The Networked Future:

Enterprise Networking

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Information Society
and Media

European Commission

In the emerging globalised economy, Europe's businesses – and especially small and medium-sized enterprises (SMEs) - have to move more quickly and flexibly than ever before.
Trends towards globalisation, outsourcing and customisation require firms to be more agile, innovative and responsive.

To succeed in this competitive environment firms are recognising the benefits of collaboration, not only with their immediate customers and suppliers but also with others in the value chain. ICT systems play a crucial role in organisations' ability to adapt to and quickly exchange information, both internally and with external collaborators. The interoperability of enterprise applications is an especially important issue for the new collaborative business networks.

In manufacturing, the pursuit of competitive advantage is leading firms to design in added-value services as part of the customer offering. This "extended product" approach combines a product with services and enhancements that improve marketability. Developments in location and tracking technologies – such as radio frequency identification (RFID) – as well as sensor networks are leading to a rapid proliferation of smart products, processes and working environments.

Digital business ecosystems is another interesting development, offering the possibility to create an environment within which businesses, and more particularly micro enterprises, will operate using application software or application services with the ability to self-organise, self-optimise and evolve.

This brochure describes IST research on **ICT for Enterprise Networking**, showing the integrated nature of European research in this domain. It presents profiles of specific research areas holding a promising future, together with selected project descriptions to exemplify and illustrate key on-going research and technology development.

Extended products and services and collaborative business networks are key elements of research in this domain. Interoperability of enterprise applications is a major interest, aiming to enable true interoperability for (cross-)enterprise applications and software. The work also emphasizes business ecosystems as collaborative and evolutionary environments for future businesses.

The brochure is one of six in **The Networked Future** series, describing European funded research for Network and Communication Technologies.

Joined up networking

With competitive pressures increasing and IT budgets shrinking, the interoperability of enterprise applications has become a major issue for businesses. Research has a crucial role to play in facilitating convergence and the development of standards.

Enterprises today have to work more efficiently than ever before. They must produce goods and services more quickly and at lower cost, while achieving ever-higher levels of quality, innovation and customisation. ICT systems play a crucial role in organisations' ability to adapt to and quickly exchange information, both internally and with external collaborators.

The information required for collaboration is typically managed by enterprise applications: enterprise resource planning (ERP), supply chain management (SCM), and customer relationship management (CRM). Problems in enabling such systems to work together within an organisation or across organisational boundaries – known as enterprise interoperability – present a major barrier to the efficiency of European enterprises. In Europe, an estimated 30%-40% of total IT budgets is spent on issues tied to interoperability.

The interoperability of enterprise applications is an especially important issue for the new collaborative business networks, known as virtual organisations (VOs). Although following common goals, enterprises within VO networks maintain their own conditions and requirements. For instance, a company may wish to continue to use its own proprietary IT applications, or protect or restrict access to its proprietary information. Hence, there is a tension between the obvious needs for co-operation among organisations (which would call for adoption of common standards), and the suitability of certain proprietary or legacy solutions that can more readily meet local conditions. We need to find ways of accommodating these "incompatible systems" within global e-business standards.

What is interoperability?

Interoperability is the ability of enterprise software and applications to interact. It can be seen as the ability for a system or a product to work with other systems or products without special effort on the part of the customer or user. Interoperability is considered to be achieved if the interaction can, at least, take place at three levels: data, application and business enterprise.

Achieving this requires a holistic approach that considers not only the technical issues but also the business and knowledge issues underlying the use of ICT systems.

A roadmap for future research in this field was developed by the FP5 project IDEAS. Some research topics from the IDEAS project can be classified according to the aspects of interoperability as defined by the European Interoperability Framework (EIF):

1. *Organisational Interoperability*: This aspect of inter-operability is concerned with defining business goals, modelling business processes and bringing about the collaboration of organisations that wish to exchange information and may have different internal structures and processes. The central research challenges here include: process model and enterprise model inter-operability; modelling cross-organisational business processes; business process ontology; and roles and policies.

2. *Semantic Interoperability*: This aspect of interoperability is concerned with ensuring that the precise meaning of exchanged information is understandable by any other application that was not initially developed for this purpose. Semantic interoperability enables systems to combine received information with other information resources and to process it in a mean-ingful manner. Research issues include: semantic annotation; semantic mapping & mediation; and ontology authoring and management systems.

3. *Technical Interoperability*: This aspect of interoperability covers the technical issues of linking computer systems and services. It includes key aspects such as open interfaces, interconnection services, data integration and middleware, data presentation and exchange, accessibility and security services. Research challenges for this layer are: cross-organisational business process execution; autonomous architec-tures; web service discovery; and model driven service-oriented architectures.

Excellence in Interoperability Research

From a technological as well as business process point of view, there are numerous gaps between the existing paradigms and the comprehensive systems required to enable true interoperability for enterprise applications and software. The INTEROP Network of Excellence is studying these concepts.

The originality of the project lies in its multidisciplinary approach, merging three research areas critical to the development of enterprise interoperability:

• Architecture & Platforms: to provide implementation frameworks;

• Enterprise Modelling: to define interoperability requirements and support solution implementation;

• Ontologies: to identify interoperability semantics in the enterprise.

INTEROP brings together Europe's leading academics, research centres, industrial stakeholders and standards communities, and works closely with other European projects such as ATHENA.

INTEROP: www.interop-noe.org

Research for Enterprise Interoperability

The global market for enterprise interoperability is substantial: estimated at around €60 billion by 2006. However, the convergence of different classes of technologies - process management, integration, portals, workflow - is generating much confusion among end-users. The individual technologies are very different, yet because they can all be used to solve essentially the same problem they are often deployed in combination. Research has a major role to play in helping them to converge.

Relevant standardisation activities focusing on interope-rability are still at an early stage and much work remains to be done. Yet without agreements there will be no interoperability. This is particularly the case for enterprise interoperability, where few standards are currently deployed.

To date, standards activities have come from two schools: internet-based technology standards have been developed by non-institutional organisations such as the OMG[1], OAG, OASIS and W3C, and have become de facto standards. Formal standards bodies, such ISO and CEN, have focused more on modelling aspects, dealing with the specifications of resources and processes as well as their related semantic and syntactic problems. European research projects are helping to establish a link between these two communities and map these standards to a consistent framework.
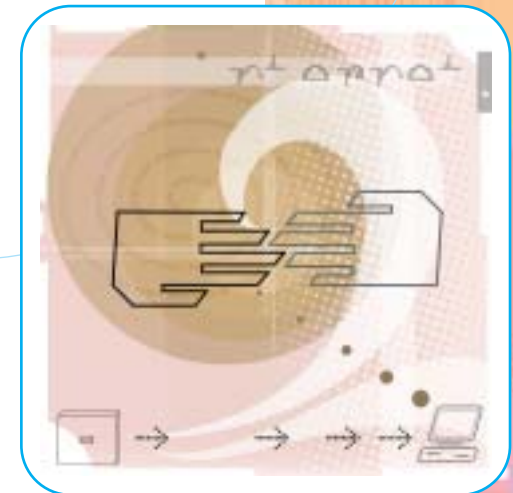
[1] OMG = Object Management Group, OAG = Open Applications Group, OASIS = Organisation for the Advancement of Structured Information Standards, W3C = World Wide Web Consortium

Further Information
www.cordis.lu/ist/directorate_d/
ebusiness/index.htm

Towards the real-world web

Developments in nano-technology, wireless communication and sensing are opening the way to a world of connected objects and places. The challenge for business is to exploit these technologies in exciting new applications.

Today's manufacturing environment is increasingly competitive, with customers demanding ever more advanced and sophisticated products, greater choice and shorter delivery times. To satisfy this demand for differentiated and customised products companies with different expertise must collaborate. But they need to do so in ways that ensure the value chain remains flexible, so as to realise the full benefits of rapid product innovation and open competition.

In addition, manufacturers are looking to make their products smarter by designing in added-value services as part of the customer offering. This "extended product" approach combines a product with services and enhancements that improve marketability. The customer proposition may subsist more in the benefits of the value-added elements than the physical product itself. Enhancements can incorporate tangible features that make the product more intelligent, customised or user-friendly, including embedded features like maintenance. Other aspects, such as services, engineering or software, are intangible and make the offering more information- or knowledge-intensive.

These capabilities can be delivered by realising, within the business environment, the vision of "smart" connected objects and places, also known as "ambient intelligence". The effect will be to enable a **real-world Web** that helps people (or computer systems) make smarter decisions as they encounter those objects and places in the real world. Enterprises will develop early applications of tagging objects and locations where improved visibility of the item will add value and, in particular, where networking creates opportunities for new service offerings.

Technologies for the Real-World Web

As the size and cost of microprocessors has shrunk, digital processing capabilities have been embedded in an ever-growing range of real-world objects, from cars to cameras and toys. Increasingly, these real-world objects will contain not only local processing capabilities but will also be able to interact with their surroundings through sensing and networking capabilities.

Wireless communication technologies will be essential, with radio frequency identification (RFID) at the top of the list to connect objects and locations to each other and to data collection environments. Other significant technologies include micro-electromechanical systems (MEMS) which place tiny moving parts onto a chip to sense and react to the environment. Examples are activating a car's airbag after rapid deceleration, or detecting the movement of a pen for handwriting recognition.

RFID has already been a catalyst for replacing bar codes for tagging and identifying objects. RFID's primary advantages are that it does not require a direct line of site with the reader, and the tags can be read even when the object is moving. In addition, the electronic product codes (EPCs) used in RFID provide a unique identifier for each item, rather than a class of items. In addition to the focus on supply chain optimization, RFID is suitable for applications where tracking has not been feasible up to now, such as consumer behaviour or healthcare.

This additional sensing and connectivity will lead to a rapid proliferation of applications that take advantage of this 'real-world Web', similar to the numerous ideas that have surrounded the World Wide Web. Business applications will centre on increasing visibility of physical assets, including equipment, products and even people. RFID will increasingly drive shifts in supply chain and retail capabilities, and location discovery will create new opportunities for locating nearby service providers. Sensor mesh networks will enable physical plant and equipment to be monitored in a more fine-grained way than was possible before.

Research for the Product Lifecycle

Research will provide enterprises with the tools to connect to this massive network of communicating objects and to extract value from the terabyte streams of data it generates.

Three technology areas that will be essential to enabling the real-world Web are location discovery, object identification and sensor mesh networks. Advances in MEMS already enable us to sense and measure acceleration, acidity, temperature, pressure, stress and many other factors.

These devices will become smaller, cheaper and less power demanding. Progress in multi-method location finding will allow devices to report their whereabouts. The evolution in standards for identity tagging will allow every object to be given a globally unique reference. Mesh networks of low-power, self-organising sensors will convey data to local area networks, and onwards to the global internet.

Managing this new Web and generating economic value from it will present a serious challenge for many enterprises. To provide the massive computing capabilities required, new architectures need to be developed to manage both the application software elements and the processing infrastructure. Considerable progress will have to be made in structuring and searching techniques for raw data, and in standards for metadata, so that software can automate the heavy lifting of analysis. In addition, further advances in visualisation will be necessary to improve the way information is viewed.

Applications that can manage processes and interactions between myriad objects will be complex. They will also have to be highly adaptable to change as the connected people and objects move through supply chains and markets. Service-oriented architecture (SOA) for application software will become essential because of these trends, and will require more granular functions and shorter cycle times in business processes. Research is needed for services virtualization to evolve.

To cope with the huge amounts of data, new computing environments should consist of large numbers of inexpensive, standard processing modules. Redundancy will be central to design, allowing faulty hardware components, or even whole servers, to be automatically taken out of service and then thrown away. New layers of software will combine and virtualise these components so that they are decoupled not only from applications but also from the operating system.

These and related aspects are being addressed under IST's research on extended products and services. The work focuses on technologies, methodologies and engineering concepts for holistic, collaborative, distributed and multidisciplinary product development, associated services and distributed global manufacturing processes.

With collaboration more important for SMEs than ever before, research is aiming to create the conditions to make collaborative business networks more sustainable.

The increasing pace of modern markets is forcing companies to be more flexible, innovative and responsive. In particular, enterprises are adapting their traditional business models in favour of collaborative ones that allow them to enter into and exit from markets much faster and at much lower cost. These collaborative business practices, facilitated by technology, are giving rise to new organisational forms – also known as virtual organisations (VOs).

Open and flexible business networks depend on affordable and dependable technical infrastructure, as well as organisational and business innovation. By doing business within a network of inter-dependent enterprises, companies – especially SMEs - will benefit from a collaborative environment, a sharing of resources, and the creation and exchange of knowledge. Examples of such collaborations include:

• *Collaborative design for optimal production*: Original design typically accounts for around 75% of the costs of a product. Collaborative design, the process of designing new products together with suppliers and/or customers, can realise major benefits including cost savings and more efficient production techniques.

• *Collaborative order fulfilment planning*: Thinking in a collaborative manner companies are better able to link sales to purchasing. A sales order triggers a purchase process, encouraging them to optimise the whole supply chain rather than their own company situation.

• *Collaborative customer support*: Collaboration enables all those in the supply chain to share support to the final customer. This makes them more responsible for customer satisfaction and helps them learn from customer experiences.

• *Collaborative design for innovative products*: In today's markets, product development is a continuous process. Collaboration enables firms to develop their products faster, share knowledge and experiences, and access state-of-the-art technologies.

Collaborative networks in general, and virtual organisations in particular, provide a basis for competitiveness, world-excellence, and agility in turbulent market conditions. Reinforcing the effectiveness of collaborative networks and creating the necessary conditions for making them a reality within the European industrial landscape, mostly based on SMEs, is a key challenge.

Building Collaborative Networked Organisations

The development of future collaborative networks requires a multi-disciplinary approach. Business models, ICT infrastructure, support services, formal theories and models, and socio-economic aspects are all areas needing to be addressed. Several FP5 projects set a vision for these future collaborative networks and identified and characterised the key research challenges.

• Well-defined **business models** should be developed to allow the systematic VO management, namely to act in regards to planning, control, organisation and leadership, taking into account the importance of social mechanisms in multi-interest collaboration networks, as well as the transitional nature of VOs.

• **The ICT infrastructure** should be developed as a transparent, low-cost, and easy to use enabler of collaborative behaviours in networked organisations.

• **IT support services** should be developed to assist VO brokers, management and employees with their tasks for setting-up, operating and dissolving virtual organisations. Easy-to-use tools should be embedded in flexible architectures suited for different types of VOs; driven by a variety of business, social and legal needs.

• Decision-making in all phases of the VO lifecycle should be based on **well argued and verified models and methodologies**. These should provide the basis for the ICT-based support for business and organisational development and operation, as well as for education, training, and active operation of VOs.

• **The socio-economic environment** should be fully developed to support VOs, stressing the importance of human-related issues at the individual and organisational levels, in enabling institutions and in a transparent regulatory environment.

Research for Collaborative Networked Organisations

These challenges are being addressed under IST's research for dynamic collaborative business networks within FP6. The work focuses on new organisational forms, structures and models for business networks and knowledge-based interactions, complex adaptive and self-organising systems, and organisational change management.

The FP5 research roadmap is being taken forward by projects in the Collaborative Business Networks cluster, including ECOLEAD (see box).

Adding Value to Collaborative Networks

ECOLEAD, an integrated project under IST-FP6, is developing technologies for networks of collaborative enterprises.

It foresees that in ten years time most enterprises will be part of one or more sustainable collaborative networks. These will act as breeding environments for the formation of dynamic virtual organisations in response to fast-changing market conditions. ECOLEAD aims to enhance the added value to businesses of operating within these dynamic collaborative networks.

The work focuses on three inter-related areas: breeding environments, dynamic virtual organisations, and professional virtual communities. Its results will be a set of methodologies, services and tools to support these dynamic networked organisations. These will, for example, support processes such as VO set-up, contract negotiation, performance measurement, collaborative problem solving, and day-to-day management.

As well as SMEs in such networks, beneficiaries will include European ICT suppliers and consultancies involved in supplying applications and services. The project is working closely with regional and international initiatives who act as multipliers.

ECOLEAD: www.ecolead.org

Further Information
www.cordis.lu/ist/directorate_d/
ebusiness/index.htm

Mirroring the situation in nature, researchers are beginning to think of local economies as ecosystems. Digital technologies can provide the DNA for such environments, enabling firms to adapt and evolve according to local conditions.

While many may think that the internet revolution is already over, in all probability we are still only at its opening stages. At present we are only really using the internet to replace pre-existing functions such as brochures, postal mail and trips to the bank. Often radically new technology only really blossoms once human thinking can get to grips with the new possibilities it opens up.

Small and medium-sized enterprises (SMEs), in particular, urgently need this new thinking. In the emerging globalised economy, European SMEs have to move more quickly and flexibly than ever before. Information and communication technologies (ICTs) can help SMEs become more innovative. Yet, with the exception of a few start-ups, most have not embraced e-business as actively as they should. The barriers are well known: lack of resources, lack of skilled employees, lack of easy-to-use technology adapted to SMEs, and also lack of awareness of the potential benefits for them.

Being more follower than leader of the change process, small organisations need particularly favourable conditions to accelerate the take-up of ICTs, and thus avoid an ever-widening digital divide between large and smaller enterprises and between regions. We need to identify technology strategies, supported by policies, which allow ICT to be incorporated successfully into local economic development.

At the same time, our understanding of the local context of businesses is changing. In the traditional view – sometimes known as the industrial district – business structure was dominated by small, locally-owned firms. Economies of scale were relatively low and key investment decisions were made locally. Trade was substantially among buyers and suppliers within the local geographical area with only weak linkages to firms outside. Over the last ten years, an alternative model of spatial development has emerged known as the Growth Node. This is an evolution of the cluster concept and emphasizes the external networking dimension, knowledge transfer and social learning. Firms and other organisations are seen as being grouped into high-performing geographical clusters, networked to other clusters and potentially supported by ICT.

From networked organisations to digital ecosystems

Business ecosystems represent a further evolution in our thinking on the networked economy. Just as we can only get a proper understanding of nature by considering each of the species as part of an ecosystem, so we can only get a proper view of local economies by considering them as communities of interacting and evolving organisations. By coming together within networks, firms are able to work faster and smarter: they can exploit market opportunities, combine their products and services, and jointly produce and offer new services and products. Eventually the boundaries among organisations start to fade, forming networked organisations.

Driven to its logical conclusion, this dynamic networking allows firms to build communities that share business, knowledge, and infrastructures. Today's slowly changing networks of organisations will be replaced by more fluid, amorphous and often transitory structures based on alliances, partnerships and collaborations. Players within these networks are not just SMEs but also large enterprises, local and public administrations, and research and innovation actors. Each one is a species within the business ecosystem.

This scenario envisages the dynamic aggregation of services and organisations, requiring further major leaps both in the capabilities of ICT and how it is used.

What is a digital ecosystem?

"It is not the strongest of species that survive, nor the most intelligent, but the ones most adaptable to change."

The Origin of Species, Charles Darwin

The digital ecosystem provides this leap. It is a pervasive digital environment, populated by digital components, which evolves and adapts to local conditions with the evolution of the components. The digital ecosystem is not a piece of software or business model: rather it is a supporting software infrastructure that offers and transports services (applications) and information (knowledge), and so empowers the whole business network.

A component within the digital ecosystem could be: software components, applications, services knowledge, business processes and models, training modules, contractual frameworks, laws – anything required to support firms' day-to-day business. In short, a digital component can be any useful idea (application or business model) expressed in a language (formal or natural), launched on the net and which can be processed (by computers or humans).

Digital ecosystems are based on an evolutionary systemic process; they are roughly composed of three different layers:

• *The generic ecosystem infrastructure*: a common support environment and a generic basic infrastructure which includes basic services components, generic integrated solutions and infrastructure components.

• *The sector-specific ecosystems*: services, solutions and components tailored for a specific sector (e.g. agro-food, tourism, manufacturing) or transversal applications (e.g. logistics). These use the services of the common environment.

• *Local ecosystems*: local implementations of the sector-specific ecosystem in nodes and networks of innovation. These networked instances could be linked together to form European-wide business excellence networks.

Implications of digital ecosystems

Ecosystems can be seen as a new form of 'digital commons'. Unlike many other goods, knowledge does not deteriorate with circulation and use. In fact, its use and consumption contribute to improve its quality,

quantity and dissemination. This is exactly what happens with a commons: a common good is a good augmented by its use. Like the internet itself, no one owns or controls the digital ecosystem. It is there for the world to use.

Another important principle is that digital ecosystems are based on open standards. The growth of the open source movement has shown that for software developers and their customers, the gifting and sharing of intellectual property has advantages over secrecy, protectionism and monopoly. Open systems does not equal 'free', though that may often be the case. But it does mean co-operation and transparency that leads to collaborative behaviour, to mutual benefit.

Research for digital business ecosystems

These challenges are being taken up under the IST priority's work on eBusiness. The purpose is to promote the creation of an ecosystem within which businesses, and more particularly micro enterprises, will operate using application software or application services with the ability to self-organise, self-optimise and evolve.

Further Information:
www.cordis.lu/ist/directorate_d/ebusiness/index.htm

To allow for this self-organisation and self-optimisation, it seems reasonable – but of course not obligatory – to root the concept of digital business ecosystem in the open systems philosophy. Following this approach, communities of software developers, in association with SMEs and other players, will be able to reach complex goals through collective behaviour or strategies. Leading these developments is the Digital Business Ecosystem (DBE), integrated project (see page ??).

Further Information
www.cordis.lu/ist/directorate_d/
ebusiness/index.htm

ATHENA, a major European research initiative in interoperability, will provide solutions to enable European enterprises to work together as collaborative networked organisations.

Background

One of the trends in the global market is the increasing collaboration among enterprises. Firms are transforming themselves into "networked organisations" so as to increase their flexibility and reduce operational costs. They are seeking to interact with a wide community of buyers, sellers and partners, and to adopt more dynamic trading and collaborative working practices. To realise these networked organisations, enterprise systems and applications need to be able to work together – be "interoperable" in the computer jargon.

Interoperability is the ability of two or more systems or components to exchange information and to use the information that has been exchanged. Enterprises currently face many difficulties in this respect and many major scientific, technical and business challenges remain to be overcome. Insufficient interoperability is a major impediment to the adoption of new business models that could enhance productivity and competitiveness, a key objective of the Lisbon strategy to modernise the European economy and to build a knowledge-based society in Europe.

ATHENA is a comprehensive and systematic European research initiative that aims to tackle these interoperability issues for the benefit of European industry and ICT suppliers.

Focus

Building upon an ambitious Vision Statement - "By 2010, enterprises will be able to seamlessly interoperate with others" - ATHENA aims to make a major contribution to interoperability by identifying and meeting a set of inter-related business, scientific & technical, and strategic objectives.

ATHENA's research is guided by business requirements defined by a broad range of industrial sectors and integrated into piloting and training. The project is a source of technical inventions for interoperability. It is also generating prototypes, technical specifications, guidelines and best practices that form a common European repository of knowledge.

By mobilising a critical mass of interoperability stakeholders across Europe, ATHENA is laying the foundations for a permanent, world-class European hub for interoperability and advancing European leadership in a global context.

Project Activities

The ATHENA work programme spans the full spectrum of interoperability from technology components to applications and services, from research & development to demonstration & testing, and from training to evaluation of technologies for societal impact. Research and development is executed in parallel with community building so as to ensure that solutions are industrially relevant, which in turn will lead to broad uptake by end-users.

ATHENA builds on the IDEAS project, an FP5 network which delivered roadmaps for interoperability of enterprise applications. IDEAS defined an approach for capturing and inter-relating information from many perspectives called the "IDEAS interoperability framework". This comprises three layers – business, knowledge and ICT systems – with semantics as a common requirement that cuts across all three. ATHENA uses this interoperability framework to define work areas and to cluster research challenges.

At a technical level, the research focuses on defining and developing new concepts and solutions for an infrastructure to enable seamless interoperability.

This includes:

- *Technologically neutral reference model* that provides a stable, generic foundation for specific technical innovations;

- *Interoperability requirements* for applications, data and communications, and solutions that meet these requirements;

- *Methods* which enterprises can use to manage organisational roles, skills, competencies, and knowledge assets for their own operation and for collaboration with other enterprises;

- *Semantic mediation solutions* which enable and support the above; and

- *Components of interoperability infrastructures.*

In addition, demonstrators are being set-up in four sectors with very different characteristics and business requirements: aerospace, automotive, telecommunications and furniture.

Impact and Exploitation

Despite impressive endeavours in Europe over the last few years, little has been achieved so far in the field of interoperability for collaborative enterprises. During this period we have seen many independent initiatives in relation to enterprise resource planning (ERP), customer relationship management (CRM), supply chain management (SCM), and other aspects of e-business.

Today, even the most cautious customers realise that the only way to get maximum total value from such investments is to unify the individual pieces into a seamless infrastructure. They also know that the keys to this remote realm lie in interconnecting the applications themselves, so that the business processes they support can flow freely among them. The main opportunity of the ATHENA Integrated Project lies in providing the means to allow this to happen.

By introducing new mobile applications and services, MyCarEvent aims to modernise the European market for automotive service and repair, and help the sector comply with EU regulations.

Background

The aftersales sector has become a very important market for the European automotive industry. On average, Europe's 210 million motorists spend €400 per year on repair and maintenance, or around €5000 over the life of the vehicle. The total aftersales market is valued at about €84 bn p.a., of which the service, maintenance and repair sectors account for around €40bn.

Services are delivered predominantly by franchised dealers and independent repair shops with exclusive links to specific car manufacturers. This provides them with access to proprietary and protected information and expensive dedicated diagnostic systems. However, there is concern that this situation stifles competition and causes serious inconvenience for the driver.

In the wake of new developments in the EU's "Block Exemption Regulations", these service providers have rights to access different kinds of repair information, training materials and tools, which up to now have been held exclusively by the manufacturers. But many technical, economic and operational barriers must be addressed before these regulations can be implemented effectively.

Focus

MyCarEvent is a European initiative, under IST-FP6, to make the automotive aftersales sector more creative, competitive and profitable. The project aims to introduce innovative mobile applications to enable new ways of working and collaboration among car manufacturers, workshops, roadside assistance services and the customer.

Its strategic objectives are to:

• establish innovative remote location and circumstance-based mobile services in Europe to improve roadside assistance;

• develop self-adaptive applications and services for mobile users and workers;

• develop generic information model and intelligent service portal architecture to bridge current proprietary datasets and support new services;

• strengthen competition and competitiveness of the European car aftersales market.

The core strategy is to enrich the different repair service providers with access to specialist knowledge and tools in a truly mobile working environment. At the same time, consumers will have access to world-class services with unmatched transparency and efficiency.

Project Activities

Car maintenance, diagnostics and roadside assistance are a challenging application area for mobile technologies. The aim in MyCarEvent is to develop solutions which adapt themselves to people and business needs and not vice versa. One of the critical issues here is to ensure easy and natural access to the various applications and services anywhere and anytime. This places highly stringent conditions for an "always connected", low-cost network to facilitate communication between the mobile users within a collaborative work environment.

The work focuses on the integration of wireless personal area networks, local area networks, sensor networks, and next generation cellular networks, as well as innovations in computer science. These are being integrated to deliver advanced services and applications to support drivers in breakdown situations, emergencies, and daily use. In addition, roadside assistance will be supported to increase the efficiency of their operating processes as well as consumer satisfaction.

MyCarEvent's new applications and services will provide manufacturer-specific car repair information according to the problems identified by the off-/on-board-diagnosis systems. This information will be multi-lingual and will enable the mobile user/worker to interact with the service portals of the car manufacturers and with independent services while performing the repair of the car.

The resulting systems will support the aftersales worker in coping with the increasing complexity of cars and their repair procedures, and will also provide for self-diagnosis services for car drivers in situations where a little advice or a software fix is all that is needed.

Impact and Exploitation

Users of the MyCarEvent solutions will include: automotive technicians in franchised as well as independent workshops; roadside assistance services; automotive OEMs; and last but not least the motorists themselves. Empowering the service providers with enriched applications for knowledge management and smart devices will make them more creative and competent. Consumers will also benefit through access to world-class services with unmatched transparency and efficiency.

From a wider perspective, the results have the potential to create new jobs in the mobile services society – not only for highly skilled workers – and will contribute to increasing safety. In addition, by fulfilling the aims of the EU's Block Exemption Regulations it will help increase competition.

Other industries which call for remote servicing and rely on pan-European technical standards, such as manufactured consumer goods, will also benefit from the technologies and standards developed in the project. Hence, it will be a benchmark for other sectors with a similar competitive aftermarket.
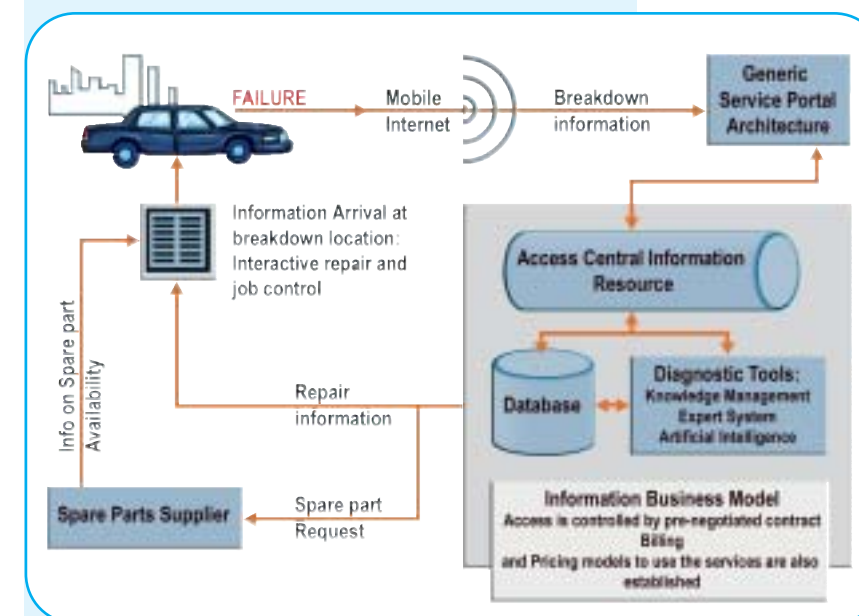
Further Information

Project Name:
Mobility and Collaborative Work in European Vehicle Emergency Networks (MyCarEvent)

Project Reference & Type:
IST-004402 (Integrated Project)

Website:
www.mycarevent.com

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www.cordis.lu/ist/directorate_d/ebusiness/index.htm

By improving the trust and security of business processes within virtual organisations, TrustCoM aims to enable enterprises to collaborate more effectively.

Background

Collaboration is a key feature of business today. Design, production, marketing and support of a product are no longer the responsibility of only one company. On the contrary: up to 5 million people may be involved in the lifecycle of a complex engineering product such as an aircraft. They work in many organisations, from single-person specialist consultancies to major corporations, as well as agencies such as regulatory authorities and government bodies. All of these stakeholders need access to information that is distributed across diverse applications and organisations.

Hence, there is an increasing demand to improve the efficiency, flexibility and dynamism of these virtual organisations (VOs). Enterprises are looking to integrate their systems across organisational boundaries in an ad hoc manner to support collaborations that may last for a single transaction or evolve dynamically over many years. This sets new requirements for scalability, responsiveness and adaptability of VOs, allowing the participating entities to pool resources, information and knowledge so as to achieve common objectives.

Security is a key concern here. Dynamic organisations, processes and software systems increase the potential for fraud and disruption due to malicious or misguided activity. Partners in VOs and consumers of the VOs' services will be reluctant to engage in business transactions unless they can be confident that commitments will be honoured. Thus, the efficiencies and other benefits of dynamic VOs will not be realised without a framework to build and maintain trust.

Focus

IST's TrustCoM Integrated Project is developing a framework for trust, security and contract management in dynamic virtual organisations. It focuses in particular on two types of collaborations:

• Large-scale collaborations spanning a broad range of industry, academic and government organisations, for instance for complex product development or "big science" projects.

• Collaborations to aggregate the service offerings of individual organisations on-demand in response to a customer's or user's requirements. Typical of such VOs are ad hoc consortia of service providers delivering an aggregated 'web service' to mobile/roaming users.

The TrustCoM framework will leverage and extend the emerging convergence of open-standards for web services, grid technologies and protocols for inter-enterprise interactions. It will be complemented by new business and socio-economic models that facilitate the setting up of dynamic VOs and an analysis of the legal context within which dynamic VOs can operate and evolve. Its models will be based on an empirical analysis of the markets, game-theory and organisational behaviour.

The TrustCoM consortium brings together end-users, technology and service providers, and experts in computing, economics and law, from industry, government and academia, who are actively involved in the development of technology and frameworks related to virtual organisations.
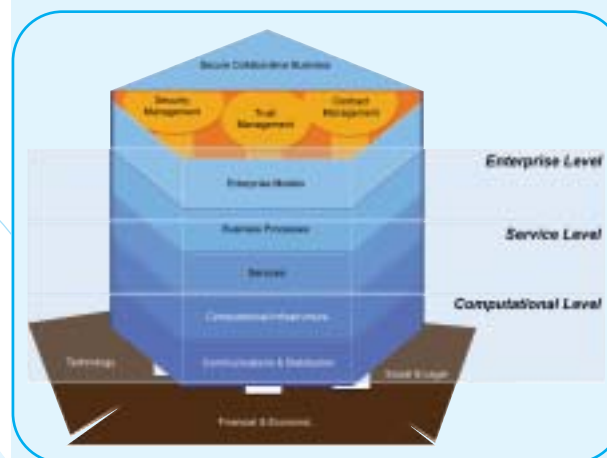
Project Activities

The TrustCoM framework will integrate tools and methods for trust management, security management, and contract management into an autonomic VO management solution that is able to define and enact secure collaborative business processes. It will provide means of achieving:

• *establishment of trust relationships* by means of digital identities, certification, reputation, and inspection to ensure the security, dependability and competency of the business partners,

• *autonomic security* including confidentiality/privacy, integrity, availability and accountability,

• *the formation, verification, negotiation and amendment* of electronic contracts, including partner agreements, collaboration/consortium agreements and service level agreements,

• *performance assessment* in the execution of electronic contracts, and enforcement of trust and security management policies.

The TrustCoM framework will be realised by means of open-standards web services based specifications and an open source reference implementation. Commercial viability of the TrustCoM solutions will be validated within industrial strength test-beds in the areas of collaborative design engineering (CE) and provision of ad-hoc aggregated electronic services.

Integration and validation will be informed by novel business models and experimental economics and legal research defining the socio-economic and legal context of dynamic VOs.

Impact and Exploitation

VOs will be based on new forms of collaboration in which participants (enterprises or individuals) can specify and negotiate their own conditions of involvement by means of electronic contracts whose operation is supported and enforced by the computing infrastructure. Such collaborations can be established only in a secure environment where the controls and procedures are automated based on clear specifications of trust, risk and policy.

TrustCoM will lower barriers to effective dynamic inter-enterprise cooperation within Europe and help make it the hub for global electronic business activity. European SMEs in particular will benefit, as VOs represent an important means for them to combine complementary specialist expertise for a specific purpose, e.g. to compete for a contract. The TrustCoM framework will thus help off-set the trust advantages possessed by large enterprises with established brands and reputations.

Research under the SATINE project to develop and deploy advanced web services will significantly enhance the competitiveness of the European travel industry.

Background

Web services are attracting a lot of attention in the IT industry as a means of empowering users to easily compose their own services using standard components. At the same time, we are seeing the strong growth in peer-to-peer (P2P) networks, where openness and low barriers to entry offer significant advantages over traditional computing approaches.

From the point of view of web services, there seems to be great opportunities in interoperating with P2P networks. Under such a scenario, service providers, especially SMEs, would be able to make their services available through a P2P network so as to exploit the advantages of both technologies. Any service, whether on a service registry or advertised through a peer, would be accessible to all users, wherever they are and whatever network or access device they are using. For this vision to be realised, a key technical problem has to be overcome: *semantic interoperability*. IST's SATINE project is addressing this issue, with particular reference to the travel sector.

Currently, travel information services are provided predominantly by a Global Distribution System (GDS), a sort of hub that gives its subscribers pricing and availability information for multiple travel products. Travel agents, corporate travel departments, and even internet travel services, subscribe to one or more commercial GDSs to check, for example, flight availability and prices for their customers. However, the GDSs rely mostly on their own private networks which, being legacy systems, are difficult to interoperate with other systems and data sources either inside the company or from outside.

To address these problems, the travel industry has formed a consortium called the Open Travel Alliance (OTA) which includes key players from airlines, hotels, car rental, rail, tour companies and the Global Distribution Systems. OTA is producing web services for the message specifications to be exchanged between the trading partners.

Focus

The SATINE project aims to further exploit these developments by introducing semantics to the web services used within the travel domain. It will produce special software - middleware – to deploy semantically-enriched web services across the travel industry.

With the SATINE tools, SMEs will be able to easily create web services from their existing enterprise applications. The tools will allow tourism enterprises to extend their reach by making their own semantically-enriched web services available to others, either through service registries or through peer-to-peer networks.

This advanced web service technology is expected to bring many advantages to the travel industry. It will allow all sorts of web services to work together better – interoperate. It will also allow the services to be automated, so that software agents will be able to "discover" travel web services without human intervention.

Project Activities

SATINE's activities focus on various technical approaches to exploit semantics for web services in the travel domain. It builds on universally accepted standards like SOAP (Simple Object Access Protocol) for invoking services and WSDL (Web Services Description Language) for describing the technical specifications of the services.

SATINE is developing a component to "wrap" existing information resources to make them appear as semantically well described web services. It will also provide an easy-to-use tool allowing SMEs to create web services from their existing enterprise applications. The wrapped resources will be able to exchange information with other web services in a peer-to-peer mode.

Currently, the main service discovery mechanism is the well established service registries like Universal Description, Discovery, Integration (UDDI) and electronic business XML (ebXML). SATINE will enrich these existing registries with mechanisms to store and access web service semantics so as to allow complex web services to be discovered and composed automatically. Furthermore, the web service registries will themselves be connected through peer-to-peer networks to facilitate the discovery of web service registries, by semantic routing of the queries.

Although there are efforts to standardise the messages exchanged in the travel domain, such as Open Travel Alliance, not every travel company can be OTA compliant. In SATINE the interoperability of all sorts of web services is being addressed at the semantic level through ontology mapping.

In some cases web services might not be registered to any service registry but simply be made available through a website. Providing a mechanism to facilitate the automated discovery of such services is also needed. SATINE is investigating such a solution based on peer-to-peer technology.

Impact and Exploitation

SATINE will open the door to new business opportunities by making it easier for travel sector businesses to connect with partners. Tourism enterprises – including SMEs – will be able to easily create web services from their existing enterprise applications, and to make these semantically-enriched web services available to others through service registries and peer-to-peer networks.

A new paradigm for business-to-business networks, based on evolving software and applications, will help European SMEs compete in world markets.

Background

Small and medium-sized enterprises (SMEs) are the backbone of the European economy, but are currently lagging behind in the adoption of e-business as a strategic channel for production and distribution. For SMEs to compete in the globalised knowledge economy they need to become more flexible and more agile and find new ways to support partnering and collaboration. Bringing these benefits to Europe's 19 million SMEs will be crucial in realising the EU's ambitions to build a competitive and dynamic knowledge-based economy.

The Digital Business Ecosystem (DBE) is the first step towards a new approach to business networking that overcomes the limits of current paradigms. In essence, the DBE is a special knowledge-based environment in which businesses will be able to interact with each other in very effective and efficient ways. The ecosystem will contain services components that are supported by a specially-designed software infrastructure. This infrastructure will allow the ecosystem services to evolve over time, constantly seeking to improve their effectiveness for the user.

The shape of this next generation of e-business services is still emerging, but some aspects of what it will involve are already clear:

- It will make use of the internet as an environment for delivering services and making commercial transactions.

- It will rely on open source principles so that, like the internet itself, no organisation can ever dominate the ecosystem and all contributors will have an equal chance to compete.

- Finally - and this is the most exciting and innovative step – it will use software applications and services that are able to 'evolve' and to organise themselves in a way that is optimised for the end-user.

Focus

The DBE Project has set out to create this new infrastructure for dynamic networked businesses. The three-year Integrated Project involves 120 researchers and specialists from 20 organisations, including some of the big names in computing. Experts from the worlds of science, computing, business and economic development are working together to solve the technical issues and to build the user community that will launch the DBE as a permanent facility.

Strong involvement from regional development actors ensures that the final results directly benefit SMEs, both as software developers and end-users. These regional catalysts are linking the project into their regional needs and providing it with several hundred pilot applications among local businesses.

As a European initiative, the DBE Project will put European ICT companies and their SME clients at the forefront of this next generation of evolving software, and so help European SMEs to compete at world-class level no matter how small, remote, or obscure their business.

Project Activities

The DBE project is currently developing the 'evolutionary' technology that is the key to the digital ecosystem concept. It involves harnessing well-known principles of self-organisation and self-optimisation, taken from various fields of science and nature, and applying them to the interactions between businesses. These interactions form value chains that can be thought of as the 'organisms' that inhabit the ecosystem and that will change and evolve over time.

Within the DBE project, work is simultaneously underway on:

- Developing the fundamental principles of applying science to software evolution;

- Modelling business processes so that such models can become the building blocks of software services; and

- Understanding the needs and competitive environment of SMEs in order to provide services that add value and increase profitability.

The DBE's core capability comes from a combination of two approaches at the interface between science and computing. First, by digitally emulating some of the many processes that occur in nature and that are observed to create self-organisation and self-optimisation, it is possible to produce entirely new behaviour in software. For example software that can optimise a process or that can modify itself while in use. Often this capability is not just within one application but involves a complex interaction between applications and between users.

Secondly, DBE follows the model-driven architecture (MDA) put forward by the Object Management Group (OMG), which represents a radical new approach to application development. When business processes are represented using MDA techniques, independent applications can interact without having to be "compatible" and without even knowing anything about each other's internal construction. As well as providing easy access to the applications, the internet acts as the platform for applications to work together wherever they are located.

Impact and Exploitation

The DBE promises to have a major impact on European SMEs and their ability to embrace e-business. Success for the project will provide Europe with a recognised advantage in the next generation of software application development and use.

Being based on open source principles, the DBE will release SMEs from the cost and complexity of using proprietary PC-based software. More importantly, the DBE could empower smaller businesses to compete more effectively in global markets. In particular, it will allow small firms to cheaply and easily use specialist and bespoke software, such as advanced e-commerce, that is normally only viable for larger companies. It will enable them to trade in new ways and to offer new services that can only be facilitated electronically.

The most visible outcome will be the emergence of the DBE as an open and distributed ICT platform. It will be managed by a self-sustaining community of users comprising application developers, service providers and end-users - those SMEs doing business via the DBE. Initially aimed at business-to-business transactions, the DBE concept could also be extended to many other fields where self-organising and self-optimising systems could be used.

Projects List

To date, the following projects relevant to Enterprise Networking have been supported under FP6. These are funded under the Strategic Objectives:

• IST-2002-2.3.1.9 - Networked Businesses and Governments

• IST-2002-2.3.2.6 - Applications and Services for the Mobile User and Worker

They also include General Accompanying Measures and certain projects supported under joint calls with Thematic Priority 2: Nanotechnologies & Materials and Thematic Priority 6: Sustainable Development.

Further information on each of the projects is available at the URL shown. Additional projects resulting from Calls 4 and 5 will be announced in due course.

Project No.	Project Acronym	Project Website
Integrated Projects		
507849	ATHENA	www.athena-ip.org/
507953	DBE	www.digital-ecosystem.org/html/
506958	ECOLEAD	ecolead.vtt.fi/
507592	ILIPT	www.ilipt.org/
004402	MYCAREVENT	www.mycarevent.com
001945	TrustCoM	www.eu-trustcom.com/
Networks of Excellence		
508011	INTEROP	www.interop-noe.org/
Specific Targeted Research Projects		
507590	CROSSWORK	www.crosswork.info/
016527	MAPPER	
004636	MOSQUITO	www.mosquito-online.org/
507408	MYTREASURY	www.mytreasury.eu.com
507626	NO-REST	www.no-rest.org/
002104	SATINE	srdc.metu.edu.tr/webpage/projects/satine/
507601	SPIDER-WIN	www.spider-win.de.
016649	PABADIS'PROMISE	
016801	X-CHANGE	
Specific Support Actions and Coordination Actions		
506673	CO-DESNET	codesnet.polito.it
015801	EPRI START	
015871	IST-BONUS	www.ist-bonus.net
004252	LEGAL IST	www.legal-ist.org
507041	V-CES	www.v-ces.com
507469	VE-FORUM	www.ve-forum.org/
511013	VERITAS	www.veritas-eu.net
507480	XBRL IN EUROPE	www.xbrl-eu.org/