



Proposal No. IST-511780

### **MUPBED**

Multi-Partner European Test Beds for Research Networks

Instrument type: Integrated Project

Priority name: Information Society Technologies

### **Deliverable D0.3**

#### **Plans for dissemination and horizontal activities**

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<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	

## Abstract

This Deliverable provides an overview of the plan for dissemination, horizontal activities and contributions to standards. The focus is on activities planned for the first 18 months. Where appropriate, also longer-term plans are indicated.

The document contains an overview of the approach taken by project MUPBED and gives an indication of the publishable results. It also describes the current plans for

- horizontal activities, including co-operation with other projects
- co-operation with standardisation bodies and forums
- dissemination of results to the general public

This document will be updated during the project life time (see also Section 2.2).

## Document Information

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	contributions from all partners	
Checked by:	Jan Späth	Project co-ordinator

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# 1 Introduction

## 1.1 Purpose and scope

This Deliverable provides an overview of the plans for dissemination and horizontal activities of IST Integrated Project MUPBED (“Multi-Partner European Test Beds for Research Networking”).

## 1.2 Reference Material

### 1.2.1 Reference Documents

- [1] MUPBED project deliverable D0.1, “Project Summary”
- [2] MUPBED project deliverable D4.1, “Preliminary plan for demonstrations to be performed in test bed experiments during the first half of IP MUPBED”
- [3] R. Sabatino, M. Enrico, ECOC 2004, “Dealing with Emerging Research Requirements: The Evolution of GÉANT”, paper We2.2.2
- [4] Kyriakos Baxevanidis, eInfrastructures first concertation meeting, “Goals and Challenges”, The Hague, November 22, 2004

### 1.2.2 Acronyms and Abbreviations

ASON	Automatically Switched Optical Network
E-NNI	External Network-Network Interface
GGF	Global Grid Forum
GMPLS	Generalised Multi-Protocol Label Switching
IETF	Internet Engineering Task Force
I-NNI	Internal Network-Network Interface
IP	Internet Protocol
ITU-T	International Telecommunication Union – Telecommunication Standardisation Sector
MPLS	Multi-Protocol Label Switching
NNI	Network-Network Interface
NREN	National Research and Education Network
OIF	Optical Internetworking Forum
TMF	TeleManagement Forum
UNI	User-Network Interface
WP	Work Package

## 1.3 Document History

Version	Date	Authors	Comment
0.1	26/11/2004	Jan Späth Ronald Müller	Initial version
0.2	14/12/2004	Jan Späth Ronald Müller	Partner contributions included
0.3	15/12/2004	Jan Späth	revised version for initial check by all partners
1.0	19/01/2005	Jan Späth	final version

## 1.4 Document Overview

The document is structured as follows. Section 2 describes MUPBED's approach for using and disseminating knowledge in general. It highlights the multitude of possible dissemination activities, and by this serves also as a guideline to check whether the project's activities sufficiently cover the different target groups and platforms for dissemination activities. The section also includes a list of specific dissemination oriented public project deliverables.

Section 3 presents the publishable results for the first phase of the project (i.e. the first 18 months of the project lifetime), including a short description and a graphical representation of the deliverable plan over time.

An overview of horizontal activities, i.e. activities with other organisations and projects is the focus of Section 4. Out of the many opportunities for closer co-operation, specifically the co-operation with DANTE/Géant and the IST project NOBEL is given. Furthermore, the section contains an overview of further co-operation opportunities that can currently be imagined, although it has to be noted that this list is not exhaustive or exclusive.

Of specific importance is the co-operation between MUPBED and standardisation bodies and industrial forums. Section 5 is dedicated to this topic. Apart from a general description of MUPBED's view on related activities, some more details for the key co-operations with ITU-T, IETF, and OIF are given. Also here, the list might need to be extended during the lifetime of the project, and other potentially interesting bodies are shortly described.

Section 6 is dedicated to the important task for MUPBED of dissemination to the general public. Various specific plans are described, such as the MUPBED web page, press releases, demonstrations, and publications at conferences and workshops. The section describes shortly the various specific plans in this area, covering the first 18 months of the project. Finally, the section also contains various specific partner activities that will contribute to the dissemination towards a great variety of audiences.

## **2 MUPBED’s approach for Using and Disseminating Knowledge**

This section provides a general overview on how knowledge and results achieved by the project will be used and disseminated.

### **2.1 Using knowledge**

MUPBED is implementation oriented and as such the theoretical work is rapidly converted to experimental and practical applications when possible. As a goal of the project is to participate in defining the architecture and protocol mechanisms of the future communication networks, the knowledge of the project is of little value if not used and disseminated to the rest of the community working on similar issues and to those developing applications and application layers.

Therefore, the knowledge build up within this project will be quickly available to the interested community. In addition to that, the knowledge and experiences from practical experiments will also be used by the MUPBED partners themselves, mainly to define the next generation of products, services or strategic orientation for the MUPBED participants.

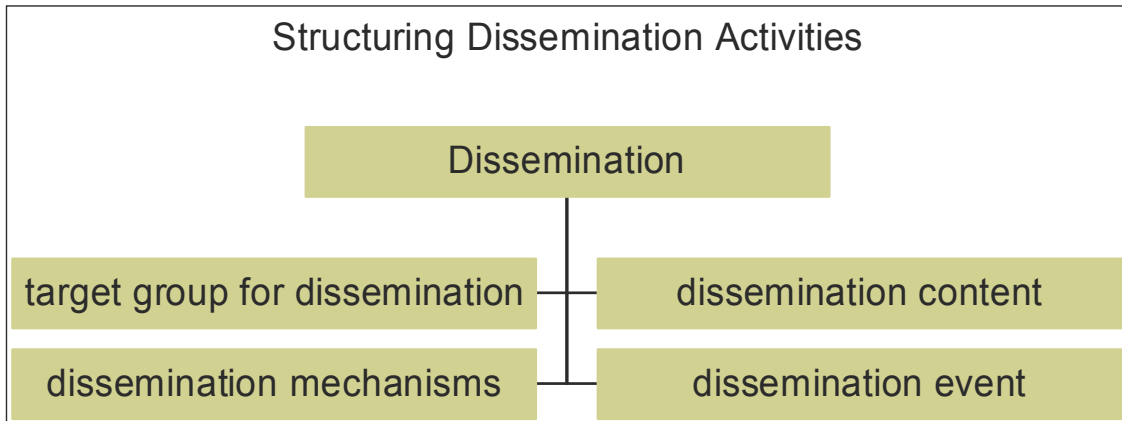
### **2.2 Disseminating knowledge**

It is of strong interest to the MUPBED project and its partners to disseminate its ideas and results to a community as wide as possible – although being focussed on research network users and applications, the project outcome is of generic value and can be applied for other user communities. Dissemination is an important interactive interface for the project for getting continued feedback on ideas and concept refinement. Dissemination is performed whenever possible by exploiting the human network of the different partners, but more specific it will be done in the following relations:

- The training activity in using and understanding the potentials of the MUPBED concept is a very important way to disseminate the results and ideas of the project.
- Towards the IST consortium, dissemination will be based on the project deliverables. They are “knowledge sharing” driven, not only from a content point of view, but also from a “formal” point of view thanks to the “Public” status of all deliverables.
- Towards the global community dissemination will be pushed with the help of conferences, seminars, workshops etc. Obviously, this will also include participation in events organised for the IST community.
- Another important element for dissemination are MUPBED demonstration activities, that will specifically focus on the dissemination towards potential users of the developed networking technologies. The demonstration plan is contained in deliverable D4.1 [2].
- Finally, dissemination towards carriers and network operators is an important project goal. This includes specifically dissemination towards NRENs (National Research and Education Network). Their requirements are of high importance for MUPBED, and the achieved results will therefore be strongly disseminated towards that community. MUPBED is in close contact not only with the NRENs directly in the project, but as well to various other NRENs that have expressed strong interest in following the outcome of the project.

### **2.3 Overview of Dissemination Activities**

This section gives a short structured overview on the multitude of possible dissemination activities. After a short general overview and motivation, the different classification criteria are described to show the great number of aspects that need to be considered for dissemination.

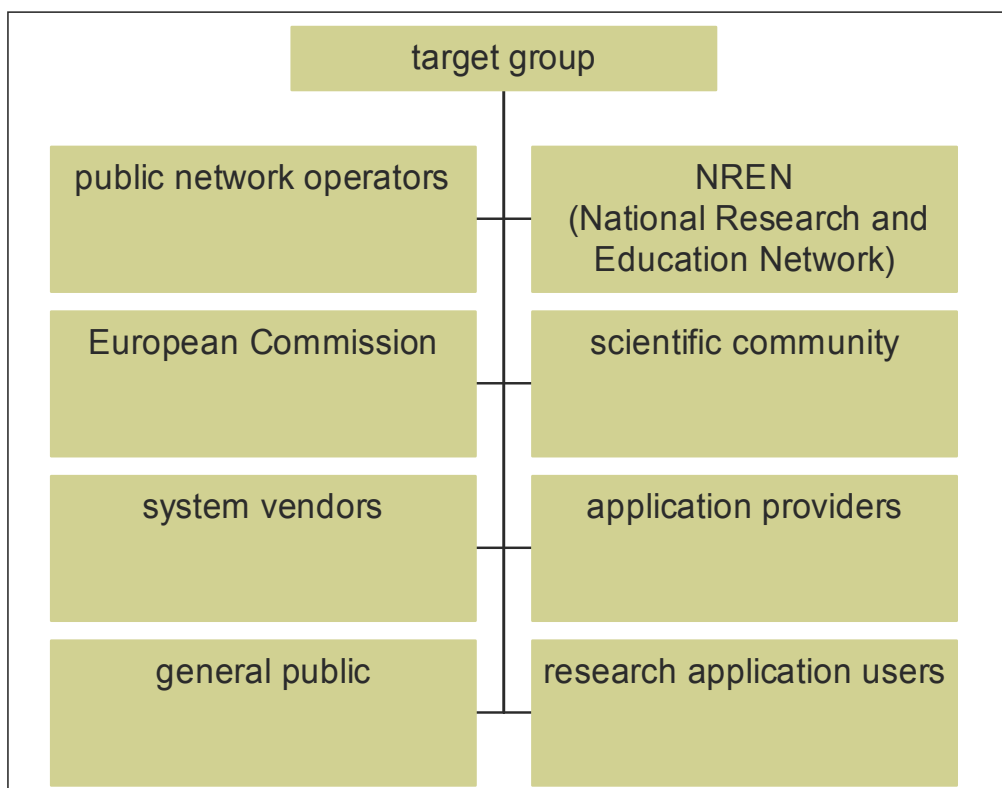


**Figure 1: Key aspects for dissemination activities**

Figure 1 represents the key aspects that can be distinguished when classifying dissemination activities. The key questions in this context are:

- who is the client of the dissemination? (“target group”)
- what shall be disseminated? (“content”)
- which medium shall be used for dissemination? (“mechanism”)
- where shall the dissemination take place? (“event”)

Therefore, each dissemination activity can be described as an “n-tuple” of parameters for the criteria above. In the context of the MUPBED project, the aspects described in the following are key.



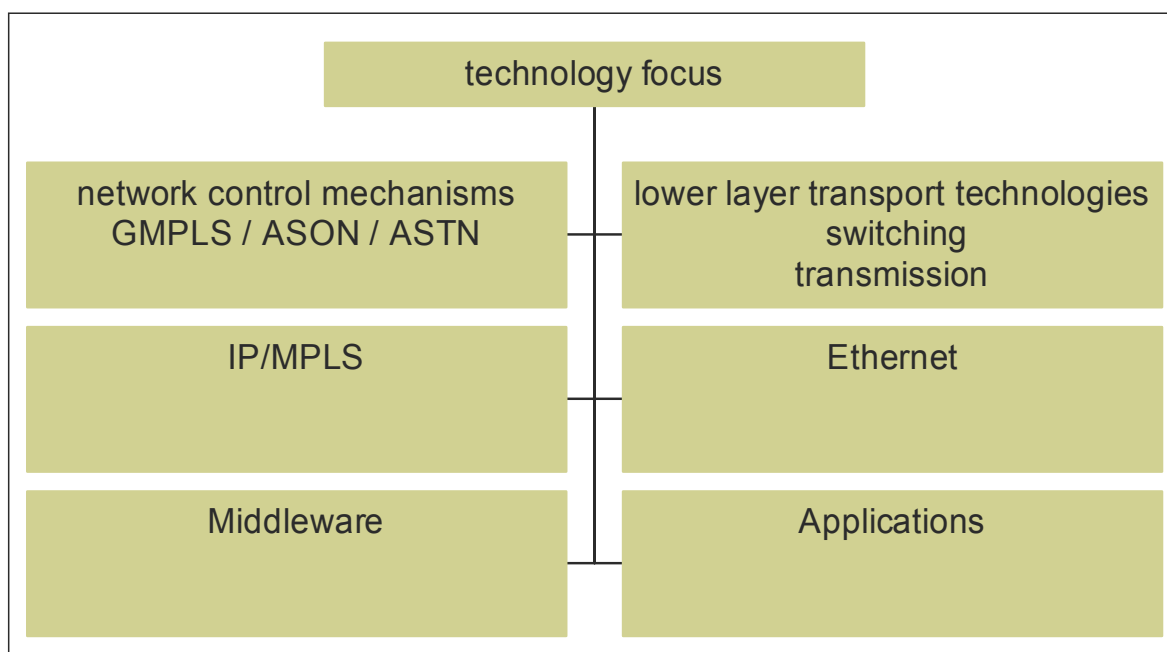
**Figure 2: Important target groups for MUPBED dissemination activities**

Figure 2 lists the key target groups for dissemination activities of the MUPBED project. Several target groups are represented also by partners of the MUPBED consortium, which should ensure the

appropriate consideration of their interest as well as an access to the respective audience. It can be seen from the list of specific MUPBED activities that are planned (see later sections) that the project tries to cover all these target groups appropriately.

The following figure gives a representation of the key technical content areas that are covered by MUPBED (the so-called “technology focus”). In addition to the technology, a kind of “achievement focus” can also be distinguished, key examples would be:

- basic functionality (proof of concept) for the different technologies in the MUPBED application context
- interoperability, with multiple sub-groups that can be identified (interoperability between domains; between vendors; between layers)
- connectivity / interconnection aspects



**Figure 3: Important technology areas to be covered by MUPBED dissemination activities**

There are many different dissemination mechanisms available, and the appropriate mechanism has to be chosen carefully, taking the target audience, the technical context, and other boundary requirements (such as resources) into account. The following is a list of important mechanisms:

- scientific / technical publication:
  - presentation
  - paper
- demonstration:
  - at individual test beds / application sites
  - jointly between multiple sites
  - “full” MUPBED demonstration (all sites, pan-European coverage)
  - “off-line” demonstration (at exhibitions, workshops, etc.)
- web page
- press release

- magazine/journal article

Finally, the dissemination event can be seen as a key characterising element for a certain dissemination activity. Further sections in this document contain the events currently planned for MUPBED activities.

## **2.4 Dissemination related Deliverables**

Plans for disseminating knowledge and horizontal activities as well as reports on related activities will be updated on an ongoing basis and also be made available in the following deliverables, to be published by MUPBED Work Package 0:

### **D0.1 Project Summary**

This deliverable gives a brief presentation of the project, its work plan, and the planned key achievements. The deliverable is publicly available since October 1, 2004.

### **D0.2 Plan for using and disseminating knowledge for the first 18 months**

This deliverable will report the plans for the use and dissemination of knowledge for the first 18 months of the project. This plan will be regularly updated, at least on a yearly basis. The deliverable is publicly available since November 1, 2004.

### **D0.3 Plans for dissemination and horizontal activities**

This deliverable will describe the plans of the project for dissemination, horizontal activities and contributions to standards. (*NOTE: This deliverable is the present document*).

### **D0.4 Dissemination and horizontal activities in Year 1**

This deliverable will report the results of the dissemination and horizontal activities that occurred in Year 1 of the project. Contributions to standards will also be reported in this deliverable.

### **D0.5 Dissemination and horizontal activities in the first 18 months**

This deliverable will report the results of the dissemination and horizontal activities that occurred in the first 18 months of the project. Contributions to standards will also be reported in this deliverable.

Similar deliverables will be planned for the second phase of the project as well.

### 3 Publishable Results for the first 18 Months

The results achieved by project MUPBED will be documented in project deliverables. A list of deliverables planned for the first 18 months of the project is given below. All planned deliverables will have a dissemination level of “public” (PU). It is expected, that these deliverables contain a significant part of the project achievements and therefore dissemination activities will largely base on the results reported in these documents.

#### **D1.1 Preliminary definition of a reference architecture for an intelligent optical network supporting advanced application in research environments**

The deliverable will provide a preliminary definition of the overall architecture (of an European test bed) investigated by the Project, comprising a multi-layer network based on IP and ASON/GMPLS technologies and equipped with a unified control plane. Along with a functional description of the network, the deliverable will report on possible solutions for integrating the key research applications (computing and data grids, storage networking, high quality video communication, etc.) with the functions of the intelligent optical network. Particular attention will be paid to issues like a standardised interface to the network services, different transport services packet and circuit based, QoS assurance, and customer access to network management and configuration.

#### **D1.2 Revision of the reference architecture according to the results of the project studies**

Based upon the results of theoretical studies, simulations and experimental activities carried on in the Project test beds, the deliverable will specify a stable, robust and scalable architectural model to be proposed to the European research network. With respect to the preliminary architecture proposed at the beginning of the project, the main technical aspects will be further addressed, comparing alternatives for their solutions and selecting the reference ones. The list of topics to be investigated will be exactly defined after the result of the first phase of the Project studies and experiments, and could include: scalability properties of the reference architecture, harmonisation of the control functions of the network and application platforms, automatic layer-involvement and network service selection, multi-domain routing and discovery; AAA services; customer management interface, etc.

#### **D2.1 Definition of application needs and scale of dynamics in research network infrastructures**

The deliverable will define the usual performance needs made by research network applications (current and potential new ones). Based on this a ranking will be made and the potential gain in a dynamic infrastructure will be outlined. In addition to the positive impact it will also be analysed if a too dynamic resource administration can have negative feedback to the applications.

#### **D2.2 Preliminary interface specification**

This deliverable will make a preliminary specification of the architecture and related protocols (and constraints) of the interface structure between the application layers and the optical transport network layers.

#### **D2.3 Specification on application enhancement procedures for selected applications to be verified in the MUPBED test bed**

This deliverables will specify the needed enhancement (generic or application specific) needed to exploit a dynamic infrastructure with focus on the applications that have been selected for verification in the MUPBED project. The deliverables will specify how

application is made network aware and how they communicate with the resource administration (directly or indirect).

### **D3.1 Test bed overview (M3)**

The deliverable will describe the overall design, of the Southern-, Central-, Northern-, Western- and Eastern European local test beds. Based on the already gained experience of the partners with the still existing parts of test-beds the overall design, architecture and functionality of the MUPBED test-bed infrastructure will be preliminary defined in the starting phase of the project and described in this report.

*NOTE: This deliverable has been available since October 1, 2004.*

### **D3.2 Report on enhanced design and architecture of local test beds**

Enhancements of the overall design will be derived by the results of the first reference architecture studies and the identified application requirements.

The general design of the test beds will also be extended to cover the integration of the IT platforms and relevant applications. In the process chain of “planning”, “implementation” and “operation” of the local test beds, the second deliverable of this WP will report about the “implementation” and “operation” of the individual local test beds.

### **D3.3 Report on interconnection and integration of local test beds**

The third deliverable of this WP will report about the “implementation”, “integration” and “operation” of the MUPBED test bed. It will cover the experiences gained with the five local test beds, the vertical integration of application-, IT- and networking layer, as well as the experiences gained by the multiple interconnection types of the local test beds.

### **D4.1 Preliminary plan for demonstrations to be performed in test bed experiments during the first half of IP MUPBED**

Based on identified features, services and applications from WP2 and WP3 that are suitable for demonstrations the deliverable provides a plan for demonstrations to be performed in test bed experiments up to M18. The plan will include proper test bed configurations in order to highlight project achievements to external user communities. Furthermore the organisation and running of demonstrations will be described.

### **D4.2 Demonstrations performed in the MUPBED test beds year 1**



The deliverable is a report covering the demonstrations performed in the MUPBED test beds during the first year of the project. The outcome of the execution of the demonstrations will be described and feedback from external users will be included.

### **D4.3 Preliminary plan for demonstration to be performed in demonstrations during the second half of IP MUPBED**

A plan for demonstrations to be performed in test bed environment during the second half of the project will be provided. The plan will include proper multi-test bed configurations and the organisation and running of demonstrations will be described. The demonstrations can involve integrating equipment and software from different sites, additionally to what is done in other WP's.

An overview of the deliverables for the first 18 months of the project including the planned time schedule is given in Figure 4.

### MUPBED: Deliverable Planning

Symbols:  Working period  
 Deliverable





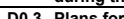

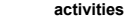




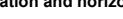
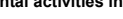


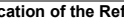



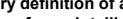
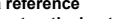











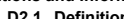

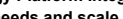













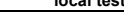






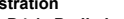




D	Month	3Q2004			4Q2004			1Q2005			2Q2005			3Q2005			4Q2005		
		07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12
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D2.2	Preliminary interface specification	15																	
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<b>Test Bed Development and Integration</b>																			
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D3.2	Report on enhanced design and architecture of the local test beds	12																	
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D4.2	Demonstrations performed in the MUPPET test beds Year 1	12																	
D4.3	Preliminary plan for demonstrations to be performed in test bed experiments (2nd half)	18																	

Figure 4: Overview of MUPBED deliverables for the first 18 months

## 4 Plans for Horizontal Activities

This section identifies current and potential future horizontal activities of the MUPBED project. This includes joint work with other projects as well as further co-operations and exchange activities. The figure below shows a kind of framework, defined by various IST activities, in which many co-operations and links are planned for the MUPBED project (which fits especially into the testbed area).

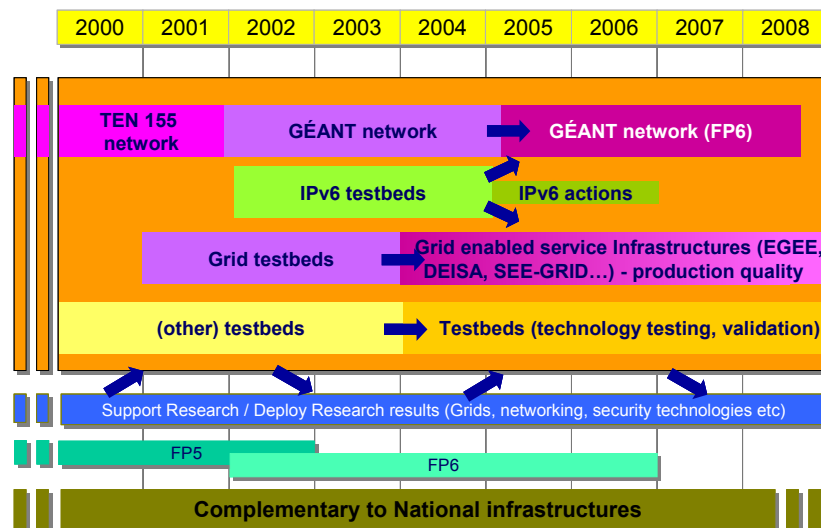


Figure 5: IST eInfrastructure roadmap [4]

### 4.1 Co-operation with other projects

Already in the starting phase of MUPBED it became obvious that there are many projects and initiatives with which a co-operation should in principle be possible. MUPBED is generally open to all these co-operation activities. However, mainly because of resource issues, each co-operation opportunity needs to be evaluated carefully, considering resource requirements, mutual benefits and synergies, and time lines of the different activities. Especially in the starting phase of MUPBED, focus has to be on achieving MUPBED's own goals, while obviously making sure that the project is aware of all relevant results from other activities to avoid unnecessary duplicated work.

The MUPBED partners have agreed on a process within the consortium to handle these co-operation activities. The key points are:

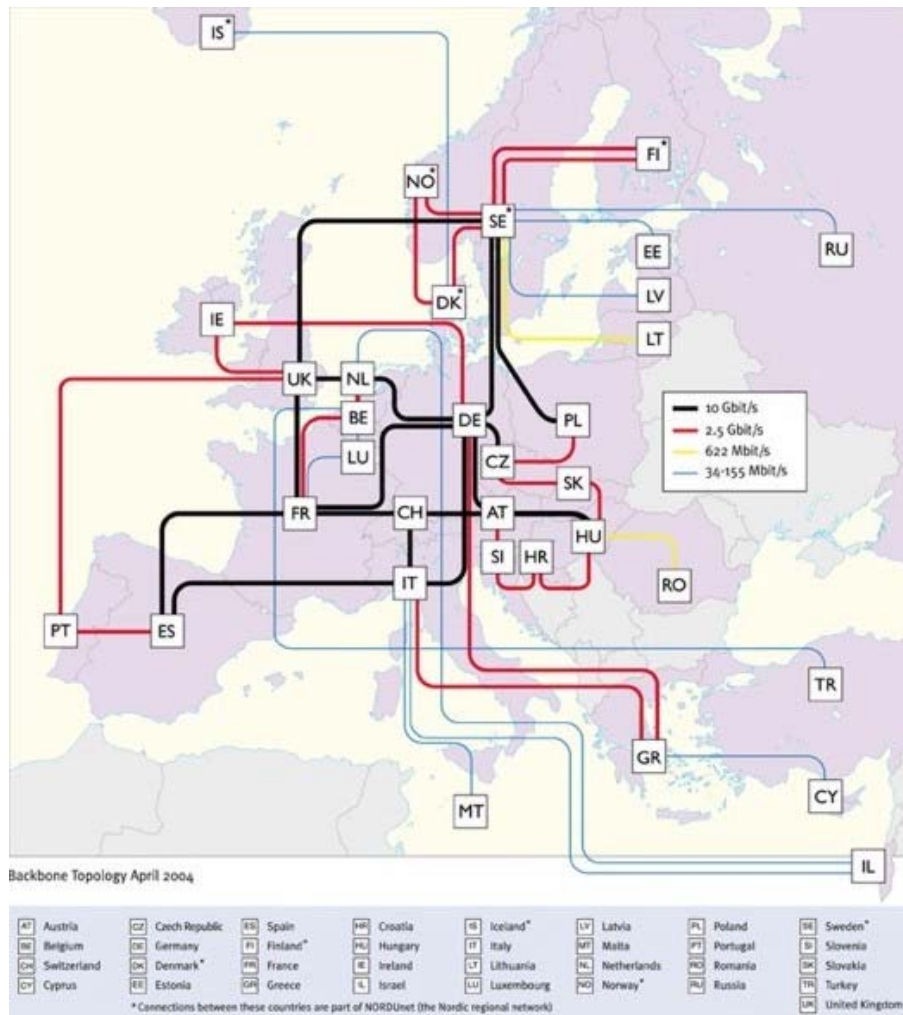
- A free exchange of overview information with any other activity that shows interest in MUPBED (or, with activities to which MUPBED partners would like to set-up a contact).
- In case that there is mutual interest and certain activities or potential working areas are defined, the consortium will agree on whether MUPBED shall engage in this co-operation.
- If the consortium supports such an activity, a responsible contact person (“liaison officer”) will be appointed, representing MUPBED and acting as key interface to the other project.
- The definition of co-operation details, including topic areas and formal steps that might be required, will be defined on a case-by-case basis.

At this stage of the project, two specific co-operation activities have been investigated by the MUPBED consortium and are now supported because mutual benefits could be identified:

- co-operation with the “GN2 Project”, driven by DANTE and several NRENs (see Section 4.1.1)
- co-operation with “IST NOBEL”, which is co-ordinated by TILAB (see Section 4.1.2)

#### 4.1.1 MUPBED – DANTE/GÉANT

DANTE (Delivery of Advanced Networking Technology to Europe) is a “not-for-profit” Limited Company, registered in the UK (based in Cambridge), and owned by a consortium of European NRENs (National Research and Education Networks). The main task of DANTE is the realisation of a common backbone to interconnect the various national research networks in Europe. This network is named “Géant”.



**Figure 6: Géant Network as of 2004 (Source: [3])**

The co-operation with DANTE is of importance for MUPBED in several ways:

- The Géant network is planned to provide the pan-European interconnection facilities needed for realising the MUPBED test bed.
- DANTE is organising in close co-operation with the NRENs a project (Géant2, GN2) to investigate the future direction of Géant. The topics studied in this project are of high relevance and importance for the activities within MUPBED, because both consider the future evolution of European research infrastructure.
- At a later stage of the project, the interconnection via NRENs and Géant will allow further users to be interconnected to the MUPBED test bed environment.

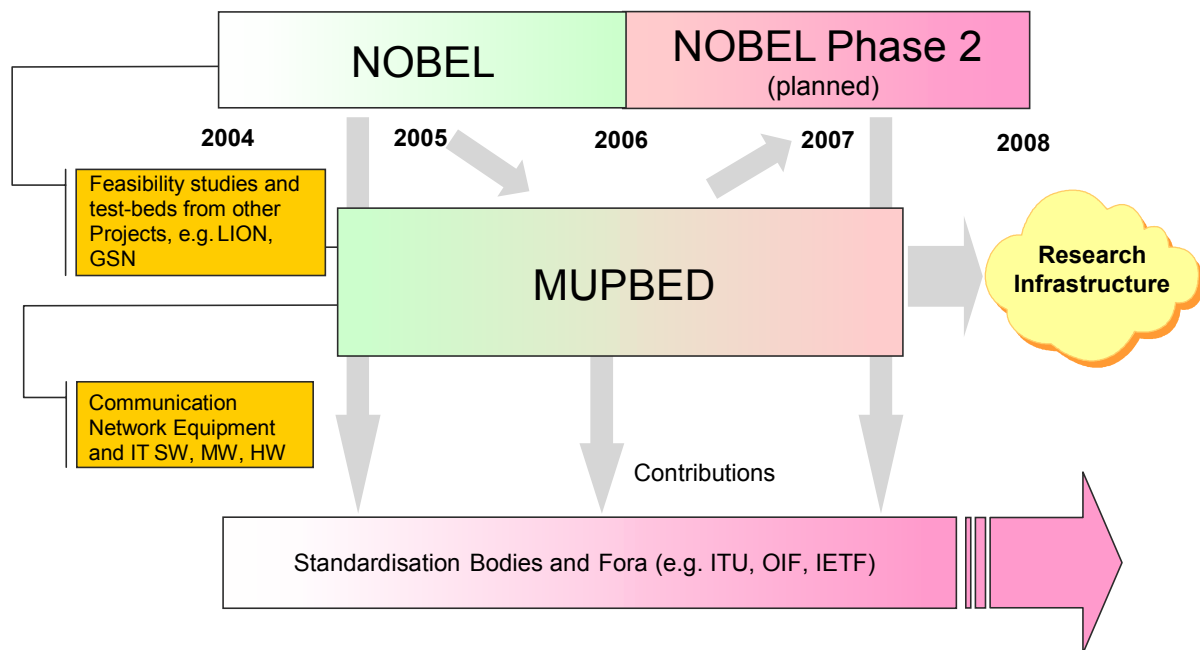
The co-operation between MUPBED and DANTE has already been set up at the beginning of the project. There are two different working areas, in which a co-operation has been agreed and is now on-going:

- One key issue is the interconnection implementation between the various local MUPBED test beds, which will be based on NREN and DANTE capabilities to realise the pan-European links. Currently, technical details are defined and agree, with implementation planned for 2005.
- The second working area is related to the theoretical investigations and studies planned in both, the GN2 project and MUPBED. In a joint meeting in November 2004 an agreement has been achieved on the next steps to identify specific joint working areas and to organise the work.

#### 4.1.2 MUPBED – NOBEL

Integrated Project NOBEL "Next generation Optical network for Broadband European Leadership" is a big Integrated Project within the IST 6<sup>th</sup> Framework. The main goal of NOBEL is to find and to validate (experimentally) innovative network solutions and technologies for intelligent and flexible optical networks, thereby enabling broadband services for all. From this overall goal it can be seen that NOBEL is more focussing on residential end-users and network technologies for broadband core and metro networks, while MUPBED is specifically concentrating on research networks, their infrastructure and application requirements.

The relationship between MUPBED and NOBEL has multiple aspects, ranging from an exchange about network architecture concepts up to joint experiments and joint usage of network and test bed infrastructure. The relationship between these two IST projects is illustrated in Figure 7. Note that this diagram includes for NOBEL a second phase, which is planned but not yet confirmed.



**Figure 7: Relationship of IST projects MUPBED and NOBEL**

At the current point in time, the following co-operation opportunities and plans have been identified. During the course of both projects, this matter will be further extended and refined in more detail.

### **Investigation of services and applications**

The two projects NOBEL and MUPBED focus on complementary services and applications: NOBEL is focusing on “Broadband for All”, therefore having a focus on residential and business end customers and network services to support their applications. MUPBED is focusing on ultra-broadband research applications such as GRID computing or high-quality video transfer. An interesting aspect is that many applications may first occur in the research environment, but will later on transfer towards residential and/or business end users.

The network requirements that occur from these applications can be very different. The co-operation between the projects will lead to a comprehensive understanding of future services and network requirements. This is of high relevance for network operators because in many cases all services (residential, business, and research customers) need to be supported by a common transport network platform.

### **Definition of network architecture and network evolution**

Based on the point above, it is obvious that also the derived network architectures and the corresponding network migration and evolution paths that will be derived by the two projects can be expected to cover complementary application scenarios. An interesting subject for co-operation between the projects will be to identify similarities and differences between these architectures and then to work on an overall framework, covering all aspects.

### **Requirements and solutions for a transport network control plane**

A key enabler for future dynamic broadband networks is a control plane, efficiently using network resources while in parallel allowing a high flexibility for the users to access these resources. It is expected that within NOBEL the current state of the art for control plane technology will be further progressed and several open issues will be tackled and solved. The purpose of MUPBED is to investigate the applicability of such control plane technology in the framework of research network infrastructure, thus leveraging on the technological progress in NOBEL. This investigation shall be done in a Europe-wide experimental network. The results and experiences from these practical activities will on the other hand give a valuable feedback towards NOBEL to further improve control plane technologies.

### **Deployment and usage of network infrastructure**

A key part of the MUPBED project will be the deployment of a network infrastructure, interconnecting multiple test beds across Europe. It is planned that this infrastructure can be used for experimental activities within NOBEL. The spectrum of such activities, probably being part of NOBEL Phase II, could cover a broad spectrum from providing interconnectivity between test beds up to joint experiments in the area of control plane and end-to-end service provisioning. The potential activities depend on the work plan and progress of both projects and have to be defined in detail during the course of NOBEL Phase I.

## **4.2 Further co-operation plans and opportunities**

In addition to the aforementioned co-operations, MUPBED is open for further collaborations. The extent of such activities has to be discussed and agreed on a case-by-case basis, but can in principle range from an active exchange of information up to interconnection to the MUPBED test bed and joint experimental activities.

Already, several other activities or bodies have been identified to which later contact looks very promising from a MUPBED perspective:

- DRAGON (Dynamic Resource Allocation via Generalised Multi-Protocol Label Switching (GMPLS) Optical Networks Project) [ <http://dragon.east.isi.edu> ]: This project is run by the Mid-Atlantic Crossroads, a consortium of universities and agencies that include NASA's Goddard Space Flight Center, the National Oceanic and Atmospheric Administration, and the National Institutes of Health. Other collaborators include the University of Southern California Information

Sciences Institute, George Mason University, the University of Maryland and the Massachusetts Institute of Technology Haystack Observatory in Westford, Mass. Several MUPBED partners have already started internal investigations to check if a specific co-operation with DRAGON could be set up.

- EGEE (Enabling Grids for E-science in Europe) [ <http://www.eu-egee.org> ]: EGEE will integrate current national, regional and thematic Grid efforts to create a seamless European Grid infrastructure for the support of the European Research Area. Since Grid computing is one of the most important applications to be supported by future research networks, the activities of this large IST project (with 70 partners) will be also important for MUPBED. Initially, creating the possibility for efficient sharing of practical knowledge on a national level is one of the main objectives, since the information dissemination and outreach is a key activity of both projects.
- VIOLA (Vertically Integrated Optical Testbed for Large Applications in DFN) [ [www.viola-testbed.de](http://www.viola-testbed.de) ]: The main objectives of VIOLA German national project are the practical evaluation of NG Ethernet and SDH network elements and architectures, of ASON/GMPLS network functions and of interworking aspects between ASON/GMPLS networks and future broadband applications, topics which are closely related to the MUPBED work
- MUSE (Multi Service Access Everywhere) [ <http://www.ist-muse.org> ], a IST project that focuses on future multi-service access technologies, and working with topics that are relevant for MUPBED in setting up realistic test scenarios.

Some of the initial contacts have already been set up, while for others further information is needed and/or first MUPBED achievements should be reached before a productive co-operation can be started.

### 4.3 Other horizontal activities

In addition to co-operations with specific projects, MUPBED is actively planning to contribute to other horizontal activities, mainly in the area of IST. At the current stage, a participation and potential contributions to the following IST horizontal activity oriented events is foreseen. It has to be noted that this list is not intended to be exclusive, further opportunities will be openly investigated::

- Concertation Meetings on eInfrastructure and GRID applications. These meetings are planned to be held twice a year, to foster the co-operation of GRID oriented IST projects, covering the areas of infrastructures for GRIDs and GRID applications
  - MUPBED, represented by partner Deutsche Telekom/T-Systems already participated at the 1<sup>st</sup> Concertation Meeting on eInfrastructures 22.-23.11.04
  - The next meeting is planned for 25.-27.04.2005, and MUPBED plans to be represented there as well.
- Annual IST Event
  - MUPBED was already presented by the meeting 15.-17.11.2004 (joint presentation together with the IST project NOBEL by TILAB). A participation at further IST events is planned.
- BREAD (BRoadband in Europe for All: a multi-Disciplinary approach) co-ordination action aims at developing a multi-disciplinary approach for the realisation of the 'broadband for all' concept within Europe. This project organised a conference "BroadBand Europe" ([www.ist-bread.org](http://www.ist-bread.org)) on 8.-10.12.2004
  - Partner Deutsche Telekom/T-Systems presented at this conference its continuous efforts on setting up comprehensive ASON/GMPLS demonstrators with strong vendor partners, including the main ASON/GMPLS client network domains: IP, Ethernet based MAN and SAN and last but not least its involvement in the MUPBED project.

- It has been announced that BREAD will organise similar events, probably on a yearly time frame. MUPBED intends to participate in future BREAD events as well.

TERENA (Trans-European Research and Education Networking Association) [<http://www.terena.nl/>]: TERENA's main goal is to promote and participate in the development of a high quality international information and telecommunications infrastructure for the benefit of research and education. Since this organisation includes many NRENs across Europe and has already established a close co-operation with DANTE, a co-operation looks also very interesting for MUPBED. As a first step, an active MUPBED participation at the TERENA conference starting June 9<sup>th</sup>, 2005 in Poznan is planned.

The TF-NGN Task Force (Task Force for Next Generation Networking) aims to investigate the suitability of advanced networking technologies for future implementation in research and education networks in Europe. The goals of the Task Force are:

- to provide a forum for exchanging experience and knowledge
- to promote development and testing of innovative networking technologies
- to define, develop and test new networking services, which can subsequently be introduced by national research and education networks and/or in the European research networking backbone infrastructure.

Several MUPBED NREN partners actively participate in TF-NGN, where the results of MUPBED will be disseminated to other research communities, including NRENs, universities, equipment vendors, etc.

In addition to these specific horizontal activities, MUPBED has plans for various further dissemination activities. Despite that fact that these activities have a broad target spectrum, they could partly also be seen as “horizontal”, because it can be expected that these activities also lead to a close exchange with other related groups and initiatives. Section 6 contains a detailed description of further dissemination activities.

## 5 Co-operation with Standardisation Bodies and Forums

With regards to development of standards, two types of institutions are important:

- standardisation bodies
- industry forums

In many cases, the industry forums work out specifications that later on are used by standardisation bodies as basis for standards (and in several cases, are directly “copied”). Another important role of the forums is to bring standards to a practical implementation level and to feed back to standardisation bodies potential standards improvements.

In many cases, there are close links between standardisation bodies and industry forums. In this section, the document tries to consider both types of institutions jointly, and the term “standardisation activity” shall cover both types of bodies. The section describes how the activities in MUPBED are based on close co-operation with relevant bodies and how the results achieved by MUPBED could be used for contributions to standardisation activities.

### 5.1 Relevance of MUPBED achievements to standardisation activities

Concerning contributions to standards, the main goal of MUPBED is to achieve a common European position on several issues related to the various interoperability aspects that are relevant to research networking. The two main areas of investigation will be:

- Interworking between network domains (different vendors and different operators)
- Interaction between IT platforms and network

Both aspects have a strong impact on the definition of the control plane of ASON/GMPLS networks (e.g.: UNI and NNI interfaces, signalling, routing, etc.), but also on other aspects, such as network management.

The activities and expected results of project MUPBED have a high potential for contributions to standards. This is due to the current state of progress and development of the technologies that the partners are going to explore.

### 5.2 MUPBED view on Standards and technical specifications

MUPBED has the intention to participate in, influence and take input from all organisations that work on producing standards and technical specifications relevant to the MUPBED project. Currently there are several activities going on, and people from the MUPBED partners are active in or leading some of them. This close personal relationship to the relevant standardisation organisations and other groups not only ensures awareness of all relevant aspects, but will also be an excellent basis for an efficient participation in standardisation and specification work. In particular we work with standardisation in ITU-T and IETF and technical specifications in OIF and TMF.

The MUPBED consortium identified a standardisation approach in order to be very effective in following and driving the standards. The approach is based on the following three basic rules:

- Those MUPBED partners joining standardisation bodies/forums should feed-back the project with the status of development of the standardisation process;
- The consortium should identify those areas where the project's results may contribute to the standards;

- Those MUPBED partners joining standardisation bodies/forums should use their involvement (be it either by direct personal participation, or via company's standardisation representatives), while obviously the rules of each organisation have to be considered.

The basic rules are equally valid for MUPBED participation in industrial forums.

Already at the start of the project it was identified, which of the standards and technical specification areas are of key importance for MUPBED. One of the industrial forums whose activities and achievements have both a clear impact on and may be influenced by the activities within MUPBED is the OIF. Of the standardisation bodies, ITU-T and IETF were identified as important for MUPBED. The background for the planned participation in the OIF and in standards bodies is described in some more detail in the following subsections.

## **5.3 Co-operation activities**

### **5.3.1 Co-operation with the ITU-T SG13 and SG15**

The architectures and requirements specified by the ITU-T for automatically switched networks are relevant for the MUPBED testbeds and the project as a whole. The participation in this work is channelled through MUPBED partners who are members of the ITU-T, and when MUPBED partners are invited as technical experts to Study Groups and Questions.

### **5.3.2 Co-operation with the IETF**

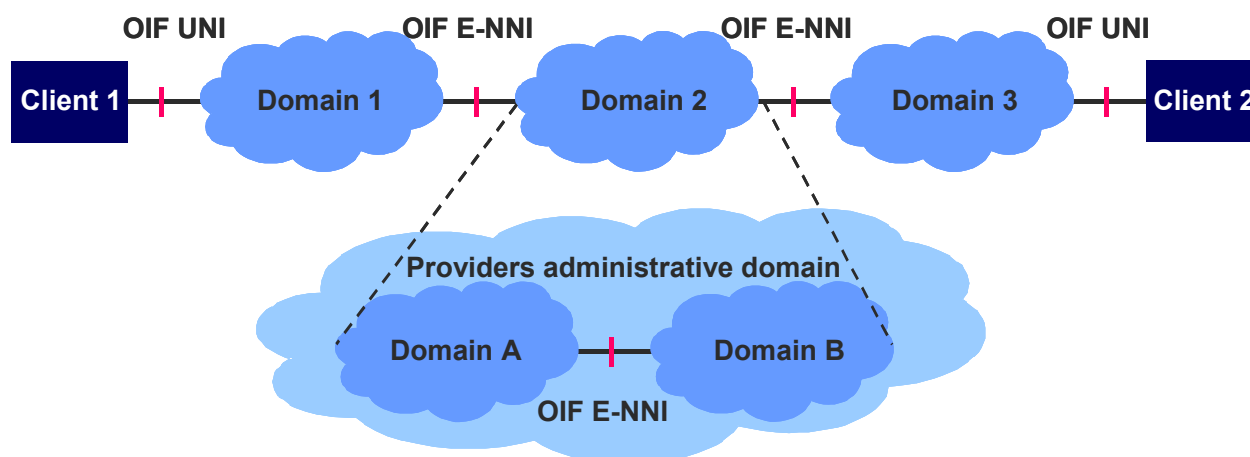
The routing and signalling protocols developed by the IETF are integral parts of both the GMPLS (IETF) and ASON (ITU-T) architectures. IETF are currently developing inter-domain and point-to-multipoint extensions for Traffic Engineered networks.

IETF is an open standards organisation where participation is based on individuals, this means it is open for input from projects like MUPBED, but any contribution has to be sent in as an individual Internet Draft. The GMPLS architecture is an architecture for a common control plane, in networks with "switching capabilities" on more than one forwarding plane.

### **5.3.3 Co-operation with the OIF**

The OIF network architecture is compliant to the ASON/GMPLS architecture. This architecture is already partly implemented in the Southern and Central European test beds and will be completed during the first 18 month. It is based on multiple, independent network domains with standardised interfaces (data plane and control plane) between them. In this model, there are three substantially different reference points, the User-Network-Interface (UNI), Internal Network-Network Interface (I-NNI) and External-NNI (E-NNI), see Figure 8. The OIF has defined Implementation Agreements for the UNI and E-NNI (based on ITU-T recommendation G.7713.2), while the I-NNI is regarded as internal to the network domains.

As described in deliverable D3.1 already, the MUPBED partners Marconi, TILAB and T-Systems/Deutsche Telekom have participated at the OIF World Interoperability Tests and Demonstration at SuperComm 2004 and will further continue to implement the OIF Implementation Agreements related to the control plane interfaces UNI and E-NNI in this project, but maintaining this high level world wide interoperability reached in June 2004. By doing this, practical experiences enable these partners to provide substantial feedback to the OIF specification work.



**Figure 8: Control plane interfaces of transport networks partitioned into multiple domains and different hierarchy levels**

Details of a next OIF interoperability test event in 2005 are currently being discussed within the OIF. From the MUPBED consortium, there are plans to participate in this test event, mainly related to the implementation of UNI2.0 Ethernet, enabling Ethernet (client) network domains to request by using an Ethernet interface connections from transport networks in the same manner as they can do it today with SONET/SDH signal formats. Details of a MUPBED involvement will be discussed as soon as the OIF plans become more stable.

Furthermore the OIF has started a new project aiming at providing a design guideline document for the interoperability of OIF/ITU-T ASON and IETF/GMPLS network domains. This topic is highly relevant to the MUPBED project, but not restricted to this, and therefore MUPBED partners will actively participate at this activity.

## 5.4 List of relevant standardisation bodies and forums

This section shall give a short overview of the standardisation bodies and industrial forums mentioned above that are of specific importance for MUPBED. The following short overview already reveals that there are many areas of importance for the project, and also various opportunities where the project results can influence standardisation work.

### 5.4.1 ITU-T

In general, ITU-T is carrying out studies in the various Questions on the many aspects of Optical Networking, leading to a series of planned or published Recommendations, as described in Recommendation G.871, addressing: (a) Optical Transport Network architecture; (b) functional characteristics; (c) structure and mapping aspects; (d) management aspects; (e) physical layer characteristics. Particularly, the concept of ASON networks is one of the key topics currently being investigated by ITU-T

Considering the current organisation of ITU-T, the main contributions produced by the MUPBED project will address the following Study Groups:

- SG13 “Multi-protocol and IP-based networks and their interworking”
- SG15 “Optical and other transport networks”

Within these Study Groups, many Questions will be monitored and contributions will be provided to them on the basis of pieces of work developed in the project. Table 1 lists the relevant Questions.

Question	Title
10/13	Core network architecture and interworking principles
9/15	Transport equipment and network protection/restoration
11/15	Signal structures, interfaces and interworking for transport networks
12/15	Technology Specific Transport Network Architectures
14/15	Network management for transport systems and equipment
19/15	General characteristics of optical transport networks

**Table 1: Questions of ITU-T SG13 and SG15 relevant to MUPBED activities**

### 5.4.2 Optical Internetworking Forum (OIF)

The OIF is an open industry organisation of equipment manufacturers, network operators and end users dedicated to promote the global development of optical internetworking products and foster the development and deployment of interoperable products and services for data switching and routing using optical networking technologies. The Technical Committee is divided into different working groups, focussing on specific areas. Currently the Working Groups are:

- Carrier
- Architecture & Signalling
- OAM&P
- Interoperability
- Physical and Link Layer

The results planned in the MUPBED project will impact on OIF activities of almost all Networking Working Groups (Carrier, Architecture, OAM&P and partly Interworking WG). In particular, contributions are foreseen on the definition of architectures, requirements for inter-carrier E-NNI and UNI 2.0 control plane interfaces and their interoperability evaluations. Furthermore, during the negotiation phase of this project, a few of the MUPBED participants are already actively involved in OIF interoperability tests on interfaces which are building a bases for the MUPBED test bed functions (UNI 1.0 and intra-carrier E-NNI).

### 5.4.3 Internet Engineering Task Force (IETF)

The IETF is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet standards, architecture and protocols, as well as the smooth operation of the Internet. The actual technical work of the IETF is done in its working groups, which are organised by topic into several areas (e.g., routing, transport, security, etc.). Particularly, GMPLS protocols have been developed by IETF.

The activities that will be carried out within MUPBED can give potential contributions to the *Routing and Internet Area* and, in particular, to the following working groups:

- Common Control and Measurement Plane (CCAMP), a working group working on the development of the GMPLS technology, and in particular with protocol issues for non-packet based technologies
- Multiprotocol Label Switching (MPLS), a working group working on the development of the GMPLS<sup>1</sup> technology, and in particular with protocol issues for packet based technologies
- Layer 2 VPN (L2VPN), a working group that among other things works on issues related to create L2VPN over GMPLS enabled networks
- Layer 3 VPN (L3VPN), a working group that among other things works on issues related to create L3VPN over GMPLS enabled networks

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<sup>1</sup> Note: this is not a misspelling, the working groups are working on a common technology - GMPLS

- Pseudo-Wire Emulation End to End (PWE3), a working groups that works on developing methods to transport traffic carried in specific data plane technologies, e.g. ATM, FR, Ethernet and STM over GMPLS enabled networks.

The MUPBED project can exploit the results obtained to reinforce the European representation within the IETF, which is often dominated by US companies' views.

#### **5.4.4 TeleManagement Forum (TMF)**

The TMF is a non-profit organisation including service providers, network operators and suppliers of equipment and software to the information services and communications industry. Its main goal is to help service providers and network operators automate their business processes in a cost- and time-effective way. It uses a business and customer services driven approach to achieving end-to-end automation using integrated Commercial Off-the-shelf (COTS) software.

The MUPBED result will be mainly related to the following TMF initiatives:

- New Generation OSS (NGOSS): intend to provide the operators with systems integration framework to improve their processes automation level
- Multi-Technology Network Management (MTNM): defines an interface to manage transmission network, including technologies like SDH/SONET, WDM and ATM.

#### **5.4.5 Global GRID Forum (GGF)**

The Global Grid Forum (GGF) is a community-initiated forum of thousands of individuals from industry and research leading the global standardisation effort for grid computing. GGF participants come from over 400 organisations in over 50 countries, with financial and in-kind support coming from GGF Sponsor Members including technology producers and consumers, as well as academic and federal research institutions.

GGF's primary objectives are to promote and support the development, deployment, and implementation of Grid technologies and applications via the creation and documentation of "best practices" - technical specifications, user experiences, and implementation guidelines.

GGF efforts are also aimed at the development of a broadly based Integrated Grid Architecture that can serve to guide the research, development, and deployment activities of the emerging Grid communities. Defining such architecture will advance the Grid agenda through the broad deployment and adoption of fundamental basic services and by sharing code among different applications with common requirements.

Wide-area distributed computing, or "grid" technologies, provide the foundation to a number of large-scale efforts utilising the global Internet to build distributed computing and communications infrastructures. As common Grid services and interoperable components emerge, the difficulty in undertaking these large-scale efforts will be greatly reduced and, as importantly, the resulting systems will better support interoperation.

## 6 Dissemination to the General Public

This section describes the initial steps and current plans on how MUPBED will reach the maximum level of awareness and public participation and will achieve a high usage of its services.

### 6.1 Public pages on MUPBED web page

Public pages on the MUPBED web page <http://www.ist-mupbed.org> will be used to make information about MUPBED available to the public. This includes:

- Overview of the project and project related news
- Information on progress and achieved results as well as plans for the future
- Demonstration events, project related activities at conferences, exhibitions, etc
- Information about the project consortium and its individual partners
- Links to the IST programme, related projects and activities

### 6.2 Press releases and bulletins

A press release publishing an overview of the project including links for further information will be published after project start and clarification of all formal issues.

Further press releases will be published by the MUPBED partners and are planned in order to

- report on relevant progress and achievements of the project
- report on participation in demonstration events etc.

Furthermore, MUPBED partners plan to publish bulletins, news, and other short information within already established publication media. Examples of media in which MUPBED information has already been published are:

- “DFN-Mitteilungen”, Heft 66, Nov 2005, “Pan-Europäisches Testbed für flexible Bandbreiten” (J. Rauschenbach)
- Campus-wide publication of University of Erlangen, called “BI” (“Benutzerinformation”), the MUPBED overview information appeared in issue 72, 10/2004 with the title “Overview on ‘MUPPET’. A European Networking Initiative”, pp. 16-19.

### 6.3 Demonstrations

The MUPBED project has set up a separate Work Package (Work Package 4), dedicated to demonstration activities. This shows the importance given to this kind of activity.

A more detailed description of plans related to demonstration activities can be found in MUPBED Deliverable D4.1 (“Preliminary plan for demonstrations to be performed in test bed experiments during the first half of IP MUPBED”).

### 6.4 Conferences and Publications

It is planned that MUPBED participants will contribute to various conferences. The following list gives an overview on some important events foreseen at the moment. The focus is on events within

the next 12 months (until end of 2005). The list is not an exclusive list, further activities can be added if considered helpful.

- Optical Networks oriented conferences:
  - ECOC 2005, September, Glasgow
  - OFC 2005 (in March in Anaheim, US; a MUPBED overview paper has been accepted as poster presentation)
  - OECC 2005
  - APOC (MUPBED has been shortly presented at APOC 2004)
  - NOC 2005
  - 9<sup>th</sup> Conference on Optical Network Design and Modelling, ONDM 2005 (7-9 February 2005, Milano, Italy); a MUPBED overview paper has been accepted as oral presentation
  - Hungarian WDM Workshop 2005, 1<sup>st</sup> March 2005 (one or two presentations on the overview of the MUPBED project and on the scope of the Matav's activities in the project are planned)
  - 7th International Conference on Transparent Optical Networks, ICTON (3-7 July 2005); a presentation on actual status of MUPBED project is planned by Matav in co-operation with PSNC, other partners' contributions are welcome.  
Note: The ICTON 2005 conference will be held in Barcelona, Spain, hence, the TID and RED.ES can co-operate with PSNC and Matav to make a valuable presentation of MUPBED.
- Conferences on Internet topics, MPLS conferences, research networking events, such as:
  - MPLS World Congress 2005 (a MUPBED contribution to the "MPLS World Congress 2005" has already been accepted)
  - TERENA TNC 2005, June 2005, Poznan, Polen (MUPBED will give a presentation, MUPBED partner PSNC will host this conference)
  - 1<sup>st</sup> International Conference on Testbed and Research Infrastructure for the Development of Networks and Communities, Tridentcom 2005 (23-25 February 2005, Trento, Italy); MUPBED will participate to a panel on "Autonomic computing and communication testbeds"
- IST conferences such as:
  - eInfrastructure Concertation Meetings (probably two per year, with the next one in April time frame; MUPBED plans to participate; <http://public.eu-egee.org/concertation>)
  - IST co-ordination conferences and workshops (e.g. IST-BREAD), [http://www.ist-bread.org/events\\_item.asp?id=42](http://www.ist-bread.org/events_item.asp?id=42)
  - annual IST events, the next one being probably in November 2005 ([http://europa.eu.int/information\\_society/istevent/2004/cf/vieweventdetail.cfm?ses\\_id=368&eventType=session](http://europa.eu.int/information_society/istevent/2004/cf/vieweventdetail.cfm?ses_id=368&eventType=session))  
Several MUPBED partners usually participate at these events, representing industry partners as well as research institutes and NRENs.
- Other conferences and similar events:
  - SuperComm 2005, June, Chicago: MUPBED plans to contribute to the OIF Interoperability Event
  - IEEE Globecom 2005
  - DRCN 2005 (Design of Reliable Communication Networks)
  - Workshops organised by IIR or Marcus Evans
  - Conferences on broadband applications (GRID, multimedia)
  - ISOCORE, Oct 2005, Washington DC

## 6.5 Articles in science magazines

It is planned to publish major progress and achieved results in appropriate magazines to address both, the scientific community and the general public.

## 6.6 National workshops and events

National workshops and participation in national events with multimedia-oriented demonstrations which are open for the public in general are planned in various countries of the MUPBED partners. Events that are currently being investigated for contributions are for example:

- “Week of Science” (Madrid, Spain)
- “ExpoInternet” (Madrid, Spain)
- VIOLA annual workshop 2005 (Berlin, Germany)
- “Night of Science 2005” (11<sup>th</sup> June 2005, Berlin, Germany), Opening T-system labs to the public
- “Internationale Funkausstellung IFA 2005” (Berlin, Germany)
- “ITG Workshop 2005” (Leipzig, Germany)
- GARR conference, May 2005, Pisa
- further events at universities, e.g. science days
- workshop of German project “ VIOLA ”, 27/28 April Berlin, Germany (MUPBED presentation planned)

## 6.7 Other Activities

In addition to the activities above, MUPBED partners support and foster the co-operation of R&D and standardisation activities. Within the first 18 months, the following specific activities have taken place or are planned (with the plan to do similar activities in future):

- By hosting standardisation meetings (SG15/Q14 meeting 1.-5.11.2004, Berlin) in the area of ASON/GMPLS and provide the attendees presentations and demonstrations of prototype implementations they are working on
- By participating at OIF interoperability tests and demonstration (in 2004: [http://www.oiforum.com/public/supercomm\\_2004.html](http://www.oiforum.com/public/supercomm_2004.html)) in testing areas which are highly relevant to the MUPBED project (see section 5.3)
- Participation at the OIF interoperability tests and demonstration in 2005 is planned (see section 5.3)
- Video Quality Expert group (VQEG) is an independent expert group to assist ITU in e.g. video quality. MUPBED partner Acreo is co-chairing the multi-media working group, and can by this ensure a close exchange of relevant information
- Isocore, a spin out company from George Mason University sets up interoperability tests for MPLS, GMPLS and MPLS based services in their lab each year, as well as at some of the main industry exhibitions. Acreo is a partner with the possibility to impact tests and gain feedback from the test results.

Another activity, that can also be seen as dissemination activity, are training activities within the project. Several partners have plans to organise and conduct training in the course of the project. Specific examples are:

- Acreo runs a series of seminars on GMPLS technology, market and latest developments

- Lectures on MPLS, GMPLS and dynamic optical networks held by MUPBED partner by CoreCom within the course “Optical Networks” at Politecnico of Milan, Department of Electronics and Information

Furthermore, several partners plan internal dissemination activities to distribute the MUPBED achievements within their companies and institutions. Specific examples are:

- company internal training on latest technological progress, specifically on control plane issues, by Marconi
- MUPBED topics are presented continuously at the DT T-Gallery at DT Headquarters in Bonn
- MUPBED topics will be presented continuously at T-Systems, Technology Center Show Room in Darmstadt (estimated start is mid 2005)