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**Abstract:**

This Deliverable describes the plans for the dissemination of knowledge gained during the work, and (to the extent that can be foreseen at this stage) the exploitation plans of the results for the consortium as a whole, for individual participants, and groups of participants. It expresses as far as possible in concrete terms, the dissemination strategies, the target groups and the strategic impact of the project in terms of improvement of competitiveness or creation of market opportunities for the participants.

One of the purposes of this Deliverable is to disseminate information about the project, and its progress, in such a way that other workers in the area can make use of the results, or see how they can feed information into the project. In this way it acts as a vehicle for the cross-fertilisation of ideas and a means of establishing co-operation. This document will be regularly updated, and will lead to the Technology Implementation Plan (TIP).

**Keyword List:**
Exploitation, dissemination, trials, standards
Executive Summary

New concepts and technological results are being derived that will have an impact on future communication systems, particularly concerning user mobility and associated services (including those delivered via the Internet). It is, therefore, seen as being of crucial importance to publish the results from the project in the appropriate literature. Agent technology is also recognised as being extremely important to the future extension of software engineering practice and significant new approaches are being learnt from the developments to date. This work is being contributed to the FIPA standardisation activities.

This Dissemination and Use Plan will be treated as a living document\(^1\) and will be updated during the life of the project. It will include at each update a summary of changes since the previous release and an outline of expected future additions or changes. Being a publicly available document, it will be made available on the project web site and minor releases will be added there more regularly.

One of the purposes of this Dissemination and Use Plan is to disseminate information about the project, and its progress, in such a way that other workers in the area can make use of the results, or see how they can feed information into the project. In this way it acts as a vehicle for the cross-fertilisation of ideas and a means of establishing co-operation.

The contents of the Deliverable include:

- plans for the dissemination of knowledge
  - standards
  - publications
  - Deliverables
  - trials
- exploitation plans
  - project as a whole
  - individual partners
- clustering

\(^1\) The term living document is applied to the Dissemination and Use Plan and to the Technology Implementation Plan mentioned later. This means that both documents will be updated regularly in accordance with the project plan, at least at every milestone.
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1. Plans for the Dissemination of Knowledge

1.1 Standards Bodies

New concepts and technological results are being derived that will have an impact on future communication systems, particularly concerning user mobility and associated services (including those delivered via the Internet). It is, therefore, seen as being important to feed these results into standardisation, and to publish papers from the project in the appropriate literature. Agent technology is also recognised as being extremely important to the future extension of software engineering practice and significant new approaches are being learnt from the developments to date. This work is being contributed to the FIPA standardisation activities.

Inputs to the following standards bodies will include contributions on security, mobility and support for new technology (eg. small footprint FIPA-OS for hand-held devices).

- the ETSI GPRS standards;
- the 3GPP UMTS standards;
- the FIPA standards for agent interoperability;
- W3C standards for device independent service delivery; and operators (in a competitive environment) and the relationship between them.
- OpenGIS.

1.2 Publications

The consortium is publishing papers at conferences and in journals. At the time of writing this report, the following papers have been published, or accepted for publication:

The Federation of European Cities Tourist Offices (FECTO, see also http://www.visiteuropeanities.com) will have its annual meeting in Heidelberg on June 21st, 2001. The CRUMPET project will be presented at this meeting.


1.3 Deliverables

Almost all Deliverables from the project are available as public material.

1.4 Trials

Validation and trials will be designed to test the scalability, robustness and adaptability of the services. An assessment will also be made of the impact on the network in a roaming situation, in terms of message and processing load. The public trials and validation experiments also serve as a valuable form of dissemination. Where feasible with the type of service, trials will be made available and publicised on the Internet, leading to a high impact global public experiment where interested parties are encouraged to participate and give their feedback on the Smart Tourism services delivered via the nomadic service environment across the Internet.

Portable demonstrations of the trials will also be shown at public events. The consortium will also publish descriptions and results of the trials in papers for conferences and technical journals.

Current tourism services for nomadic users are in their infancy. Mobile phone users can get the same voice services as they can from a fixed phone and some text-based travel information is also available. Fixed (home- or office-based) Internet users have a much richer supply of tourism information and services, although even this is in its infancy compared to what will be possible once e-business establishes itself. Customers are increasingly using the Internet to book holidays, make travel arrangements and to discover information about their destination. New mobile services, such as WAP and GPRS, will enable the nomadic usage of these applications and offer opportunities for new ones, a trend that will accelerate with third-generation mobile networks.

Some of the current limitations of Internet tourism services are: knowing where to find the information, extracting the appropriate information, and receiving the information in a form that is easy to digest and suitable to the user context, the transport characteristics of the delivery network, and the terminal capabilities. The introduction of WAP technology, therefore, does not automatically enable access to the vast range of Internet based tourism services currently available, but simply enables Internet services to be adapted for delivery to WAP enabled devices. The trials in CRUMPET demonstrate not only the physical network adaptability, but also the adaptation of the content format to the delivery network and terminal capabilities. They will represent a service environment that generically integrates the traditional Internet and wireless services.

The trials reflect the changing tourism environment: more and more people are taking short breaks several times a year as well as a main vacation. More and more people combine several purposes with travelling, purposes such as business, leisure, entertainment, and education. The result is what can be called “edutainment” and “busitainment”. People travelling for business, for education, for adventure do not call and perceive themselves as classical “tourists”. These “advanced tourists” have additional interests and needs compared to classical tourists, and are likely to spend more - so offering a revenue stream to support the introduction of new services. Advanced tourists also need pragmatic and logistic information; they also expect additional information about the destination domain, including history, culture, folk, art, economics, environment and nature. Advanced tourists also expect individualised
information and services taking into account their own (levels of) interest and their history of activities and history of information.

CRUMPET, therefore, takes into account these factors and provides information and services for a far more heterogeneous tourist population than any system in the past. Information and services accessible from any location by different devices and different connectivity allow the user to prepare a journey and plan activities during that journey, or at the destination. Technical infrastructure, content integration and adaptive information and service selection and presentation give the user the services they wish while roaming.

The nomadic tourism services created by CRUMPET will share the following criteria, they will be useful, consistent, timely, available, user-friendly, context-sensitive, and personalised.

These features will be disseminated to public audiences through trials in Heidelberg, London and Helsinki. The precise scenarios for each location are currently being defined, but will likely include the following main features:

1.4.1 **Heidelberg**

Frank from Vienna (Austria) is visiting Heidelberg. After lunch he goes shopping in the old town of Heidelberg. While shopping, he comes close to one of Heidelberg's historic sights, and the CRUMPET system knows he might be interested in this sight. So, the CRUMPET system suggests visiting this sight.

Frank reads the short description, and indeed he is interested to visit the location, so he requests the directions. CRUMPET gives a description of a short pedestrian route leading to the sight.

When Frank has found the sight, he requests more information about the building. CRUMPET displays more text about the history and current use of the building.

Frank becomes excited about all the sights in Heidelberg and decides to change his plan and go sightseeing. He asks for more recommendations. The CRUMPET system suggests several sights that could be interesting to him and that can be visited in a 3-hour walking tour.

Frank visits all the suggested sights and uses CRUMPET as a navigation aid as well as a tour guide to the historical sights and general topics of interest in Heidelberg.

After walking all afternoon, Frank finally becomes hungry and asks CRUMPET for a restaurant. CRUMPET asks whether this should be a nearby restaurant and if he wishes something special today. Frank wants to walk there and asks for an Indian restaurant, if possible. Frank is happy with CRUMPET's recommendation and follows the directions to the Indian restaurant.

Two hours later, having enjoyed his meal, he decides to go to a cinema and watch a movie in the evening. He asks CRUMPET for movies running this evening in a cinema close to his current position.

CRUMPET gives the choice of three movies for the evening. For each, the title, a short description, the cinema with address, and the start time is given. More information is available upon request. Frank downloads the preview of one movie, but does not like it. He then chooses "The Student Prince" as a typical film about Heidelberg. Online booking is not available at this cinema, and so CRUMPET is not able to make a reservation. However, CRUMPET provides the option to connect Frank to the cinema telephone booking system, knowing that Frank’s PDA has a telephone built-in. Frank declines, deciding that the cinema is unlikely to be busy. He departs for the cinema on foot, guided by the CRUMPET navigational assistance.

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2 If it is only a PDA (i.e. no built-in phone) then the phone number would be shown instead.
1.4.1 Technical Environment

The mobile equipment will be a high-end PDA (iPaq). The mobile equipment needs interfaces to all the used wireless networks. There are two kinds of data transmission over wireless links: messaging and file transfer (video clips). The amount of data transmitted over wireless links is variable (small, medium and large).

1.4.1.2 Features

This scenario focuses mainly on the following features:

1. Location awareness and location specific system support.
2. Proactive generation of tourist tips.
3. User modelling and adaptation of services to user interests.
4. Adaptation of presentation to dialogue history.
5. Availability of several local tourist services, integrated user interface.
6. Generation of tours and directions, using GIS data and the current location of the user.

Other technical requirements are the same as for Helsinki (see section 1.4.3).

1.4.2 London

Sarah, a new student at Queen Mary University of London, wishes to carry out an orientation tour of the University campus. She asks the CRUMPET system to plan a personalised tour corresponding to the locations of her lectures extracted from her timetable and the locations of some auxiliary buildings such as the library. When she is near to each building, the CRUMPET system displays information about it and then provides a route to the next building within the tour.

Towards lunchtime she gets hungry, so she asks the CRUMPET system to search for lunch venues nearby (both on the campus and outside the campus). The CRUMPET system supplies her with a list of lunch venues taking into account her preferences such as: time constraints, cost and the dynamic capabilities of service providers such as special offers. She selects a restaurant and the CRUMPET system supplies directions to the venue.

After lunch, Sarah resumes her tour, guided by CRUMPET. She also registers with CRUMPET to receive notification of suitable places to eat during subsequent lunchtimes. She then has her first lectures in the afternoon.

After her lectures, she intends to meet up with other members of her family and friends to go on a tour of London. CRUMPET establishes each person’s current location and suggests a meeting place based upon criteria such as the shortest travelling time. Sarah agrees to meet-up and the CRUMPET system informs her of how to get to the location. Once everyone is together, the CRUMPET system is used to suggest venues that the group may wish to visit. The selection of sites is based upon constraints set by each member of the group. Once the tour has been agreed the CRUMPET system provides directional and tourist information as the group reaches each location.

1.4.2.1 Technical Environment

The technical requirements are the same as specified for the Heidelberg and Helsinki scenarios.

1.4.2.2 Features

1. Location awareness and location specific system support.
2. Generation of tours and directions, using GIS data, data about "sights", and user-specific data such as personal preferences, interests and current position.
3. Persistence of tour plans and dialogues, they can be resumed after interruption.
4. Restaurants guide, considering personal preferences and provider's offers and constraints.
5. Support for tourist groups. Suggestion of meeting place and tour planning, adapted to group location and group interests.

1.4.3 Helsinki

Jonathan, as a member of an EU inspection committee, is visiting Helsinki to carry out the annual inspection of Finland’s special requirements for EU support. The meeting ended earlier than expected, and he has an afternoon and evening off. He is keen to see a local attraction. Jonathan uses his PDA and activates the CRUMPET system to search for interesting things to do. The system accesses the Internet via the wireless LAN provided by the hotel Jonathan is staying in. CRUMPET uses knowledge of Jonathan's preferences and current location. It finds information about a show from the tourist service of Helsinki tourist office that might interest Jonathan. Jonathan wants to see more information about this show. The system begins to display video extracts of the show. Jonathan finds the show interesting and prepares to leave for the evening show.

While waiting for a taxi, Jonathan continues to look at the video clips of the show from his PDA. Jonathan leaves the hotel building, and his PDA seamlessly roams from the hotel's wireless LAN to a public mobile network. There is insufficient bandwidth for the full video extract to be transmitted to the PDA, and the system adapts the data so that only voice is transmitted over the mobile network, and Jonathan continues to listen to soundtrack music of the show.

1.4.3.1 Technical Environment

The mobile equipment can be either a high-end PDA or a low-end laptop, which is easy to carry and use when moving. The mobile equipment needs to have interfaces to the necessary wireless networks. It is proposed that the PDA will have a WLAN PC-card and Bluetooth, IrDa, or serial cable connection to Jonathan’s mobile phone (e.g. GPRS / UMTS access could be via Bluetooth, infrared or serial cable). There are two kinds of data transmission over wireless links: messaging and file transfer (video clips). The amount of data transmitted over the wireless links is large.

1.4.3.2 Features

This scenario includes several features:

1. Roaming from WLAN to UMTS, GSM, or GPRS and vice versa.
2. Providing QoS information about data transmission over wireless links.
3. Notifying application agents about disconnections, reconnections, and changes in QoS.
4. Content adaptation based on QoS and other issues such as terminal capabilities, personal preferences, and content providers' restrictions.
5. Locating the CRUMPET access node;
6. Use of the CRUMPET access node;
7. User profiles related to communications stating personal preferences how to use communication media:
   - what media to use;
   - limits to usage, e.g. cost, locations, QoS;
   - location: mobile terminal

Agreement has already been reached with the tourist authorities in Heidelberg and Helsinki for information to be provided and for collaboration with the trials. These trials will be for "city tourism" where high bandwidth network nodes (e.g. Bluetooth) will be placed in a small number of museums.
and similar locations to provide the high-bitrate indoors applications and allow demonstration of the seamless roaming to the outdoors GSM. The difference between the two is that Helsinki will use location detection based on GSM triangulation whereas Heidelberg will use GPS.

Discussions are being held with the English Tourism Council to provide a wide-area trial (outdoors only) for rural tourism. GSM with GPS location (and possibly GPRS if the GPRS coverage is sufficiently good in rural areas) will be used. Bluetooth will not be used here (being in the other two) since the aim is to provide CRUMPET services to people touring round a wide area.

2. Exploitation Plans

2.1 Exploitation Plans for the project as a whole

The overall aim of CRUMPET is to implement, validate, and trial tourism-related value-added services for nomadic users (across mobile and fixed networks). In particular the use of agent technology will be evaluated (in terms of user-acceptability, performance and best-practice) as a suitable approach for the fast creation of robust, scalable, seamlessly accessible nomadic services. The implementation will be based on the standards-compliant open source agent framework FIPA-OS, extended by CRUMPET to support nomadic applications, devices, and networks.

The main features of the CRUMPET approach include:

- services that will be trialled and evaluated by multiple mobile service providers;
- service content that will be tourism-related, supporting intelligent, anytime, anyplace communication;
- adaptive nomadic services responding to underlying dynamic characteristics, such as network QoS and physical location;
- a service architecture implementation that will be standards-based and made available at the end of the project as (mostly) publicly available open source code;
- suitability for networks that will be those that a typical tourist user might be exposed to now and in the near future (including IP networks, Wireless LAN, and mobile networks supporting WAP technology: GSM, GPRS, and UMTS); and
- suitability for a wide range of terminal types, including next generation mobile phone / PDA / PC hybrid terminals.

The implementation will be developed using best practice, including “open source for open standards” development, developing generic re-usable components on an open distributed architecture. During the trial phase of the project, an assessment will be made of the scalability, robustness, and time-to-market advantages of the approach.

2.2 Exploitation plans of the individual partners

The project partners form a value chain for exploitation. This includes research from the academic partners and technology transfer from the industrial partners into their lines of business. The Telcos expect to use the technology to differentiate their service offerings.

Furthermore, since the start of the project, the development team from Nortel Networks have formed a new company (Emorphia), specialising in agent technologies. They have taken over the responsibility for the implementation workpackage from Nortel Networks, and are therefore perfectly placed in this
project to realise the exploitation of the results. They have also taken over the support of the FIPA OS from Nortel.

Partners will generally enhance their expertise in the following areas:

- implementation, validation, and trialling of tourism services for nomadic users that will adapt to both dynamic network changes (QoS), and user location and other contextual changes;
- development of a service-oriented architecture to establish and deploy flexible tourism services and applications;
- adaptation of tourism services to the different QoS offered by different bearer services, to changes in physical location and to other contextual factors such as the characteristics of the terminal in use;
- development of a generic seamless execution environment across different types of networks and access devices for a range of value-added services within the tourism domain;
- development of an evolutionary approach to the integration of emerging technologies in this application area, such as the provision of services over mobile cellular standards such as GSM/GPRS/UMTS; and over wireless data standards such as WLAN and Bluetooth and wired data standards such as IPv4 and IPv6;
- the use of contextual information such as presence, location (e.g. GPS), and user-preferences (e.g. service-specific preferences and preferences associated with different contexts) to intelligently adapt service delivery;
- the applicability of advanced software techniques, specifically Intelligent Agent technology, for service creation, deployment, distribution, personalisation, and interaction for nomadic users;
- provision of an architecture that supports the distribution and re-distribution of intelligence between smart terminals and smart network elements - this will involve consideration of active network research;
- implementation of the services, together with content, in a form accessible from the trial networks;
- evaluation of how the system meets the business needs of multiple service providers and network

The exploitation plans will obviously vary between the different types of organisation within the consortium; the overall approach to exploitation is, therefore, divided between the types of organisation with more detail for specific partners. This sub-section not only includes exploitation plans for industrial partners but also for the research institutions because exploitation of research is seen as a valuable part of the work that universities and research institutes are expected to do.

2.2.1 QMW (QMUL)

Queen Mary University of London (QMUL) brings to the project its experience of designing and implementing agent systems in telecommunications. It will exploit the results and knowledge from this

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4 Most approaches have simply assumed that the Mobile Internet will be a reality and aim to intercept this occurrence (the revolutionary approach); however, the true usable seamless realisation of this is still some way off in the future. In the meantime there are in excess of 200 Million global users of GSM that could start to use the CRUMPET services today. A solution that can evolve from GSM, through GPRS, to UMTS (the evolutionary approach), and in addition, to WLANs, has immediate market opportunities and could make the revolutionary approach obsolete. The other class of user that could benefit from the concept today is the ordinary Internet user: this could be seen as an evolution of the Internet Portal concept.

5 Presence includes information such as the data recorded about users in an Instant Message Server (IETF IMPP Working Group) relating to the current context that the user is in (such as in the office, in the car, etc.) and the types and associated constraints of the terminals they have access to.
project by generating research papers to reinforce its standing as a major research-led University and to maintain its position in the competitive UK Research Assessment Exercise. The work in CRUMPET will extend the ability of the University to generate new research funding from other sources, such as UK Government and industry. Income from the HEFCE (the QR component) depends specifically on its research standing.

In addition, QMUL is in the process of starting a "spin-off" company to exploit the results from an ACTS project on the intelligent control of telecommunications resources. Results from CRUMPET will be added to the intelligent-control knowledge base of that company and will add to its business opportunities. Further details may be given in confidential discussions with the Commission.

2.2.2 **Nortel Networks**

Nortel Networks have contributed in the early phases of the project to the definition of the agent architecture, through their expertise in agent systems, and especially FIPA-OS. Nortel's role towards the end of the project becomes more related to the dissemination and exploitation of the results.

They are a major manufacturer of telecommunications equipment, and remain committed to exploring the feasibility and opportunity for incorporating agent technologies (especially through Emorphia).

Nortel Networks will also be involved in the dissemination of the project results through various industry fora. Nortel Networks is an active participant in the ETSI SMG committees and chairs the SMG3 Plenary and SMG3 System Architecture groups. It is also active in the 3GPP forum for UMTS standards. Nortel Networks have a further exploitation route to the US through a department in Texas that is building up expertise in agent technologies. Some of the partners have established direct links with this part of the organisation.

2.2.3 **EML**

EML will use the CRUMPET work to develop information-processing systems in which the technical barriers between human user and system fall below the level of conscious awareness. From the user's point of view, the systems are intended not as equipment for providing information, but rather as active, or "intuitively accessible", sources of knowledge. Such active sources of knowledge are of interest both for applications in everyday life and for some of the more demanding tasks that arise within science itself.

The European Media Laboratory concentrates its efforts on a small number of far-reaching research areas, which it pursues in co-operation with other centres throughout the world.

At present, the European Media Lab is pursuing projects in the four areas of:

- **Personal Memory**
- **Bioinformatics**
- **Information Technology in Medicine**
- **Storage Technology**.

The most relevant to CRUMPET is the area of **Personal Memory**, which addresses the major challenge of accessing the information content of unstructured and weakly structured data in a dynamic and context-dependent manner. "Deep Map" - the main project in this area - has as its goal the development of a portable device that can be used as an electronic tour guide in Heidelberg. The device will provide an individual with suggestions for a sightseeing tour of Heidelberg and then escort the tourist around the chosen route. The electronic tour guide possesses a comprehensive knowledge of Heidelberg in the form of geographical, historical and other data. It also takes into account the cultural backgrounds of the users, their special interests and the amount of time they wish to spend on the tour. Deep Map 'speaks' and 'understands' several languages; among other things a camera helps to
locate and orient the tourist in the city; and the electronic tour guide is able to display three-dimensional views of the town in its present state and in former epochs. It will be able, for example, to answer such questions as:

- Where do I need to stand to get the best photo of the castle?
- What did the castle look like before it was destroyed?
- What is that building straight ahead of us?
- Can I still get tickets for the organ concert this evening?
- Is there a pizza restaurant somewhere near here?
- It's starting to rain - what can we do now?

The successful development of Deep Map involves tackling numerous questions in the fields of pattern recognition, user interfaces, data modelling, mobile computing, geo-information systems, computer linguistics and others. Experience from Deep Map will be brought into CRUMPET, extending the capabilities to include global access and a seamless execution environment.

EML's goal is to transform research results into commercially viable product models or systems. The actual manufacture and marketing of such products are not among its purposes. Nevertheless, EML does work to ensure that its research and development efforts will find real-world commercial applications by granting licenses and by actively supporting the formation of new and spin-off ventures. At EML, all projects are carried out with a view to producing a prototype. Evaluation of the prototype, in co-operation with potential user groups, is part of the project plan. In the development of a prototype, appropriate attention must be paid to certain systems aspects, such as its integration into an operating environment, the influence of standards, problems of maintenance and operation, scalability and economic viability. EML develops research prototypes to a sufficiently advanced stage for industrial partners or newly established companies to begin product development immediately. In this phase, EML will continue to provide advice and support, but does not, itself, pursue the goal of developing and marketing products.

EML's favoured mode of research involves the co-operation with industry partners, as well as University and non-University research laboratories, which are all indirect routes for dissemination.

2.2.4 GMD

GMD brings competence in user modelling and adaptive selection and presentation of information and services. User modelling, evaluating the user history, is the means for personalised services taking into account the user’s preferences, knowledge and interests. Based on localisation technology (such as infrared and GPS) the physical location of the user is identified to adapt the selection and presentation of information and services to the current user position and needs.

The results of CRUMPET have a number of possible application areas for personalised information systems and services that will be explored; the results will be exploited both on a scientific and on a commercial path. GMD is interested in the development and evaluation of adaptive and adaptable features developed in the CRUMPET project in further scientific research and development. Several projects have been conducted and are planned in this field integrated partly into the GMD long-term research programme Social Web. GMD is in contact with several local museums and tourist organisations as potential user organisations. A positive response has been obtained so far from the Deutsche Museum (Bonn), the Bonner Kunstmuseum, the Kunst und Ausstellungshalle der Bundesrepublik Deutschland (Bonn), the Haus der Geschichte der Bundesrepublik Deutschland (Bonn), and the Institute of Computer Science of the University of Bonn developing an autonomous mobile robot system for museum visitors.

Services for disabled tourists form another area that GMD is interested in exploiting. Tourism for disabled people is extremely difficult. Indeed, disabled people (blind, deaf, wheelchair users) have a problem navigating in a modern city, especially in an unfamiliar place. Their need for an information and navigation aid is of crucial importance for their freedom of mobility. The CRUMPET concept...
with a personalised user interface may be a valuable tool for helping disabled people managing everyday life. Personalised information systems for disabled people have been developed in an earlier project by one of the partners (GMD) in the AVANTI project, with stationary systems (kiosk systems). However, the mobile concept of CRUMPET goes well beyond what has been done before by offering personalised services, including location information, in a mobile environment.

GMD's Spin-off Company "HumanIT, Human Information Technologies GmbH" is the commercial exploitation arm. HumanIT expects to exploit CRUMPET-based results, in co-operation with existing industrial partners, in two commercial contexts. The first deals with ubiquitous personalised computing environments for enterprises, the second is a socio-cultural application domain for tourist services. HumanIT will offer the results in a modularised form in order to be able to sell turnkey components for flexible and widespread use. Therefore, the exploitation efforts mentioned above require various types of analyses as well as direct marketing activities targeting local governments, exhibitions, travel agencies, and industrial partners.

GMD presents its results and research activities at conferences, in scientific publications, on the World Wide Web, and in its quarterly magazine, the GMD Spiegel. These results benefit GMD's co-operation partners in business, science, public administration, and the media, as well as the end-users of new and improved products.

2.2.5 **PORTUGAL TELECOM INOVAÇÃO**

Portugal Telecom Inovação (PTIN) is the research division of the Portuguese national, mobile and cable operator, and Internet service provider. It therefore brings an operator perspective on the requirements for new tourism services and on the likely scenarios for a suitable execution environment.

The activity of PTIN has long been devoted to the implementation and usage support of Systems, Services and Solutions thus enhancing the market stance of the whole Portugal Telecom organisation. It also plays a decisive role in the development and promotion of the Information Society by demonstrating new services and integrating new technologies, easing their commercial introduction. Within the Portugal Telecom sphere, and in order to create and sustain business for the Portugal Telecom group of companies, PTIN is a proactive agent in the launching of new business areas, by bridging advanced technologies with the fresh markets in an effective way.

Expertise within PTIN includes areas such as Value Added Services, ISDN, Intelligent Networks, Broadband Communication Networks, ATM, VoIP, Telecommunications Management Networks, Network Architectures and Infrastructures, Optical and Mobile Communications, Equipment Certification and Compliance, Multimedia and Internet Services, CATV Networks, Software Engineering, Expert Systems, Digital Information Processing and advanced training-oriented interactive multimedia applications and services over IP/ATM, integrating Internet technologies as well as software development expertise.

The mission of PTIN is to participate in key projects for Portugal Telecom as the leading group in the areas of knowledge that are strategic for the development of the group’s business. This mission is met through the commitment to the promotion of the innovation process at both the service, technology and operations levels, so as to ensure competitiveness for the PT companies, both inland and on the International market.

Portugal Telecom's interest in new services and in moving up the value chain will be put to valuable use in the operating side of the business, with which there are strong links. The results of this project may well shape business decisions of the company in the future.

This organisation has high expectations of ensuring that the technology developed as part of this project is followed through to practical use.
PTIN provides the national representation in International standards bodies (CEPT, ETSI, CCITT, ITU), and co-operates actively with universities and other national and international R&D institutions. It has therefore excellent paths for dissemination.

PTIN owns sophisticated and accurate lab equipment that enables it to compete in national and international R&D. Besides ensuring the business process for the Portugal Telecom group of companies, it is also a valuable support to both the industry and the entrepreneurial fabric in Portugal.

2.2.6 **SONERA**

Sonera is the leading Finnish telecommunications company with subsidiaries, or joint ventures with other operators, in 14 countries. Sonera provides basic data and Local Area Network interconnection and management services to large business customers and is the market leader for such services in Finland with a market share of more than 50%. Sonera is also the leading provider of Internet services in Finland with a market share of more than 35%.

Sonera brings experience in wireless data communications, especially in the 2nd and 3rd generation systems (GSM, GPRS, and UMTS), wireless service provisioning, and software agent technology in nomadic applications. Sonera is working on:

- the design and implementation of FIPA nomadic application support and
- new agent-based tourism services in co-operation with Finnish tourist information content providers.

Sonera is a forerunner in Europe as a provider of advanced data and media communications services, and as such has very strong commitment to the development and service offerings of 3rd generation mobile networks, such as UMTS. Sonera already has licenses to operate a UMTS network, and this 3rd generation broadband mobile communications network will make possible services such as the transmission of video and the versatile use of Internet pages by a mobile handset. Sonera has also decided to implement GPRS. Sonera is participating in international development work on the new mobile communications system and intends to be a provider of new content services by pursuing co-operation with content providers.

Sonera participates in - and influences - the development of software agent standards, for example, FIPA and OMG standards.

Sonera will exploit the results and knowledge from the CRUMPET project by using them in the development of Sonera's new, advanced wireless Internet (e.g. tourism, electronic commerce, news) services. Sonera hopes to strengthen the service differentiation by using the technology developed in the CRUMPET project. In addition, Sonera will exploit the results by writing research papers to increase its standing as a research organisation in the field of software agent technology and wireless data communications.

2.2.7 **UNIVERSITY OF HELSINKI**

The Distributed Systems and Communication Group has a long experience in experimental and constructive computer science, in which new and innovative ideas are also implemented as software prototypes. The research focus is on the following four themes:

- nomadic computing (protocols for wireless communications, services for nomadic users),
- distributed software architectures (ODP, OMG, TINA),
- real-time and embedded systems (real-time databases, device drivers), and
- formal methods (specification and verification of protocols).

Through both pan-European and national research projects, the group has established a strong reputation in mobile computing. The group actively participates in international standardisation: IETF (PILC), OMG (Telecom DTF, Benchmarking PSIG, Agent WG), FIPA (Nomadic support), ISO
In addition, the core of the team that developed the LINUX operating system (a public domain Unix implementation for PCs) was from the department.

Research is a major part of the raison d'être of any University and the University of Helsinki is no exception. This partner brings into the project knowledge and experience of designing, specifying and implementing computing and communication services for nomadic applications. The experience of the computer science department in previous projects is being exploited in CRUMPET and, in the future, results from this project will be exploited to enable the department to participate in new proposals. The results will also help the department contribute effectively to standards.

2.2.8 Emorphia

Emorphia Limited is a start-up company founded in December 2000 by the Nortel Networks’ Agent Technology Group to exploit the rapidly emerging ‘agent solutions’ area. Emorphia technology is based on novel intelligent software agents that are reusable, re-configurable; and can be given personalities, profiles, and missions – collectively adapting their behaviour to new circumstances as they try to attain their goals. These agents conform to the FIPA (http://www.fipa.org) standards for agent interoperability allowing them to ‘plug and play’; this component paradigm will do for the software industry what programmable devices did for the semiconductor industry, providing unprecedented re-use and rapid time-to-market for new types of services and applications.

Currently smart software, that for instance delivers modified content to a user, is proprietary and bespoke, but Emorphia enables a new approach by conforming to emerging standards for smart software such as FIPA, XML, and Java. Agents can be useful for both existing software systems (e.g. database integration or network management) and future systems (eg. 3rd Generation mobile services and resource control).

Emorphia is actively involved in the FIPA agent-interoperability standardisation effort, including participation on both the Architecture Board and the Board of Directors. The Emorphia team also manages FIPA-OS, the world’s first standards-compliant commercial multi-agent framework, managed as an Open Source development (http://fipa-os.sourceforge.net). FIPA-OS has regularly been one of the most active Open Source projects (of 15,000 projects on SourceForge) since early 2000. FIPA-OS can be used royalty-free and contributors retain their own copyright; improvements are made publicly available on a regular basis with contributions from the global community of developers. Enhancements to FIPA-OS are used to check the validity of FIPA specifications and influence FIPA standardisation efforts.

Emorphia’s main contribution will be in definition and prototyping of agent architectures for service portability. Emorphia brings to the project expertise in the application of agent technology and in wireless communication systems and services. Emorphia will bring and support their Open Source FIPA-compliant agent platform, FIPA-OS. Concerning agent technology, Emorphia is actively involved in the FIPA standardisation effort.

Emorphia is the technical co-ordinator of CRUMPET. The expertise amongst Emorphia’s engineers is complemented by its many academic relationships.

The deployment of agent technologies is a key feature of the company’s business plan. From a commercial exploitation perspective, Emorphia intend, within the time frame of the project, to produce a business plan for a new business area relating directly to the CRUMPET work. Emorphia will then look for partners and venture investment to turn this into commercial reality.
3. The Technology Implementation Plan

As part of the exploitation process, the project will produce a Deliverable that is called the Technology Implementation Plan (TIP). This will be generally confidential to the Consortium and to the Commission, as it will contain information that is commercially sensitive: the outputs from the project will be used to shape the future business plans of the partners. However, non-confidential extracts may be published publicly on the project web site. This will be a living document. The first version is due at the end of September.

Some information may be so commercially sensitive that it may be made available directly to the Commission by the partner concerned: for example, if any of the operators see themselves competing in the same market they would not want to reveal exploitation plans to their competitors.

Generally the TIP document will contain (but not exhaustively):

- current exploitation plans
- mapping of CRUMPET results to exploitation plans
- feedback from the commercial departments of the companies on the results.

4. Clustering

4.1 Concertation

As well as producing almost all its Deliverables as publicly available material, the project contributes to the consensus mechanism established for the projects in the tourism domain (including the Accompanying Measure project: “Federated European Tourism Information System Harmonisation – Engineering Task Force” – FETISH). Cluster meetings, combined with FETISH meetings, were attended by several CRUMPET partners in Rome (23rd - 24th October, 2000) and in Brussels (20th - 21st February, 2001), and presentations were made.

Participation in the tourism cluster is a practical method of:

- disseminating information from the project, learning from the other projects, and hearing about upcoming events for the promotion and demonstration of the project results.
- harmonising the development of CRUMPET information and services interfaces to current EC harmonisation initiatives.
- interconnecting external data sources and services to the CRUMPET services or information.

These activities are related to the implementation and the demonstration of the conceptual and technical interoperability. The exploitation of commercial developments, the business agreement with the aim of securing competitive advantage for all the partners and for allowing a commercial exploitation of the interoperable services, are outside the scope of the above contractual agreements and commitments.

The project is currently seriously considering how additional collaboration can best take place with FETISH. In particular, there is a high common interest with FETISH in the subject of Ontology, but this extra work is subject to a supplementary contractual agreement, and is subject to supplementary funding for the FETISH project.