ENTICE TTN

Public Final Report of IST HPCN Industrial Sector Group Medical

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1 Abstract

The Medical Sector Group of the TTNs was formed with the objective of accelerating the uptake of HPCN in medicine and healthcare on a European scale by gaining a critical mass of HPCN success stories in the medical field, and to share expertise. The areas if medicine for which HPCN solutions were on offer include cardiology, radiology, rehabilitation and medical image processing.

2 Synopsis

2.1 Introduction

There is great potential for using HPCN in medicine and healthcare within Europe, and the application areas in which benefits can be gained are particularly wide. A special interest group was set up within the HPCN-TTN Network to help European healthcare providers to gain the benefits from technology. The aim was to help provide more cost-effective and better healthcare through the practical application of HPCN technology.

2.2 Successes

The Sector Group achieved success in bringing the benefits of HPCN technology to a wide audience in Europe. Each participant brought in a number of successful demonstrations of HPCN in particular areas. The critical mass of projects and the ability to share information allowed the group to achieve far more than the individual TTNs working alone could have done. The application areas covered included cardiology, radiology, rehabilitation, orthopaedics and biomechanics. The technology areas included image processing, HPCN databases, virtual reality and simulation.

The interest of over 500 professionals generated by the awareness raising efforts of the group confirms that HPCN-based solutions are a cost-effective way to improve healthcare.

Many of the demonstration projects are being further exploited. Fully commercial products and services are emerging.

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3   Executive Summary

3.1   Introduction

The HPCN-TTN Network was established by the European Commission to transfer HPCN technology from universities and research institutes to help technology providers to produce useful solutions for end-users in industry, commerce and public services. The network was in existence from 1997 - 2000, and consisted of 21 centres of expertise in technology transfer - the Technology Transfer Nodes (TTNs).

Each TTN had a set of specific technology transfer actions (the preparatory support and transfer (PST) actions), which were complemented by publicity, dissemination and exploitation actions. In order to achieve more effective technology transfer, the TTNs formed special interest groups aimed at particular market sectors. Ten TTNs participated actively in the Medical Sector Group, representing half of the network and eight member states. Approximately 10% of the PSTs in the network were related to medicine and healthcare. The areas which the PSTs covered included cardiology, radiology, rehabilitation and biomechanics. The technology areas included image processing, HPCN databases, virtual reality and simulation.

The key successes of the group can be summarised:

- Generation of a 'critical mass' of success stories
- Successful deployment of HPCN based solutions in EU healthcare providers
- Raised awareness of HPCN solutions among potential new end-users
- Increased European dimension by transfer of technology between member states.
- Increased access to technology for all participants

3.2   Key actions undertaken

The Sector Group undertook a number of key actions to achieve its goals:

- Participation in exhibitions and trade fairs.
- Production and distribution of publicity material
- Maintenance of a web-site giving details of successful applications of HPCN

The Sector Group reported to the commission through the ENTICE TTN. Planning meetings were held every 6 months to coincide with the meetings of the TTN Network.

3.2.1   Participation in trade fairs

The Sector Group members attended a number of the major trade fairs and exhibitions. PST demonstrators were shown at these events, and publicity material was generated. The PST demonstrators were clustered together to get added value.

3.2.2   Production of publicity material

In addition to the brochures produced by each TTN, a general flyer of HPCN in medicine was produced early in the project. This was for use before PST results were available. In addition a flyer describing the radiology related projects was produced, and towards the end of the project a flyer containing all contact details of the organisations to be used with mailshots from individual PSTs.

3.2.3 Website

The Sector Group website was maintained by ENTICE on behalf of the group. The website served as a showcase for the projects and information point for the Sector Group. The website is being maintained and is a useful tool for ongoing dissemination.

3.3   Successes of the Sector Group

The Sector Groups exist primarily to promote the PST activities of the network. The Sector Group approach achieved much greater results than could have been obtained by the TTNs alone in promoting their activities.

As a representative example, the UK-based CAMRA PST was demonstrated at three exhibitions outside the UK. These demonstrations of CAMRA at these exhibitions were complemented by other demonstrations from other TTNs in a similar application field (cardiology and radiology). This 'critical mass' approach gave each of the demonstrators greater credibility. As a result of the combined efforts of several TTNs, CAMRA was disseminated to a larger audience over a wider geographic base than would have been possible by a TTN acting alone.

In concrete terms it can be stated that the Sector Group related activities of CAMRA led to over 70 expressions of interest, compared to around 20 for local dissemination. The Sector Group clearly had a significant impact on the dissemination of CAMRA.

Importantly, many of the contacts made through Sector Group activities were outside the UK. Such contacts are vital if the results of PSTs are to be fully exploited in Europe. CAMRA now has 12 registered users outside the UK.

There have been other successes. TTN-T for example have started two companies based on the VISPAR and HP-ISIS activities; HIPERTTN-UPV have found companies interested in distributing the HIPERCIR system, as have DANHIT with the NANOSCAN system; and the partners in IRVIT project run by TTNMV-SF have begun a development project to bring the prototype to clinical use.

4 Mission Statement

The mission of the medical Sector Group of the HPCN TTN network is to promote the uptake of HPCN by European healthcare providers by demonstrating existing HPCN-based solutions to those involved in the decision making process. The ultimate objective is to demonstrate that healthcare can be improved in a cost-effective way, and to seek new ways in which HPCN technology can be transferred to this sector.

5   Structure

5.1   Overview of the Sector

The potential market for HPCN in medicine is extremely wide.

A first category of applications can be identified where HPCN can clearly be used for computationally intensive tasks such as image processing, simulation and VR. There are also a large number of data-intensive tasks such as image archival and retrieval. Applications in these areas are close to the patient care and clinical end of the process, and the end-users of the technology are the medically qualified: doctors, nurses and consultants.

A second category of potential applications is the optimisation of human and other resources. The end-user in this case would be hospital managers with a responsibility for delivering cost-effective healthcare (either privately or as part of a public service).

Thirdly there are the applications relevant to suppliers and manufacturers of goods and service to the health-service. The end-users here would be for example manufacturers of products used in healthcare - these could be anything from sterile dressings to hospital food.

The Sector Group focused chiefly on the first group. The reasons for this choice were that the PSTs available fell mainly into this category. However the Sector Group attempted to raise awareness among non-clinical end-users of the potential for HPCN (the second group identified above).

The needs of the third group are quite generic and are met by some of the other Industrial Sector Groups of the TTN Network (for example quality control and inspection is relevant to many suppliers of medical consumables).

The technology providers able to exploit the results are mainly sellers of medical software (or instruments with integrated software), and suppliers of IT systems.

The economic models that determine the behaviour of European healthcare providers are complex and non-uniform between member states. Unlike many other sectors it is frequently not those who benefit from new solutions who pay. For example in the some member states, those who benefit (patients) do not pay directly for their healthcare under the state provided schemes. Payment is made indirectly through taxes. The approach taken by the Sector Group was to make healthcare providers aware of the fact that they could provide better healthcare more cost effectively by using HPCN. It was also evident early on that each solution must also show clinical benefit as well as being cost effective.

5.2   Group Overview

Ten TTNs participated in the Sector Group:

TTN	Country	Contact Name
DANHIT	Denmark	Jørgen Moth
DUTCH-TTN	Netherlands	Jan Willem Tellegen
ENTICE	UK	Mark Sawyer
ESCALATE	UK	Paul Gordon
HIPERTTN-UPV	Spain	Vicente Hernandez
INNO	Greece	Hercules Avramopoulos
ProHPC	France	Karine Van Heumen
TTN@GMD	Germany	Ottmar Krämer-Fuhrmann
TTNMV-SF	Finland	Antti Soini
TTN-T	Germany	Dietmar Starke

5.3   PST activities

The TTNs hosted twelve PST activities. Each of these projects produced demonstrators, which were used by the Sector Group.

Demonstrator	TTN	Theme
CAMRA	ENTICE	Cardiac magnetic resonance image analysis
CAREN	DUTCH-TTN	Rehabilitation of balance disorders
KNEES-UP	TTN@GMD	Simulation of human knee
HIPERCIR	HIPERTTN-UPV	Image processing
MBASE	ProHPC	Image storage and retrieval
VISPAR	TTN-T	Diagnosis of Glaucoma
CAUCHYPAR	TTN-T	Neurology
HP-ISIS	TTN-T	Image Segmentation Algorithm for Brain Liquor Determination
3DHEARTVIEW	INNO	3D Model of the heart
NANOSCAN	DANHIT	Automatic analysis of smear tests
IRVIT	TTNMV-SF	Instrument tracking for keyhole surgery.
PARSEMED	ProHPC	Image processing

In addition to these there was a PST activity called THERAPY involving ESCALATE and ENTICE. This activity was cancelled when it became apparent that there was a mismatch between the end-user requirements and the technology. ESCALATE continue to promote the underlying technology.

5.4   Covered Areas

5.4.1   Geographical

The sector group had representative from UK, France, Netherlands, Germany, Denmark, Finland, Spain, and Greece. This is over half the member states of the EU and spans northern and central Europe, Mediterranean, Scandinavia and the Low Countries.

5.4.2   Applications

The application areas covered include cardiology, radiology, diagnosis, neurology, obstetrics, rehabilitation and histology.

5.4.3   Technologies

The technologies involved include image processing, image storage and retrieval, parallel databases, virtual reality, simulation.

5.5   Market Overview

See section *Overview of the Sector* on page 8

5.6   Strategy

The strategy of the group was to participate in the large exhibitions which take place in Europe. These events are attended by the target end-users for the sector. Publicity actions such as mailing of brochures and press announcements preceded each event. As demonstrators became available, they were shown at exhibitions.

Other actions such as maintaining a website supported this activity.

6   Actions Carried Out

6.1   List of events and summary of participation

The TTNs attended the following events.

Event	Date	Venue	Participants	Event Theme
Healthcare computing	Mar 98	Harrogate,UK	ENTICE	UK's and one of Europe's biggest medical IT conference, attracting around 5,000 senior delegate.
European Congress of Cardiology	Aug 98	Vienna, Austria	ENTICE, INNO	Europe's biggest cardiology conference, attended by over 20,000 professionals.
European Society of Magnetic Resonance in Medicine and Biology	Aug 98	Geneva, Switzerland	TTNMV-SF	One of Europe's biggest MR conferences, attended by 2,000 professionals.
Journées Françaises de Radiologie	Oct 98	Paris, France	ProHPC	The worlds biggest French-language radiology event, with 19,000 visitors.
Telemed 98	25-26 Nov 98	London	ESCALATE	Major European telemedicine conference
Medica 98	Nov 98	Düsseldorf Germany	TTN-T, TTN@GMD, INNO	Europe's largest general medical fair attracting over 100,000 visitors.
European Congress of Radiology	Mar 99	Vienna, Austria	HIPERTTN-UPV, TTNMV-SF	Major European radiology event attracting over 12,000 professionals.
HPCN '99	April 99	Amsterdam, Netherlands	DUTCH TTN, ESCALATE, HIPERTTN-UPV, TTN-T	Workshop organised at this HPCN conference.
Computer Assisted Radiology and Surgery	June 99	Paris, France	ENTICE, ProHPC	One Europe's major radiology conferences.
European Society of Magnetic Resonance in Medicine and Biology	Sept 99	Seville, Spain	HIPERTTN-UPV, ENTICE, TTN@GMD	One of Europe's biggest MR conferences, attended by 2,000 professionals.
European Congress of Pathology	Sept 99	Barcelona, Spain	TTN-T, DANHIT	Major European conference on pathology, attended by around 1300 delegates.

6.2   Publicity material

The following publicity material was produced, in addition to the material produced by each PST

- A general purpose flyer. This was produced early in the project, before results of PSTS were available and therefore draws on previous HPCN projects. The flyer was used a general publicity before results became available.

- A flyer for the radiology related projects. This flyer was designed to be used to show the results of several related radiology projects (IRVIT, HIPERCIR, MBASE, and PARSEMED). The flyer was distributed at radiology specific events (e.g. ECR 99).

- A contact flyer of all the TTNs was produced by the Sector Group to accompany mailshots of PST related material. The rationale is that the medical sector is very wide and hence giving a representative summary in a small flyer is not possible. It was considered that selecting a small number of success stories might give the impression that the network was not active in other areas.

- A large brochure with all the PST success stories in detail will be produced in collaboration with TTN-T. The target audience for this publication consists of clinical professionals.

- A poster for Telemed 98.

6.3   Web site

A web site for the Sector Group was produced and maintained. This activity is ongoing beyond the end of the TTN Network. The web site contains details about most of the PSTs relevant to the sector. The PSTs are presented in a 'success story' style, giving details of the benefits of each project, rather than technical details.

See http://www.epcc.ed.ac.uk/ttn-Medical

6.4   Telemedicine survey

Telemedicine is a rapidly growing area of healthcare which makes extensive use of IT. The Medical Sector Group decided to survey the state-of-the-art of telemedicine and see what opportunities there were for applying PST results to telemedicine projects. ESCALATE and ENTICE carried out the survey and ESCALATE attended the Telemed 98 conference to discuss the results. After the conference a mailshot was sent to the most relevant-looking contacts from the survey and conference (a total of 49 medical professionals). Recipients were directed to the individual PSTs for any follow-up.

From the survey and conference it is clear that telemedicine is still in its infancy. There is a lot of research going on, but most telemedicine being used in pratice is very rudimentary (simple PC-based videoconferencing). There is definite interest in more sophisticated approaches, where HPCN could bring real benefit, but there will be no real user pull for a couple of years.

6.5   Press campaign

The Sector Group proposed to carry out a press campaign, but were unable to agree with the Commission how this could be out-sourced to a third party. It was agreed that the national press campaigns being carried out by the network would cover medical stories.

Individual PSTs generated a large number of press articles.

7   Achievements and Outcomes

7.1   Contacts generated at exhibitions and events

In all, attendance by the Sector Group at events resulted in well over 500 interested contacts for the Sector Group members.

7.1.1   Healthcare Computing 98

ENTICE attended the HC'98 exhibition in Harrogate in March 1998. Two demonstrations were shown; the 3D HEARTVIEW project and the SIGMA glove. The latter was the result of an earlier EC supported HPCN project, and was used because most PSTs were at an early stage and not yet producing results. The objective of attendance was to increase awareness of the work of the TTN Network

Contacts generated: over 50 contacts were made, indicating a high level of interest in HPCN as a tool for medicine.

7.1.2   European Congress of Cardiology

The INNO and ENTICE TTNs were represented at the ECS Congress 1998 in Vienna, 22-26th August 1998. INNO showed the 3DHeartView project and EPCC showed the CAMRA project. In addition lectures were given at satellite events.

Contacts generated: More than 200 people (about 70% cardiologists, 15% commercial visitors, 10% researchers, 5% others) visited the demonstrations. Representatives from three scanner manufacturers (Philips, Siemens, GEMS) were interested in the CAMRA system.

7.1.3   European Society of Magnetic Resonance in Medicine and Biology 1998,1999

The TTNs were represented at this event in 1998 (Geneva, Switzerland, TTNMV-SF) and in 1999 (Seville, Spain, HIPERTTN-UPV, ENTICE, TTN@GMD). The demonstrators shown were: IRVIT (1998) and CAMRA, HIPERCIR and KNEESUP (1999). CD ROM demonstrators of each project were available.

Contacts generated: CAMRA 16, HIPERCIR 26, KNEES-UP 19

7.1.4   Telemed 98

ESCALATE presented a poster at the Telemed 98 conference as a vehicle for discussing the results of the survey. A poster was presented and a follow-up mailing was made.

Contacts generated: 49

7.1.5 HPCN '99

DUTCH-TTN organised a workshop on HPCN in medicine titled 'Healthcare of the Future'. This featured demonstrations of HIPERCIR, CAREN, HipCOM and CAUCHYpar, and talk by ESCALATE. There were also presentations from the Dutch ministry of Welfare, Health and Sport, and

Contacts generated: The workshop was attended by around 50 people, mainly from within the Netherlands.

7.1.6 Journées Françaises de Radiologie

During this exhibition MBASE and PARSMED-3D prototypes were shown to several hundred professional visitors. HIPERTTN-UPV provided a poster showed the HIPERCIR demonstrator. Together with the TTN posters and flyers, high speed client/server networking for on demand medical images and video delivery was demonstrated.

Contacts Generated: MBASE: End-users 12, Companies 16. PARSEMED: Practitioners 94 consultants 10.

7.1.7 Computer Assisted Radiology and Surgery

ENTICE and ProHPC attended the CARS in Paris, June 1999. ENTICE showed the CAMRA system, while ProHPC showed the MBASE and PARSEMED projects.

Contacts generated: 20 (CAMRA).

7.1.8 European Congress of Radiology

The ECR'99 was the 11th European Congress of Radiology. It was held in Vienna, Austria from 7th to 12th March 1999. The goal of participation at ECR was to promote the results of the demonstrators, especially HIPERCIR and IRVIT. The target was to set-up contacts with interested people in order to improve the demonstrators, to create awareness and also to have support for future commercial exploitation

Contacts generated: 125 information packages were collected from the stands. 20 questionnaires from HIPERCIR and 21 from IRVIT were returned.

7.1.9 Medica 98

Medica is one of the world's largest medical exhibitions. It has a very wide scope and attracts an enormous number of visitors (in excess of 100,000). The TTN representation was by TTN-T, INNO and TTN@GMD. The exhibits on show were VISPAR, KNEESUP and 3DHEARTVIEW.

Contacts generated: The total number of contacts with agreed follow-up actions was 14 (11 VISPAR, 3 3DHEARTVIEW). A further 200+ contacts were generated.

7.1.10 European Congress of Pathology

TTN-Thuringen and TTN-DANHIT jointly participated with a booth on the 17th European Congress of Pathology in Barcelona, Spain, September 18-23. Three HPCN projects were displayed at the booth, VISPAR and CAUCHYpar from TTN-T and NANOSCAN from DANHIT.

Contacts generated:

NANOSCAN: 20 contacts generated including 3 potential distributors.

7.2   Lessons learned

Dissemination best practice: the TTNs learned that hands-on demonstrators at exhibitions are very attractive to end-users. CDs with demonstrator versions of software are also a very attractive and convenient.

Marketing message: many of the end-users of HPCN medical technology are those involved directly with patients. The advantages of HPCN in terms of improved clinical care are as important as the cost-effectiveness of the technology.

7.3   Added value of the Sector Group

Most TTNs conclude that the Sector Group added value, since it was possible to get a critical mass of demonstrators at events. The clustering of projects around a common theme (e.g. an application such as cardiology or a technology such as image processing) was useful.

The access to markets and end-users outside each TTNs member state was of benefit to many of the TTNs. It is generally much more difficult to find end-users outside the geographic location of the partners in a particular project. Therefore the Sector Group was a success in terms of exploiting the individual PSTs and in terms of achieving the wider objectives of technology transfer at the European level.

The existence of the Sector Group also focused attention on dissemination at an early stage. It is easy at the start of a PST activity to focus only on the problem solving aspects and not to plan on dissemination of the results. The Sector Groups were valuable in this respect.

7.4   Future Actions

Most of the PSTs are either being exploited by the TTNs that hosted them or directly by the partners.

With regard to future network activities, several of the TTNs are interested in pursuing technology transfer activities as a group.

- Several of the TTNs are considering participation in an IST supported programme to transfer technology to the third Mediterranean countries (EUMEDIS).
- Some of the partners are proposing to continuing with dissemination activities under the Framework V 'Raising Public Awareness' activity of the 'Improving Human Potential and the Socio-economic Knowledge Base' programme.
- The Sector Group web-site will be maintained by ENTICE to so that the successes of the Sector Group continue to be disseminated.

Conclusions

The TTNs who took an active part in this Sector Group gained considerable benefit. The benefits were better opportunities for the commercial exploitation technology. These were achieved through a critical mass of success stories, and concerted dissemination efforts such as demonstrations at events.

The Sector Group has accelerated the uptake of HPCN technology by medical end-users, bringing the benefits much closer to the EU citizens.

Most of the organisations concerned intend to carry on their work in the medical sector, and networked collaboration is a strong possibility.

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APPENDICES: Individual contributions

DANHIT

TTN Summary and demonstrators

DANHIT was hosted by UNI•C Scientific Computing in Denmark.

The demonstrator from this TTN is the NANOSCAN project. This project combines line-scan camera technology, HPCN and advance colour image analysis. NANOSCAN enables technicians to digitise cytology and histology slides and to analyse their morphology on a computer using an existing colour image analysis package developed by DIMAC. NANOSCAN makes such analysis more than four times quicker and produces reproducible quantitative results. The end-user application is the analysis of tissue smears for screening.

Actions carried out

DANHIT's major contribution was to in the organisation of the TTN Network participation of 17th European Congress of Pathology in Barcelona.

Achievements and outcomes

As a direct result of the Sector Groups activities, DANHIT received 20 interested contacts in NANOSCAN. This includes four expressions of interest in becoming a distributor. Two of these were from the USA. The remaining contacts were interested in the use of NANOSCAN as a product.

Conclusion and assessment

DANHIT had a single PST within the medical area and had little opportunity to discuss medical issues within its local arrangements. It was therefore of great value to become a member of the HPCN-TTN medical Sector Group and be given access to discussions and exchanges of experience in a wider forum. Our PST partners, Dimac and Randers Hospital, were very happy to use this channel of opportunities to bring forward the results of their NANOSCAN project to a larger public. Especially the very successful Pathology conference in Barcelona has brought many useful business contacts to Dimac.

DUTCH-TTN

TTN Summary and demonstrators

DUTCH-TTN was hosted by Platform HPCN in the Netherlands.

The demonstrator for this TTN is the CAREN PST activity. CAREN is a real-time virtual-reality medical system for dealing with balance and co-ordination disorders. Through the use of virtual reality, position sensors and a motion platform, patients can be trained to move correctly and to compensate for injuries and other disorders.

This TTN has not supplied details of actions, achievements or an assessment of the impact of the sector on it.

Actions carried out

Achievements and outcomes

Conclusion and assessment

ENTICE

TTN Summary and demonstrators

The ENTICE TTN was based at EPCC in the United Kingdom and is the leader of this Sector Group.

The demonstrator for this TTN is the CAMRA PST. This is a system for quantitative analysis of cardiac MRI scans to measure heart function. The software cuts by a factor of ten the amount of time for the analysis, and runs on a high-end PC. The end-users for this system are cardiologists.

Actions carried out

Events

ENTICE organised the TTN presentation at the Healthcare Computing'98 exhibition (Harrogate UK, 1998), and took part in the European Society of Cardiology congress (Vienna, Aug 1998), the Computer Assisted Radiology and Surgery conference (Paris, June 1999), and the European Society for Magnetic Resonance in Medicine and Biology (Seville, Sept 1999).

Material

ENTICE co-ordinated the production of an English language flyer at the start of the TTN Network for use as general publicity before PST results were available, and a contacts flyer to accompany PST specific material.

ENTICE maintains the Sector Group web-site, which will continue after the end of the TTN Network.

Leadership of the Sector Group

ENTICE was the Sector Group leader. The responsibilities included organising meetings, producing reports, approving spending proposals from TTN and other co-ordination tasks.

Achievements and outcomes

The CAMRA PST enjoyed considerable success as a result of the Sector Groups activities. The PST was presented at 3 major events, leading to a greater number of registered users outside the UK (12), and interest from three MRI scanner manufacturers.

Involvement in the Sector Group has led to the possibility of further technology transfer activities under a planned Framework V programme activity (EUMEDIS).

Conclusion and assessment

The Sector Group related activities of CAMRA led to over 70 expressions of interest, compared to around 20 for local dissemination. The Sector Group clearly had a significant impact on the dissemination of CAMRA.

The number of PST projects available to the Sector Group was quite large (although not as large as in a sector such as quality control and inspection, which had 40 PSTs - almost 25% of the entire TTN Network). The PSTs in general had diverse end-user applications and came from a large number of TTNs. It was possible to cluster some of the projects together (for example there were several medical image analysis related projects).

A significant amount was learned about best practice for dissemination. For example the Sector Group learned that live demonstrators at exhibitions are very useful, and that emphasising the clinical benefits of a system as well as the cost effectiveness is of great importance.

A Sector Group leaders, ENTICE can comment on some of the organisational aspects of the Sector Groups:

The fact that a large number of TTNs was involved in the Sector Group reveals a minor weakness with the way this aspect of the TTN Network was implemented. Because many of the TTNs had PSTs in many application areas, the Sector Group approach sometimes led to resources being stretched too thinly; TTNs involved in several Sector Groups were not always able to participate fully in the Sector Group activities. However there was no alternative method for TTNs to promote their PSTs in the global framework of the TTNs except through the Sector Groups.

The process of several TTN contributing financially to an activity such as an event created a large amount of bureaucracy.

It was also difficult to satisfy the desires of all the TTNs in an activity. For example in planning the press campaign it was impossible to satisfy the needs of all the TTNs while keeping a reasonable sized proposal.

ESCALATE

TTN Summary and demonstrators

The ESCALATE TTN was based at IT Innovation in the UK.

ESCALATE were to have been involved in a PST activity called THERAPY, also involving ENTICE. This activity was cancelled when it became apparent that there was a mismatch between the end-user requirements and the technology. ESCALATE continue to promote the underlying technology.

Actions carried out

ESCALATE carried out a market study on HPCN and telemedicine. The survey has shown that current telemedicine applications are using very primitive technology and so will probably not be ready for HPCN within the life of the TTN Network.

ESCALATE presented a poster at the Telemed 98 conference as a vehicle for discussing the results of the survey. After the conference a mailshot was sent to the most relevant-looking contacts from the survey and conference (a total of 49 medical professionals). Recipients were directed to the individual PSTs for any follow-up.

ESCALATE participated in the Healthcare of the Future' workshop at HPCN 99 and presented some ideas on using case-based reasoning for medical diagnosis.

ESCALATE also spent considerable effort negotiating the running of a press campaign for the Sector Group with external PR consultants. It proved impossible within the timescales to produce a plan to satisfy the Sector Group members, the Commission and the external consultants. The press campaign was thus shelved in favour of the general press activity of the TTN Network.

Achievements and outcomes

ESCALATE's main interest in the Sector Group was promotion of the THERAPY project. This project was cancelled, but IT-Innovation are still interested in the promotion of the underlying technology. In this respect the Sector Group helped to introduce them to more contacts on a wider European scale.

Conclusion and assessment

Even without a PST, the Sector Group proved useful for ESCALATE. The main added-value has been in European awareness raising, and in gaining credibility for HPCN solutions

HIPERTTN

TTN Summary and demonstrators

HIPERTTN was a multi-centre TTN based in Spain, Greece, Portugal and France. The centre involved with the medical sector is HIPERTTN-UPV based Universidad Politecnica de Valencia.

The demonstrator for this TTN is the HIPERCIR PST. This is a software package that leads to more accurate diagnosis, through its fast 3D-visualisation tools. These can also be used for surgical planning. HIPERCIR is designed to show 3D views of selected tissues or organs quickly and easily.

Actions carried out

Publicity Material

An English/Spanish flyer of the HiperCIR activity.

An English flyer of the activities in the Radiology Subgroup.

Three posters of the HiperCIR activity,

One video in English of the HiperCIR activity.

Pages of HiperCIR activity in three WWW sites:

Evaluation CD-ROM.

Downloadable demonstrator

Events

HIPERTTN-UPV has directly organised the presence of the Medical-SG in two events. Both are European-wide events with English as official language.

ECR'99. The 1999 edition of the European Congress of Radiology,

ESMRMB'99. The 1999 edition of the Annual Meeting of the European Society for Magnetic Resonance in Medicine and Biology.

Publications

13 publications in general press, medicine press, scientific press and TV were obtained for promoting HIPERCIR.

Achievements and outcomes

As a result of the participation on the Medical Sector Group, the following benefits were obtained:

Availability of a larger portfolio of activities. Dissemination material was prepared together, including brochures and flyers.

Capability of reaching wider audiences. The Dutch clinics that attended the HPCN'99 could not be reachable from HIPERTTN-UPV easily. It is the same factor for TTN@GMD and ENTICE in relation with the Spanish clinics that attended the ESMRMB'99.

Improvement of the message. Three different activities in the stand of the ESMRMB'99 helped people to get information on activities that did not attract them at the beginning. The use of common dissemination material helped to reach contacts that did not realise that some activity was available.

Sharing of costs. the ECR'99, the Workshop at the HPCN'99, the ESMRMB'99 and many dissemination material was made possible with the collaboration of the partners.

Many lessons have been learnt in these three years of co-operation. Regarding dissemination material it should be large and coloured. The text should be brief and direct, although a larger explanation should be available somewhere else. Large pictures are better and a gradual information is very important. The first flyer of the radiology subgroup was smaller than it should be, and it contained slightly much text. However, pictures colours and the inclusion of four demonstrator were very interesting.

On the press campaign, it is important to say that, although it does not produce contacts itself, it helps to create awareness and to remain familiar to the potential interested people. As an example, during the ESMRMB'99 half of the Spanish contacts remembered the TV article about HIPERCIR when visited the stand, thus increasing the interest and credibility.

Regarding events, all the events in the medical area organised by HIPERTTN-UPV were European-wide and had the participation of activities from other TTNs. HIPERTTN-UPV made possible the participation at ESMRMB'99 at very low cost due to many reasons:

Direct contact with local organisers and negotiation of a cost reduction. The aims of the HPCN-TTN network was easily transmitted.

Use of equipment owned by HIPERTTN-UPV. This saves the high cost of renting computer equipment.

Local mailing. This reduces the cost of a global mailing, although this action was aimed at improving the message.

The capability of HIPERTN-UPV on organising events has improved with the experience of ECR'99 and ESMRMB'99.

As a conclusion, it is important to remark that the HIPERCIR project has been promoted totally at European level.

Conclusion, including assessment of the Sector Group and individual participation

The participation on the Medical SG has been quite successful due to the quantity and quality of the activities. It has been a key element to foster the dissemination and totally crucial for reaching the European dimension. The level of expertise reached by the nodes that have collaborated is enough for acting as technology brokers as themselves. The availability of dissemination material and the know-how about the market and the problems are of great value.

INNO

TTN Summary and demonstrators

The INNO TTN was based at the National Technical University of Athens.

The demonstrator for this TTN is the 3D HEARTVIEW PST. This is a software system for generating 3D models of the heart from X-rays. The end-uses are cardiologists.

Actions carried out

Events

INNO were involved in the European Society of Cardiology congress (Vienna, Aug 1998) and Medica 98.

Achievements and outcomes

A considerable amount of interest was generated in the 3D HEARTVIEW PST.

Conclusion and assessment

No conclusion or assessment can be made by this TTN since it completed before the writing of this report. The final report from INNO is not available.

ProHPC

TTN Summary and demonstrators

The ProHPC TTN was hosted by Ecole Normale Superieure de Lyon, France.

The demonstrators for this TTN are the MBASE and PARSEMED PSTs. MBASE is a parallel database server for archival and retrieval of medical images. End users are any hospital departments that require access to medical images. PARSEMED is an imaging processing system tailored to processing ultrasound images. The end-users are obstetricians.

Actions carried out

ProHPC participated in the JFR 98 and CARS 99 events. The MBASE and PARSEMED activities received much good publicity.

Achievements and outcomes

It is not clear what success for this TTN came from the Sector Group.

Conclusion and assessment

No conclusion or assessment can be made by this TTN since it completed before the writing of this report. The final report from ProHPC is not available.

TTNMV-SF

TTN Summary and demonstrators

TTNMV-SF was hosted by Finnish Automation Support Ltd in Finland.

The demonstrator for this TTN is the IRVIT PST. The system uses advanced technology for accurate and safe real-time guidance in minimally invasive surgery. The end-users will be surgeons.

Actions carried out

As a member of Medial Sector Group TTNMV-SF contributed to Medical Sector Group Dissemination Plan and Web pages and participated in four events:

The initial results of the project were presented in the annual conference of **the European Society of Magnetic Resonance in Medicine and Biology** in 17th -20th September 1998 in Geneva, Switzerland. The conference is the largest European and second largest international annual meeting on the medical magnetic resonance imaging. Dr. Teuvo Vaara gave a presentation "ESR Probe for Interventional MRI Instrument Localisation", which described the initial results of ESR needle tracking. The audience was noticeably amazed on this novel technology. Another presentation, "Image-based Registration for Interventional MRI", was presented by Lasse Jyrkinen. The abstracts of the presentations have been published in the **European Radiology**.
Two TTNs (HIPERTTN-UPV and TTNMV-SF) of the radiology sub-group participated in **European Congress of Radiology (ECR'99)** 7th- 12th of March 1999 in Vienna, Austria. The conference is the largest annual European congress in Radiology typically having over 15000 attendees. TTNM-SF had their IRVIT demonstrator in a joint booth with HIPERCIR from HIPERTTN-UPV. The goal of the participation was to promote the results of the demonstrators, especially IRVIT and HIPERCIR. The IRVIT demonstration was made with a video showing the simulated biopsy operation that was done under IRVIT system guidance. Radiology flyer, two-sided colour flyer from IRVIT and two posters (A0) supported the demonstration and dissemination. The feedback was encouraging. 125 people took flyers and 21 returned the questionnaire and indicated their interest in the technology and the upcoming workshop in Oulu.
Annual national radiology conference (Radiologia uutta ja vanhaa) was held in 22rd and 23rd of September, 1999, in Oulu University Hospital, Finland. The IRVIT activity organised a workshop consisted of three lectures given by participants of IRVIT consortium. A "hands on" demonstration was organised at the end of the workshop in the interventional MRI suite of the Oulu University Hospital.
A scientific publication on "Visualisation of changes in Magnetic Resonance Image Data" was accepted and presented in **WSCG'2000** (The 7th International Conference in Central Europe on Computer Graphics, Visualisation and Interactive Media). The conference was held in Prague, Czech Republic, in February 2000. The paper was prepared by Mr. Kari Suomi and Dr Jarkko Oikarainen from Oulu University Hospital.

The Radiology group produced a Radiology flyer, where IRVIT project was one of the four projects included in the flyer. The flyer was printed by TTNMV-SF in November 1998, 4000 edition, and distributed in different events.

Contribution to press:

In the volume 10 of the **Journal of Magnetic Resonance Imaging** Dr Gösta Ehnholm published an article on ESR technology. The paper presents the initial results of the ESR tracking by using 2mm ESR probe.
A scientific article on "Volume Rendering using Seed Filling Acceleration: Supporting Cut Planes and Fast Re-seeding" was published in **Computer-Aided Surgery** Volume 4 Number 4. The paper was authored by Dr Jarkko Oikarainen, Mr Rami Hietala and Mr Lasse Jyrkinen and it presents the volume rendering algorithms developed during the project.

Achievements and outcomes

The IRVIT project was able to demonstrate a system concept for an interactive magnetic resonance imaging guided procedure. Two new products supporting intervention use are immediate results of the project: "I path 100" for real-time system control and visualisation and "I path 200" for real-time instrument localisation.

Real-time visual feedback was demonstrated during the interventional procedure. The system is capable to achieve acceptable 10-frames/second speed by using current state-of-the-art 700MHz multimedia PCs.

The ESR marker technology provides excellent performance for biopsy needle localisation. The application accuracy is far superior to any other method currently available. The marker technology can be integrated into the tip of the needles of practical diameters and it can provide correct localisation in spite of needle bending.

A lot of work is still required to make the demonstration prototypes available for clinical use. However the demonstrations made it possible to get end-users aware of the technology and to collect valuable feedback for future development. The demonstration system has significant potential to enable new operations under MRI control. The partners have started a development project called AMIT to bring the prototype to clinical use.

Conclusion and assessment

Medical Sector Group and its Radiology sub-group have with their co-operative efforts supported IRVIT project to create awareness and to get valuable feedback for the development work. Concerted effort in organising presence in ESR'99 and putting together Radiology Flyer are concrete outcomes of this initiative.

Medical Sector Group has an important role in pushing individual projects through TTNs to invest in awareness creation and dissemination already in an early phase of these projects. In the early development phase the projects are reluctant to give out information or plan their dissemination efforts forgetting that it takes time, easily one year, to prepare a good awareness creation and dissemination effort. Medical Sector Group meetings and dissemination plans help in collecting updated information of this sector (events etc.) and in planning the concerted efforts accordingly.

The HPCN-TTN initiative was a good basis to build up contacts and concerted actions. Medical Sector Group brought together people working with the same problems, technology and customers. This contact base is valuable for projects and TTNs also in planning future projects and concerted actions.

TTN@GMD

TTN Summary and demonstrators

TTN@GMD was based at the German National Research Centre for Information Technology.

TTNatGMD was full member of the Medical Sector Group and engaged in order to disseminate the results of the Sector Group related PST activities, being carried out at GMD. These activities targeted the orthopaedic and the pharmaceutical working field with the following projects:

Knees-Up (first accurate 3D model of the human knee),
Dechema (awareness campaign with assessments in the pharmaceutical industry).

Actions carried out

Production of dissemination material

We produced a CD-ROM containing all information of the Knees-Up project. Information about the Dechema project can be easily accessed by the WOICE of ACHEMA CD-ROM, which will be distributed with these information in 40,000 copies between 1999 and 2004.

Another opportunity for information is possible by the web pages at the URL:
http://www.gmd.de/SCAI/ttn

Finally, we gave input for the book „Image Processing and Parallel Computing in Medical Applications", which is actually in production by TTN-T.

Dissemination events

MEDICA '98 - 30th World Forum for Doctor's Practices and Hospitals, from November 18-21, 1998 in Duesseldorf (Germany):
TTN-T has ordered a booth at this fair. We used this opportunity to present our project Knees-Up. So, in strong collaboration with the partners of the TTNs TTN-T and INNO we prepared this event for all exhibitors.

Technology Transfer Workshop "HPCN Experiences in Biotechnology", February 17, 1999 Frankfurt (D):
TTNatGMD organised a workshop for the European pharmaceutical industry in the building of the DECHEMA association in Frankfurt. The main focus of this event was rational drug design and pharmaceutical experiences by projects of the HPCN TTN network. So, besides the assessment partners of the DECHEMA project, we invited the partners of the TTN projects DRUG and PSUDO for presentations. TTNatGMD planned, organised and prepared the workshop. Additionally a mailing action was performed based on the Biotechnology segment of the DECHEMA association member database to 2,700 persons working in this field. The workshop was closed with software demonstrations of the codes ToPLign, FlexX and GOLD.

17. DECHEMA Annual Conference on Biotechnology, April 27-29, 1999 in Wiesbaden (Germany):
A TTN stand was organised by TTNatGMD. Presentations have been given by all three assessment partners of the DECHEMA project. Additionally dissemination material of the TTN Biotechnology projects DRUG, PSUDO and REBDUC were distributed.

7th International Conference on Intelligent Systems for Molecular Biology ISMB'99,   August 6-10,1999 in the Townhall Heidelberg (Germany):

TTNatGMD supported BIOTITAN and organised a booth on this conference, where all European TTN Biotechnology projects were demonstrated: DECHEMA, DRUG, PSUDO, and REBDUC. TTNatGMD took over the whole preparation and planning.

ESMRMB'99

Conference of the European Society for Magnetic Resonance in Medicine and Biology and exhibition in Seville (Spain), September 16-19, 1999:

The stand has been organised by HIPERTTN-UPV, who presented the HIPERCIR project. Additionally ENTICE demonstrated their CAMRA software solution.

TTN press conference and exhibition at GMD, Schloss Birlinghoven, March 28, 2000, Sankt Augustin (Germany):

As part of the German press campaign TTNatGMD invited the German scientific press and its community "Wissenschaftspresse-Konferenz" (WPK). Additionally, in collaboration with Caprice, NETAPDEX, and TTN-T, TTNatGMD presented 14 TTN projects. Three of them were related to the medical sector: CAUCHYpar, Dechema, and Knees-Up.

Achievements and outcomes

MEDICA '98 - 30th World Forum for Doctor's Practices and Hospitals, November 18-21, 1998 in Duesseldorf (Germany):

One of the visitors was a member of the trainer team of 'Tour de France' winner Jan Ulrich. Gerd Quecke explained him the facilities and chances of the new accurate 3D human knee joint model. TTN-T gave a detailed report on the participation in MEDICA fair '98. They estimated 40-50 visitors per day. Most of the visitors on our booth were members of research centres.

Technology Transfer Workshop "HPCN Experiences in Biotechnology", February 17, 1999 Frankfurt (D):

This workshop was attended by about 50 participants mostly from industry, and can be assessed as very successful, which was the result of analysing the distributed questionnaires.

17. DECHEMA Annual Conference on Biotechnology, April 27-29, 1999 in Wiesbaden (D):

250 flyers and 60 "HPCN TTN Experiences in Biotechnology" reports were distributed to the conference attendees. Over 100 persons visited our booth, where a third have been interested in a software demonstration of ToPLign and GOLD. Many people showed interest in testing ToPLign via the free Internet access on the GMD server and also for the "HPCN Experiences Report in Biotechnology", which was produced for this event.

7th International Conference on Intelligent Systems for Molecular Biology, August 6 to 10,1999 in the Townhall Heidelberg (Germany):

During the event we contacted approximately 100 people (80% of them industrial). With 30 people we had detailed discussions about the software solutions available. Besides this, we distributed about 150 project flyers and 75 „HPCN TTN Experiences in Biotechnology" reports!

ESMRMB'99

Conference of the European Society for Magnetic Resonance in Medicine and Biology with exhibition in Seville (Spain), September 16-19, 1999:

During this event we distributed 38 Public Final Reports and 102 flyers of Knees-Up and demonstrated more than 30 times the new accurate human knee joint model using the collection of demonstrators of the Knees-Up CD-ROM.

TTN press conference and exhibition at GMD, Schloss Birlinghoven, March 28, 2000, Sankt Augustin (Germany).

Several publications in different newspapers were the first result of this event. This process is still on-going. Additionally, a video production has been made. A short version is available in the internet. A long version will be used for the production of a CD-ROM, which will be used for further dissemination actions.

Conclusion, including assessment of the SG and individual participation

The way of ‚networking‘ – planing of dissemination actions and collaborating in joint events – needed a lot of work and experience. But finally, it has been proved, that this was realised not only in this Sector Group with success!

There were several advantages to be member of this Sector Group:

First of all, the opportunity to exchange information and experiences how to disseminate project results to the medical sector.
Another point, that is true especially for TTNatGMD, we were not able to perform events like those described above without having a critical mass of information (projects). This was a big motivation for ‚networking‘ and joint actions!
It is difficult to organise an event in a foreign country. So, members of the Sector Group invited others to participate in their events, which gave each event an international touch and were always an improvement!
Finally, work was coordinated and distributed between the members. In this way all members of the sector group helped to be successful!

It has been shown, that we reached the target group of medical imaging experts with the Knees-Up model and drug research experts with Dechema assessments results by different actions. As described above, TTNatGMD reached more than 500 people by the different events and more than 3000 people by mail shots. Additionally, TTNatGMD produced with its partners 19 publications in journals and newspapers. This dissemination is still on-going! For TTNatGMD it has been proved, that the Industrial Sector Groups were the best way to disseminate results and experiences of PST activities, and that this Medical Sector Groups worked really with success! As a result several members are looking for a new framework for joint actions and opportunities for renewed collaboration.

TTN-T

TTN Summary and demonstrators

TTN-T was hosted by Transferzentrum Mikroelektronik E.V. in Germany

The TTN has three medical demonstrators: CAUCHYPAR, VISPAR and HP-ISIS

CAUCHYPAR is a parallel system to provide a scaleable high performance system for localising and visualising electrical discharges within a human brain. End-users are neurologists. VISPAR is a system to implement decision support for the diagnosis of glaucoma. HP-ISIS is a high performance implementation of a similarity-based image segmentation algorithm for brain-liquor determination. The end-users for this technology are neurologists.

Actions carried out

PST activity co-ordination

TTN-T has co-ordinated three activities in the Medical Sector Group CAUCHYpar, VISPAR and HP-ISIS activity.

Dissemination activities

Printed matter

TTN-T has actively co-ordinated producing the Sector Group printed brochure 'Image Processing and Parallel Computing in Medical Applications' and further, taken part in developing posters and flyers for presentations in events organised by other Sector Group members, e.g. related to the 17th Congress of Pathology (September. 18- 23) in Barcelona managed by DANHIT TTN.

Events participation

TTN-T has participated and organised a joint booth at the MEDICA '98 in Düsseldorf (TTN-T, TTN@GMD and INNO) including producing all dissemination materials (posters, flyers etc.)

Press and publications

TTN-T has had a total of 15 articles published related to medicine.

TTN-T has actively taken part in developing the Medical Sector Group web site.

Achievements and outcomes

HP-ISIS project achievements:

The goal of this project was the development of a scalable high performance image processing system for the determination of the ratio between brain and Liquor in the human head, for the fast and effective diagnosis of pathological changes in the brain. In the development phase of the project, a four node parallel processor (Parsytec Cognitive Computer, Parsytec GmbH Aachen) was used. The target system for customers is a PC (PPro-class) with at least 2 processors and Windows NT as Operating System.
The scalability of the image processing makes a very good adaptation to the performance and efficiency requirements of the customers possible. The hence fast availability of relevant data is

decisive in many diagnostic situations as well as when the clinically monitoring of pathological changes in the brain is necessary. The results of the brain / liquor determination can directly be stored in the clinical patient monitoring log.

The VISPAR achievements:

The purpose of VISPAR was to develop an extension for the Heidelberg Retina Tomograph, which is used in ophthalmological examinations. The Retina Tomograph analyses the morphology of the optic nerve head (papilla) and supports therefore glaucoma diagnosis. The VISPAR solution combines advanced visualisation techniques and fuzzy based decision support to improve the definition of the contour of the papilla by the ophthalmologist on the one hand and to make easier the glaucoma progress evaluation on the other hand.
The 3D-visualization on an autostereoscopic display delivers a real spatial impression of the optic nerve head. This visualisation together with a papilla contour proposal support the accurate definition of the optic nerve head by the ophthalmologist.

CAUCHYpar project achievements

An accurate source localisation of cerebral activities is a prominent goal in medical diagnosis (like pre-surgical localisation of epileptic activities) as well as in brain research in general.
The positions/direction of active electric regions in the brain can be calculated based on non-invasive electro-encephalographic measurements (EEG) in combination with the individual tomographic data (MRT) of the head of a patient / trial person. Magneto-encephalographic data (MEG) also can be taken into account. For a spatial resolution with an accuracy of 6 mm such a source localisation calculation needs about 30-50 hours on a standard workstation (100 - 166 MHz) with the sequential CAUCHY code.
Especially for diagnostic purposes neurologists and surgeons need a shorter response time as well as a higher spatial resolution. Calculation we can fasten by parallelising the most time-consuming parts of the code.
Within the project the most time consuming parts of the CAUCHY-code have been parallelised. The new code CAUCHYpar reduces the sources localisation calculation to medically acceptable times - for the example mentioned above the calculation needs only 5 hours on a 8-processor parallel CCe-system (200 MHz). It also allows to achieve higher spatial resolution in acceptable time.

The portable code can be run not only at the special parallel platform at the RWTH in Aachen but at all parallel platforms which support the MPI-standard –including workstation-clusters too. The EEG/MEG- and MRT-input-data as well as the source positions as the output of the code form only some tens of Mbytes. Hence they easily can be transferred between hospitals and one of the future Network Service Centres where experienced people will watch also over the quality of source reconstruction based on their experience how to use code details. Actually the CAUCHYpar-project team is analysing the technical and personal requirements for Network Service Centres as well as for a first Network Teaching and Computing Centre (NTCC) for remote diagnostic and research applications of the new code as well as for training purposes.

Conclusion and assessment

New solutions: Software packages (products)

Determination of brain/liquid ratio in human head (HP-ISIS software)

Improvement of the definition of the optic nerve head by the ophthalmologists (VISPAR software package for 3D Glaucoma diagnosis)

Accurate source localisation of cerebral activities (CAUCHYpar software)

New companies:

HP-ISIS: Internet based Service Ltd.

VISPAR: 3D – Display Ltd.

New service departments:

CAUCHYpar: Network Service Centre (Internet based Network Teaching and Computing Centre) at the University of Aachen