopal Gupta	3	105	00:01.5
Manuel Hermengildo	2	9	00:01.3
Daniel Cabeza	2	9	00:01.9
P Wegner	3	14	00:01.9
F Arbab	3	21	00:14.3
D Goldin	3	32	00:01.5
D Robertson	3	23	00:01.5
Y Z Wei	3	31	00:00.4
Daniel M Weinreich	3	17	00:01.4
Lin Chao	3	23	00:01.5
J Watson	22	165	00:06.4
J Mattick	10	77	00:02.7
D Bradley	3	24	00:15.6
J Hallinan	17	128	00:05.4
F Rothlauf et al	2	9	00:05.9
H Williams	3	14	00:01.9
M S Capcarrere	3	22	00:02.3
A A Freitas	197	1080	01:31.4
P J Bentley	3	20	00:02.1
C G Johnson	28	221	00:08.7
Kyoung Jae Won	3	32	00:02.7
Thomas Hamelryck	3	24	00:02.9
Sophie Wuerger	3	21	00:01.5
Georg Meyer	3	21	00:04.4
P J Mc Nally	3	35	00:00.4
G D M Dilliway	3	36	00:00.4
B A MacDonald	3	23	00:02.6
V Bonora	3	23	00:04.4
B Henderson-Sellers	3	22	00:03.0
P Giorgini	3	22	00:03.8
Y Zheng	3	26	00:10.9
M Endo	3	23	00:01.6
Hai Zhuge	3	23	00:03.6
Jie Liu	3	23	00:08.5
Geoffrey C Fox	191	1855	01:26.9
B Hillebrands	2	9	00:02.1
F R REsendiz-Rodriguez	3	31	00:03.6
C C Evci	3	29	00:02.8
D Vitello	3	25	00:03.4
S D Brotherton	3	31	00:01.7
A Gill	3	29	00:01.8
J M Shannon	3	25	00:03.5
K N Ngan	3	17	00:02.9
J Ambjorn	3	23	00:02.8
S Otto	3	29	00:04.8
V N Purswani	3	23	00:02.7
J Darlington	3	23	00:01.5
D A Turner	3	22	00:01.8
T Simon	5	30	00:06.0
R Scholes	5	30	00:01.6
G A Jones	3	24	00:03.5
P F Coventry	3	27	00:02.4
M M Holness	3	26	00:02.9
P Bolton	3	23	00:02.4
J R Smith	3	37	00:00.6
P Lees	3	27	00:06.1
D McAllister	3	27	00:01.6
J R G Pude	3	18	00:03.2
S Bone	3	23	00:03.3
J Behi	3	23	00:06.1

Continued on next page

Person	Graphs	Triples	Time
R Pethig	3	23	00:03.4
K G Nicols	3	35	00:01.9
A J Guttman	3	31	00:03.3
B W Keck	3	23	00:02.5
F H Y Chan	3	23	00:03.1
G Fontaine	2	9	00:01.4
I Gale	3	23	00:04.9
F Benjamin	3	25	00:02.7
P J Patrick	3	29	00:02.4
J van den Bos	3	21	00:01.5
J Bormann	2	9	00:02.0
E Bacs	3	35	00:01.6
J M Butcher	3	25	00:06.9
E F French	3	23	00:04.7
R L Kelly	3	24	00:04.1
C S Athwal	3	23	00:02.4
J Pude	3	18	00:01.7
J Smith	3	37	00:00.4
D Nunn	3	23	00:03.0
T Pisanski	3	38	00:04.1
J Vrabec	3	21	00:02.7
P L Knight	2	9	00:01.3
R D Speller	3	23	00:01.4
C Wallis	3	23	00:01.9
Eduardo Alonso	3	24	00:02.5
Simon Colton	3	24	00:01.4
Daniel Kodenko	3	24	00:01.4
Michael Schroeder	3	24	00:03.5
Kostas Stathis	3	24	00:01.4
T Y G Tay	3	25	00:02.3
Klaus Tittelbach	3	23	00:01.5
Gunther Lippert	3	23	00:01.4
Olaf Krueger	3	23	00:02.3
Jens Lehman	3	23	00:01.4
Norbert Fiebig	3	23	00:00.7
Kai Dombrowski	3	23	00:01.6
Rolf Kraemer	3	23	00:17.7
Patrick Maehoenen	3	23	00:00.4
Yvonne Margaret Howard	4	184	00:01.2
M Petrichuk	3	23	00:00.5
P Brazdil	2	9	00:00.5
A Jorge	2	9	00:00.4
Y Metivier	3	25	00:01.8
P Wacrenier	3	21	00:01.9
M Mosbah	3	25	00:01.0
Petros Oikonomakos	3	38	00:01.6
Hock Kim Tan	3	77	00:00.4
Gian Pietro Picco	2	9	00:00.5
Matthew J Dodgson	15	144	00:04.1
Huimin Lin	3	21	00:02.0
U Hoppe	3	34	00:01.7
U Eysholdt	3	26	00:02.8
Jack MacDonald	5	36	00:01.4
H Golledge	3	17	00:01.5
John Gigg	3	15	00:02.4
Martin Tovee	15	160	00:02.9
Yoav Tadmor	15	141	00:03.4
H Mohamad	3	31	00:01.1
A I A Rahim	3	24	00:02.2
Theo Gonciari	3	53	00:00.5
Andrew C Lamb	3	45	00:00.5
Fuccio Cristiano	3	29	00:01.1
Peter L F Hemment	3	73	00:01.7
P F Flores	3	17	00:01.5
H C Neto	3	14	00:01.6
James B Hayfron-Acquah	3	27	00:00.6
Mark S Nixon	450	3434	03:34.4
HT How	3	23	00:04.0
TH Liew	3	23	00:04.5
EL Kuan	3	23	00:03.2
Philip J B Jackson	3	47	00:00.8
Siegfried Handschuh	3	70	00:01.7
Rose Dieng-Kuntz	2	10	00:00.5
Steffan Staab	4	45	00:01.1

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Person	Graphs	Triples	Time
Stuart Edward Middleton	4	140	00:01.5
David C De Roure	488	4207	03:46.5
Surresh Uppall	3	41	00:00.4
Arthur F W Willoughby	3	36	00:00.4
Janet M Bonar	3	115	00:00.4
Nick E B Cowern	3	33	00:01.5
Richard Morris	3	26	00:01.6
Mark G Dowsett	3	26	00:01.5
Paul Chapman	3	23	00:02.0
A Majumdar	3	17	00:02.7
R Sarswat	3	41	00:00.4
D Chauhan	3	17	00:01.4
M Petrovich	63	380	00:25.6
Stephen Chan	3	28	00:01.6
David Bearman	2	9	00:01.1
Franca Garzotto	2	9	00:00.4
V F Dent	3	23	00:00.6
S Harris	3	90	00:00.6
K H J Buschow	3	13	00:01.4
R W Cahn	3	13	00:03.3
M C Flemings	3	13	00:01.8
B Ilschner	3	22	00:02.5
E J Kramer	3	13	00:02.2
S Mahajan	3	13	00:01.4
D Esrafili-Gerdeh	4	64	00:00.8
M S Gaur	3	37	00:00.8
F Hamid	3	31	00:00.8
Thomas V Papakostas	3	28	00:01.8
Pieter H Hartel	627	2900	04:57.5
K T V Grattan	2	9	00:00.5
S H Khan	2	9	00:00.4
Isabelle Attali	2	9	00:00.5
Thomas Jensen	2	9	00:01.0
N Clayton	3	25	00:00.6
A C Lamb	3	45	00:00.5
L S Riley	3	29	00:00.4
B Lawrence	3	23	00:00.5
Laksono Adhianto	3	199	00:01.2
Leonid Mikhailov	3	16	00:01.5
A Fu	3	23	00:01.4
B H Blott	3	57	00:00.4
Gerald Fischer	2	9	00:00.5
FX Roithinger	2	9	00:01.7
A H Al-Khoury	3	27	00:01.5
Goddard K F	3	23	00:02.5
Ship K S	3	23	00:03.3
RW Stewart	3	60	00:02.4
R Rabenstein	3	29	00:01.8
J Ross	3	137	00:00.5
A Brown	133	1268	00:54.2
Leejay Wu	3	25	00:01.5
Christos Faloutsos	3	21	00:02.8
T Zhang	3	25	00:02.0
M Riehle	3	17	00:01.6
A Curtis	3	23	00:01.9
Yellowlees Douglas	3	22	00:02.2
David G Duran	3	22	00:02.2
Y Xie	12	114	00:02.5
Samhaa R El-Beltagy	3	23	00:02.7
S Reich	2	9	00:00.5
M M Tzagarakis	2	9	00:00.5
P M E De Bra	2	9	00:00.4
Ben Juby	3	31	00:01.9
Kevin R Page	4	168	00:01.3
Richard Greenough	3	21	00:01.6
Hugh Davis	2	9	00:00.7
Yellowlees Douglas	2	9	00:00.4
David Durand	2	9	00:01.1
Sigi Reich	2	9	00:00.4
N G Green	4	385	00:00.4
M P Hughes	3	25	00:01.4
F J Rixon	3	17	00:01.6
N D Hewer	3	33	00:00.4
R Mann	2	9	00:00.9

Continued on next page

Person	Graphs	Triples	Time
D Mewes	2	9	00:00.4
P Ronson	2	9	00:00.2
J Generowicz	3	43	00:00.4
R Mann	2	9	00:00.5
D Mewes	2	9	00:05.4
P Ronson	2	9	00:00.7
Neil Ridgway	3	23	00:01.1
Myungchul Kim	2	9	00:00.4
Byoungmoon Chin	2	9	00:01.5
Sungwon Kang	2	9	00:00.7
Danhyung Lee	2	9	00:01.5
WC Chan	3	23	00:03.1
CJ Harris	3	23	00:21.8
A Ciesla	3	23	00:01.8
B Garda	3	23	00:01.5
Tim Wilkinson	3	31	00:01.8
J Domingo-Ferrer	3	37	00:02.9
Stefan Hallerstede	3	23	00:00.5
Arved Hubler	2	9	00:00.5
Peter Linde	2	9	00:01.1
John W T Smith	2	9	00:00.6
Chang-Eob Kim	3	29	00:01.6
A L Oliveira	3	25	00:00.5
A L Reynolds	3	24	00:01.6
I G Thayne	56	365	00:23.4
J M Arnold	3	24	00:01.5
P J I Maagt	3	24	00:02.9
C Ciuti	3	24	00:02.9
M Skolnick	3	29	00:03.1
VY Trakhtengerts	3	23	00:29.0
AG Demekhov	3	35	00:07.4
DL Pasmanik	3	25	00:02.1
EE Titova	3	23	00:01.5
BV Kozelov	3	23	00:01.4
MJ Rycroft	3	26	00:01.4
D J Bakewell	3	50	00:02.0
J P Foster	3	30	00:01.8
Josef Bigun	2	9	00:00.7
Fabrizio Smeraldi	2	9	00:00.2
P Glynne Jones	84	451	00:36.1
E P James	3	50	00:00.4
Mathias Wagner	3	45	00:00.7
P R Routley	3	24	00:01.8
P A J de Groot	3	30	00:01.7
ChewYean Yam	3	26	00:01.5
James Benson	3	51	00:01.0
Nele V D'Halleweyn	3	57	00:00.6
Craig A Easson	3	23	00:01.4
Michael J Uren	3	81	00:00.9
Olivier Faynot	3	23	00:00.5
Jean-Luc Pelloie	3	23	00:00.5
T Brody	4	177	00:02.4
Z Jiao	3	23	00:00.7
S Hitchcock	4	206	00:01.2
Jason Farquhar	3	23	00:00.8
R Hollands	3	24	00:03.2
A S Clough	3	24	00:01.9
R Peel	3	24	00:02.1
R Smith	3	45	00:00.5
J Sousa	3	27	00:07.5
M Abramovici	3	23	00:02.1
B M Armstrong	3	21	00:05.2
H S Gamble	3	24	00:01.9
Rick Mauntel	3	23	00:01.7
Margaret Huang	3	23	00:01.7
Robin W Allen	3	31	00:02.3
Christopher P Bailey	3	77	00:15.6
J V Champion	3	33	00:00.6
M A Brown	3	92	00:04.7
Peter Cheng	3	45	00:04.0
James Cupt	3	47	00:00.6
BP Hiett	3	40	00:00.7
JM Generowicz	3	43	00:01.2
D Beckett	3	37	00:00.5

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Person	Graphs	Triples	Time
GJ Parker	185	1689	01:24.5
KS Thomas	4	184	00:17.4
Ivan Wolton	3	23	00:01.2
David Nowak	2	9	00:02.8
T S White	3	25	00:01.4
G Hazel	3	21	00:01.5
Louise Crow	3	24	00:01.9
Manoranjan Satpathy	3	15	00:01.5
Eduard de Jong	3	25	00:02.7
Mark Longley	3	25	00:04.8
J N Oliveira	2	9	00:02.6
P Zave	2	9	00:00.9
John F Hughes	3	23	00:00.4
M E Mokhtari	3	26	00:02.0
J N Oliviera	2	9	00:00.5
P Zave	2	9	00:00.4
M J Palmer	3	48	00:00.5
T J Grasby	3	44	00:00.4
P J Phillips	3	40	00:00.6
M J Prest	3	41	00:00.4
E H C Parker	3	69	00:00.4
T E Whall	3	68	00:02.1
C P Parry	3	30	00:00.4
A M Waite	3	82	00:04.0
A G R Evans	3	443	00:01.3
J R Watling	3	45	00:00.5
J S Sandhu	3	24	00:01.6
T Sdmeyer	3	23	00:02.7
J Aus der Au	3	26	00:02.1
L L Yang	3	419	00:01.6
T D Drysdale	3	27	00:01.7
R J Blaikie	3	27	00:12.0
D R S Cumming	3	27	00:02.1
Dave Humpreys	3	23	00:01.6
Jon Ash	3	23	00:08.4
E Goormaghtigh	3	24	00:01.8
F C A Somerville	3	24	00:01.5
A Harris	3	33	00:01.3
M B D Charlton	4	269	00:01.5
D Tudhope	3	37	00:00.5
H Alani	3	151	00:01.5
K Nordstad	3	25	00:03.4
P Berry	3	31	00:01.5
N Wayth	3	39	00:02.6
T Williams	3	63	00:25.0
A Bailey	3	103	00:01.0
M Thew	3	37	00:00.8
Brown AD	132	1266	00:53.4
Ross JN	3	137	00:00.7
Nichols KG	3	23	00:00.9
Anna M Barney	3	24	00:01.6
Christine H Shadle	3	24	00:23.6
Peter A J de Groot	184	1080	01:20.9
Jeff P Foster	3	30	00:08.0
E Gaura	2	9	00:30.3
Michael Kraft	2	9	00:01.4
V Marik	3	15	00:06.7
O Stepankova	3	23	00:06.4
R Trappl	3	22	00:13.5
K Ga?kowski	3	266	00:01.2
L Fajstrup	3	22	00:01.6
M Blagrove	3	22	00:03.4
E F Pace-Schott	3	22	00:01.8
M Solms	3	22	00:03.6
J C Abanulo	2	11	00:00.8
R D Harris	2	11	00:01.0
P N Bartlett	2	11	00:00.8
G S Aglietti	3	55	00:00.5
R S Langley	3	59	00:00.9
S B Gabriel	3	63	00:08.6
F N Alavi	3	23	00:00.5
D O King	3	23	00:01.5
E Alonso	3	21	00:00.5
D Kudenko	3	35	00:01.6

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Person	Graphs	Triples	Time
Anupriya Ankolenkar	3	29	00:00.7
Mark Burstein	3	37	00:04.6
Jerry Hobbs	2	15	00:17.6
Ora Lassila	3	26	00:00.9
Srini Narayanan	2	13	00:01.8
Honglei Zeng	3	23	00:01.7
P Anthony	3	26	00:08.7
J Ortiz Lopez	3	23	00:01.4
V Apostolopoulos	2	12	00:01.0
L M B Hickey	2	12	00:00.2
D A Sager	2	11	00:00.4
J C Bagett	37	244	00:15.1
Tim Menzies	2	9	00:00.6
O R Tutty	3	64	00:00.7
F Barbanera	3	27	00:01.5
M Dezani	3	26	00:00.6
I Salvo	3	21	00:02.0
N P Barnes	3	24	00:01.7
B M Walsh	3	24	00:01.5
M Bauderon	3	23	00:01.5
A Sellami	3	23	00:00.9
L Baresi	2	9	00:00.7
M Pezze	2	9	00:00.3
G Taentzer	2	9	00:00.6
C Zaroliagis	2	9	00:00.6
J V Subhas Chandra Bose	3	23	00:01.1
M M De Souza	3	23	00:01.8
E M Sankara Narayanan	3	31	00:00.8
T J Pease	3	23	00:01.5
J Humphry	3	29	00:05.0
K Shoop	3	21	00:00.6
G Brambilla	27	210	00:09.4
H J Booth	3	23	00:26.3
E K Illy	3	23	00:31.3
L Reekie	3	23	00:11.9
L Dong	3	23	00:23.3
V Pruneri	3	24	00:24.6
Peter Brezany	3	14	00:03.6
Marianne Winslett	3	14	00:13.0
Toni Cortes	4	35	00:18.6
M P Bruijn	2	13	00:08.5
M Ridder	23	173	00:35.9
P A J DE Korte	3	31	00:16.3
R Wiegerink	3	27	00:31.4

BBC Programmes Expansion Profiles

The following is an Expansion Profile given in Turtle syntax that is used for the experiment presented in Section 4.2.2. It is effectively the default expansion profile with an additional Dataset and Linkset added in order to follow `po:series` and `xhv:alternate` links so that the desired data from BBC programmes can be retrieved and preserved.

```
   @prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>.
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>.
@prefix xsd: <http://www.w3.org/2001/XMLSchema#>.
@prefix owl: <http://www.w3.org/2002/07/owl#>.
@prefix foaf: <http://xmlns.com/foaf/0.1/>.
@prefix dcterms: <http://purl.org/dc/terms/>.
@prefix scovo: <http://purl.org/NET/scovo#>.
@prefix void: <http://rdfs.org/ns/void#>.
@prefix aat: <http://www.dotnetrdf.org/AllAboutThat/>.
@prefix po: <http://purl.org/ontology/po/>.

@base <http://localhost/minithesis/expansion#>.

<> a aat:ExpansionProfile;
   aat:maxExpansionDepth 3;
   rdfs:label "Default Expansion Profile".

<#BBC> a void:Dataset ;
           dcterms:title "BBC Programmes" ;
           dcterms:description "BBC Programmes Dataset" ;
           foaf:homepage <http://www.bbc.co.uk/programmes> .

<#BBCSeries> a void:Linkset ;
                    dcterms:title "BBC Series Links" ;
                    dcterms:description "po:series links in BBC Programmes" ;
                    void:target <#BBC> ;
                    void:linkPredicate po:series ;
                    void:linkPredicate <http://www.w3.org/1999/xhtml/vocab#
    alternate> .

<#DBPedia> a void:Dataset;
                  dcterms:title "DBPedia";
                  dcterms:description "RDF Data extracted from Wikipedia";
                  foaf:homepage <http://dbpedia.org>;
                  void:sparqlEndpoint <http://dbpedia.org/sparql>.
```

```
<#SameAs> a void:Dataset;
                    dcterms:title "SameAs";
                    dcterms:description "SameAs URI Discovery Service";
                    foaf:homepage <http://sameas.org>;
                    aat:uriDiscoveryEndpoint <http://sameas.org/n3?uri=>.

<#Sindice> a void:Dataset;
                    dcterms:title "Sindice";
                    dcterms:description "Semantic Web Search Engine";
                    foaf:homepage <http://www.sindice.com>;
                    #void:uriLookupEndpoint <http://api.sindice.com/v2/search?qt=
    term&q=>.
                    void:uriLookupEndpoint <http://api.sindice.com/v2/cache?url=>.
```