

Global Computing II

A new FET Programme for FP6

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FET 2004 Information Day

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1 Activities

- Origins
- Building the case
- Consultations

2 Terms of reference

- The aims
- The concepts
- The challenges
- The themes

3 Conclusion

The Origin: Global Computing

Global Computing refers to computation via sharing a seamless, geographically distributed, open-ended network of bounded resources by agents acting with partial knowledge and no central coordination.

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Research themes relevant under such hypothesis

- Policies of access control and their enforcement
- Security: authentication, privacy, non-repudiation
- Protection of resource bounds
- Dynamic learning about environment and peers
- Trust formation and management
- Location awareness
- Ad hoc assemblies of computees
- and surely more...

The Origin: Global Computing Aims

Some general issues involved

- *locality and domains*
- *diversity and cooperation*
- *open endedness*
- *no trustworthy authority*
- *partial knowledge...*
- *and surely more...*
- *mobility and migration*
- *communication*
- *seamless computing*
- *malicious entities*
- *... and its acquisition*

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The Aims

- 1 Design GC systems;
- 2 Analyse and reason about their behaviour;
- 3 Avoid and/or detect undesirable behaviour through control of the system and/or its environment; and
- 4 Understand their limits.

The Origin: Global Computing Clusters

Clusters:

- **Analysis of Systems and Security:** Formal models and techniques for the specification of GC systems and the analysis of their behaviour.
- **Languages and programming environments:** Paradigms and tools for programming of GC systems, including the aspects of mobility, distribution, reconfigurability, security, and trust.
- **Foundations of networks and large distributed environments:** Algorithmic aspects of distributed systems, dynamic societies of computational entities.

The Origin: Global Computing Projects

- **DART**: Dynamic Assembly and Reconfiguration
- **MIKADO**: Mobile Calculi based on Domains
- **MRG**: Mobile Resource Guarantees
- **MyThS**: Models and Types for Security
- **Profundis**: Proofs of Functionality
- **SECURE**: Secure Environments for Collaboration
- **PEPITO**: Peer-To-Peer-Implementation-and-TheOry
- **AGILE**: Architectures for Mobility
- **DEGAS**: Design Environments for Global Applications
- **CRESCCO**: Critical Resource Sharing for Cooperation
- **DBGLOBE**: A Data-centric Approach to Global Computing
- **FLAGS**: Foundational Aspects of Global Computing
- **SOCS**: Societies of heterogeneous computees

The Origin: GC Revision – 13/14 Feb 2003

- **Feedback from revision:** Be effective, focused, and bridge towards applications.
- **Discussion:** Explain (to commission and partly to general public) why a second FET in GC is needed in the context of FP6.

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People

Vinny Cahill,
Manuel Hermenegildo,
Ugo Montanari,
Don Sannella,
Paul Spirakis,
Martin Wirsing

José-Luis Fiadeiro,
Jan van Leeuwen,
Mogens Nielsen,
Vladimiro Sassone,
Jean-Bernard Stefani

Expression of Interest NoE-GC2, 7 Jun 2002

- Precursor: EoI “**Foundations of Global Computing**”

Partners		
Aarhus	Bologna	Cambridge
Dublin	ENS Paris	Edinburgh
Florence	Genova	Imperial
INRIA	Lisbon	Lousanne
Marseille	Munich	Pisa
Sussex	Turin	Uppsala
Venice		

- **Idea:** Essentially the integration of research and training for (an enlargement of) the “**Malága**” GC clusters.

Building the case for GC2

- Brainstorming meeting (Brighton – 17.03.2003)

People

Fiadeiro, Hermenegildo, Montanari, Sannella, Sassone

- **Building the case:** Delivered Brussels – 26.03.2003
- Document's main point: "**horizontal/vertical view.**"

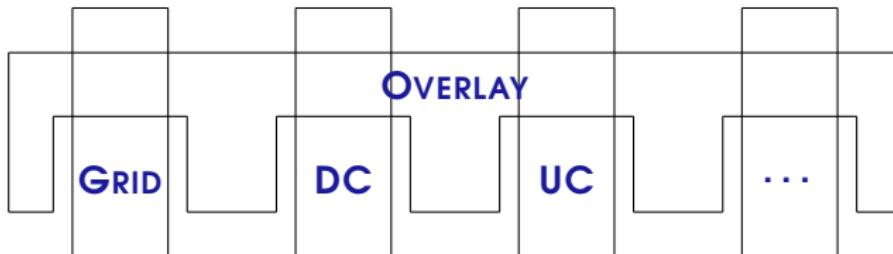
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Consultation in Brussels – 12.06.2003

- Purpose: Discuss the “Building the Case” paper.

People

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K. Geihs
C. Laneve
V. Sassone
B. Thomsen

V. Cahill
S. Haridi
F. Orejas
P. Spirakis

L. Cardelli
J. Labarta
D. Sannella
A. Tarlecki

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- Drafting the call (V. Sassone and L. Flores – 24.07.2003)
Overlay computers, integrated approach systems/theory.

Consultation in Brussels – 12.11.2003

- Cleaning, tweaking, and tuning the call
 - Balance theory/system building
 - Central issues and themes and their scope in IPs

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The complete call at “**Bulletin of the EATCS no. 82**” (Feb 2004).

Timeframe for Global Computing II

Relevant Dates (tentative)

Publication of the call	June 2004
Deadline for pre-proposals	2 Jul 2004
Deadline for applications	22 Sep 2004 (17:00 CET)
Results	Nov 2004
Negotiation	Dec 2004 – March 2005
Start of Projects	April 2005

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The Key Aims

DEFINE

- *innovative theories*
- *computational paradigms*
- *linguistic mechanisms*
- *implementation techniques*

FOR THE

- *design*
- *realisation*
- *deployment*

OF

- *global computational environments*
- *their application and management*

The Main Concepts

Issues

All four of

- ***security***
- ***resource usage and management***
- ***scalability***
- ***distribution transparency***

Methodology

Substantial integration between

- ***theory***
- ***systems building***
- ***experimentation***

Global Computers

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- **Examples:**
 - **the Internet** (reliable stream transport);
 - **virtual private networks** (privacy & confidentiality);
 - **the Web** (client/server extended handshake);
 - **the telephone network** (guaranteed QoS);
 - **the GRID** (sharing of computing power);
 - **UC** (seamless ubiquitous mobility);
 - **DC** (minutely diffused computational capacity).

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 - **the GRID** (sharing of computing power);
 - **UC** (seamless ubiquitous mobility);
 - **DC** (minutely diffused computational capacity).
- A future of **multiple, diverse** infrastructures each realising a *different* global computer is envisaged.

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- **Why?:** represent family of potential or actual global computers by abstracting over common characteristics.

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 - **resource discovery services**
(notion of resource sharing in distributed networks);
 - **search engines** (abstraction of information repository);
 - **systems of trusted mobile agents**
(notion of autonomic, exploratory behaviour);
 - **IPSEC** (abstraction of secrecy on IP);
 - several **global infrastructures** currently deployed
(e.g. the Web).

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(notion of autonomic, exploratory behaviour);
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 - several **global infrastructures** currently deployed
(e.g. the Web).
- **Non-Examples**: Abstractions relying on: **synchrony, low latency, trustworthiness, limitless bandwidth**. Approaches neglecting **scalability** and **security** not suitable.

The Research

Issues

All four of

- *security*
- *resource usage and management*
- *scalability*
- *distribution transparency*

Theories and techniques concerned with the above that are:

- either applicable to the **entire** global computing;
- or applicable to **specific classes** of global/overlay computers (where this is fully justified.)

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Proposals must show a **substantial integration** between **theory** and **systems building**. **Experiments and practical evaluation** are expected to be embedded in.

Research Themes

Research themes of interest to the initiative include:

Research Themes

- **Methods and infrastructures for trust;**
- **Models of interaction and cooperation;**
- **Abstraction mechanisms;**
- **Components and modularity;**
- **Programming languages concepts and support;**
- **Validation and verification;**
- **Algorithmic principles;**
- **Autonomy, adaptivity, and self-organisation;**
- **Interoperability;**
- **Design support and software techniques.**

Characteristics

The ideal IP proposals should:

- have the potential to radically change the way computing in global environments is done;
- aim at providing both foundational and practical advances on suitably large classes of global computers, and the integration of methods and concepts needed to lead to results that teach us general principles;
- identify clearly the class of global or overlay computers they focus on, and make sure that such a class is not unnecessarily restrictive;
- have clear objectives related to the list of core issues and challenges of global computing and expressed in terms of solutions realistically implementable in a global scenario;
- identify clearly the expected impact and concrete results, and have a set of clear methods and criteria to evaluate success.

Conclusion

Next Step

A lot of work went into this...

EoI → Building → Draft call → Call → ...

Do make applications