RESEARCH IN DIALOGUE

Systematic Thought Leadership for Innovative Business

SAP Research is the global technology research unit of SAP. The group significantly contributes to SAP's product portfolio and extends its leading position by identifying and shaping emerging IT trends through applied research and corporate venturing.

In contrast to SAP's product groups, which work on new functions and releases, the researchers explore opportunities that haven't yet been developed into products. They track technological trends, evaluate the potential impact on SAP solutions and customers, and generate breakthrough technologies.

The business model of SAP Research is based on co-innovation through collaborative research: In collaboration with leading universities, partners, customers, and SAP product groups, SAP Research oversees the development of promising ideas and prototypes into market-ready software for maximum customer value.

An integral component of the search for innovation comes from within the company. As a part of SAP Research, SAP INSPIRE leverages the creative entrepreneurial talent of SAP employees by managing and nurturing the innovation process from idea to product.

SAP Research	
SAP Research Centers	**SAP INSPIRE**
■ Identify IT trends ■ Determine business value of new technologies ■ Develop concepts and prototypes for current and future SAP solutions	■ Seeks for entrepreneurial talent within SAP and catalyzes innovative ideas from employees, customers and partners ■ Identifies growth opportunities beyond the existing portfolio
■ Long-term focus (3 to 5 years)	■ Medium-term focus (18 months)
The Innovative Force behind Tomorrow's Technology	Innovation through Entrepreneurship

Fast Facts

Website:	**www.sap.com/research**
Organization:	**11 global research centers**
Management:	**Dr. Peter Zencke, Board Member "Research & Breakthrough Innovation"; Prof. Dr. Lutz Heuser; Dr. Ike Nassi**
Employees:	**173 (2006), 233 (2007)**
PhD Candidates:	**65 (2006), 90 (2007)**
Working Students:	**140 (2006), 200 (2007)**

SAP Research Centers

A Strong Global Network
Our Bridges to Local Expertise

Belfast, United Kingdom

1

Research Director:	Dr. Wolfgang Gerteis
Major Research Fields:	Realtime Enterprise Transparency, Real-World Awareness, End-to-End Simplicity, Industrialization of Software Engineering
Environment:	University of Ulster, Queen's University Belfast (QUB), UK eScience Network, GRID Ireland
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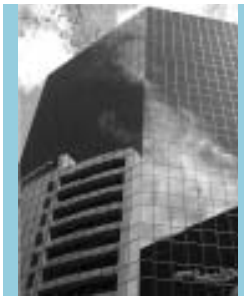

Brisbane, Australia

2

Research Director:	Prof. Karsten A. Schulz
Major Research Fields:	Real-World Awareness, End-to-End Simplicity, Real-Time Enterprise Transparency, Security & Trust
Environment:	Queensland University of Technology (QUT), University of Queensland (UQ)
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Darmstadt, Germany

3

Research Director:	Dr. Knut Manske
Major Research Fields:	End-to-End Simplicity, Industrialization of Software Development, Business Centric Networks, Next Generation Enterprise SOA
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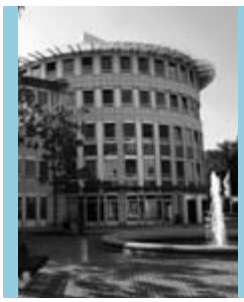

Dresden, Germany

4

Research Director:	Dr. Uwe Kubach
Major Research Fields:	Future Manufactuing
Environment:	Dresden University of Technology (TUD), "Silicon Saxony"
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Karlsruhe, Germany

5

Research Director:	Dr. Orestis Terzidis
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Environment:	University of Karlsruhe, FZI Karlsruhe, Telecooperation Office (TecO), Particle Computer
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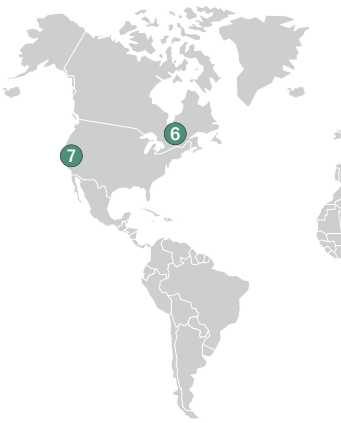

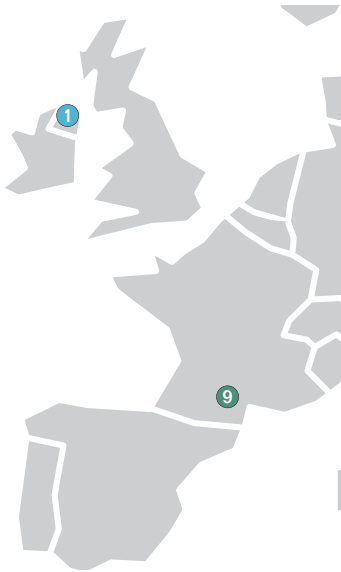

■ Campus-based Engineering Center (CEC) – co-located with leading university
■ SAP Research Center (SRC) – co-located with SAP Development Lab

Montreal, Canada

6

Research Director:	Nolwen Mahé
Major Research Fields:	Mobility, Real-World Awareness
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7

Research Director:	Dr. Ike Nassi
Major Research Fields:	Real-World Awareness, Open Source, Advanced Web Technologies, Next Generation Enterprise SOA, Security & Trust
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Pretoria, South Africa

8

Research Director:	Danie Kok
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Sophia Antipolis, France

9

Research Director:	Gilles Logeais (starting March 2007)
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St. Gallen, Switzerland

10

Research Director:	Dr. Oliver Christ
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Walldorf, Germany

11

Research Director:	Prof. Dr. Lutz Heuser
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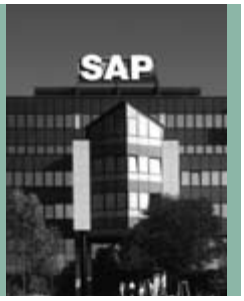

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Research Opens Our Minds

Welcome to the 2006 annual report of SAP Research.

Every day, we witness the ways in which information technology is transforming our lives and working methods. IT supports companies entering new markets with innovative technologies and business processes. To help our customers – and ourselves – stay competitive, we are constantly evolving.

We proudly look back on more than 30 years of success, but we cannot rest on our laurels and maintain the status quo. Rather, we must embrace innovative technologies and take advantage of new business opportunities. We are continuously looking for ways to improve our solutions to deliver increased value to our customers, partners, and shareholders. We are neither afraid to question what we do and how we do it, nor to take the risks necessary to bring about change.

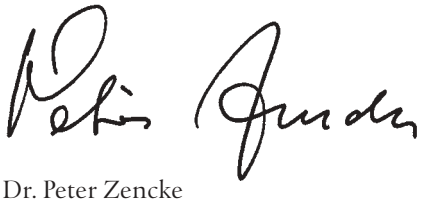
We have an important role to play in this ongoing process of evolution. Armed with an ability to distinguish between the megatrend and the overnight sensation, SAP Research adds strategic value to the company through seeking out and championing new ideas, exploring emerging technologies, and experimenting with fresh ways of deploying existing solutions. Research opens our minds. It enables us to leap beyond today's limitations and into the realms of breakthrough innovation, while always keeping the all-important ratio between cost and benefit in mind.

Co-innovation is one of our core values as well as our fundamental business model both internally (across functions, departments, and locations) and externally (with our partners and customers). Co-innovation means overcoming physical boundaries, prejudices, and longstanding mindsets to leverage the powers of creativity inherent in the widely diverse skills and ideas of our community.

To me, "Research in Dialogue" is the perfect motto for our collaborative research process here at SAP. It represents the global network of contacts and partnerships that allows us to tap into the best innovative talent available inside and outside the company. Our presence on four continents allows us to harness, simultaneously, the free entrepreneurial spirit of Silicon Valley, the IT potential of European universities and companies, and the best IT talent in the Asia-Pacific region.

Our research portfolio comprises over a dozen research fields. Managed under varying timelines, they are all of strategic importance to us. Our research projects support specific SAP solutions or prepare the ground for new ones. Whatever their function, they are helping us to evolve, and I am proud of the results and successes achieved over the last years.

I hope you enjoy diving into the world of SAP Research!



Dr. Peter Zencke
Head of Executive Board Area
"Research & Breakthrough Innovation"

An Innovation Catalyst

A round-table interview with Prof. Dr. Lutz Heuser, Head of SAP Research EMEA and Australia, Dr. Ike Nassi, Head of SAP Research Americas and China, and Claudia Alsdorf, Head of SAP INSPIRE.

How do you see the role of SAP Research in supporting the strategic goals of SAP?

Lutz Heuser: Our mission is to become a thought leader for breakthrough innovation within SAP. We want to function as an innovation catalyst for initiating technological changes within our product portfolios. Clearly we want to contribute to existing SAP products by opening new horizons and showing how technology can be used in innovative ways. But these new ways should lead to reaching the overall objectives of SAP. In order to accomplish this, we are trying to make SAP Research the preferred co-innovation partner for leading academic and research institutions worldwide, technology and industrial partners, selected customers, and, naturally, for our colleagues in development. Through long-term research, SAP Research identifies upcoming technologies and transforms them into business opportunities and radical, breakthrough innovations.

Ike Nassi: The key to the success of every research department – and this is especially true for SAP – is, first and foremost, to strive to understand the company's strategy and its anticipated effect in the market place. Second, research should reach for big, far-reaching, ambitious goals. But all goals should be in keeping with the company's strategy. At SAP Research, we focus strongly on research results. We are not doing research for the sake of it. Our work is tightly tied to the goals of SAP. We look for early adopters of new technological solutions, team up with them, and follow through. Very often this involves traveling abroad, be it to Silicon Valley, France, or Australia, in order to find our partners.

Claudia Alsdorf: I wholly agree. Although SAP Research has created a worldwide network of partnerships, we also strive to foster entrepreneurial talent within SAP through SAP INSPIRE. The employee projects we sponsor are all directly relevant to the SAP product portfolio and have the potential to become either part of an existing product or an entirely new product.

Recently, there has been a lot of talk on the topic of co-innovation and looking beyond existing silos. What is SAP Research doing to forge a closer bond with product development while, at the same time, stay in touch with the outside world?

Ike Nassi: Let me start by paraphrasing a quote from Alan Kay. Kay says the best way to predict the future is to invent it. We are in the unique position within SAP to be able to think outside the box in terms of IT. Our remit is to look for innovative ways to employ technologies as well as new technological trends, which may influence SAP's products. Certainly we should understand the corporate strategy and goals, but we should also think for ourselves. In a big company, a certain amount of autonomy is essential to keeping the spirit of invention alive.

Lutz Heuser: We are able to take a longer-term perspective. We want to focus on those technological trends that have the potential to influence SAP solutions and explore ideas that haven't yet been developed into products, even if there is a measure of risk involved. Our role is to see how these technologies can be put to work; how they might fit into existing SAP solutions. If they do not fit, our role is to propose new solutions. Obviously, this kind of research doesn't occur in a vacuum. This is why we place a tremendous amount of importance upon co-innovation; it's one of the core principles of our work.

Claudia Alsdorf: For this reason we have for example established strong relations with the European Commission and the German Federal ministries of Education and Research, and Economics and Technology. SAP Research also fosters relationships with various EU bodies dedicated to spearheading technological innovation throughout the continent. Projects like CoBIS, Athena and Promise are examples of the fruitful work being done through research consortia. Moreover, we test our prototypes in real-life settings, often with the help of current SAP customers or potential clients.

With three new research locations opening this year, SAP Research is clearly growing. There are now research centers on four continents, operating in societies with radically different innovation cultures. How do you see SAP Research making the most of this diversity

Lutz Heuser: The best thing about having a global reach is being able to tap the best research talent available. The choice of research locations is in no way accidental. Our research centers are the result of proven, long-term cooperation with partners in the respective countries. SAP Research has acquired a network of truly first-rate multicultural expertise both from within and outside SAP. This allows us to stay abreast of the latest technological trends and work on programs involving top internal and external specialists.

Ike Nassi: In the United States, for example, we are capitalizing on Silicon Valley's unique entrepreneurial ecosystem. The clustering of venture-capital firms, IT start-ups, and industry heavyweights literally within a short drive has provided a very stimulating, fruitful environment for exchanging ideas, looking at what others are doing, and gaining real insights. Additionally, we are expanding our existing relations with some of the best universities in the United States and the world, positioning us at the forefront of next-generation technological research.

Why is this global spread of SAP Research beneficial to SAP?

Lutz Heuser: By partnering with leading universities and companies from around the world, we promote SAP's association with innovation and the power of new ideas. Our research fields span a broad spectrum of technological research, demonstrating SAP's commitment to excellence – a commitment that has held strong for the last 30 years. SAP Research is actively contributing to SAP's superior customer value, operational excellence, and strong partner ecosystems.

Ike Nassi: Our work helps SAP to enter new geographical and industrial markets. We are also developing cutting-edge applications for new markets. China is one example of a country that demonstrates great potential for future research collaborations.

Claudia Alsdorf: SAP Research also contributes to SAP's commitment to corporate citizenship. For example, in emerging markets like the Republic of South Africa, we are helping educators implement – and reap maximum benefits from – information technology. The goodwill we foster reflects back positively on SAP as a whole.

How does SAP Research understand customer needs?

Lutz Heuser: As I mentioned earlier, we do not function in a vacuum. Through our commitment to SAP's overall strategy we are also committed to SAP's customer focus. As such, we strive to involve SAP customers either as partners in projects or as early adopters. With the help of regular think tanks held in different locations across the globe we gain insights into our customers' wants and needs and solicit feedback on research work.

Ike Nassi: We also recently created a partner community around Sensor Networks to provide customers and partners with an environment for the exchange of ideas and expertise. We then integrate the results of these online discussions into our prototypes. By building and testing prototypes with end-users we are able to include customers' specifications early on in the design process. Thus when technologies become products, they are already, to a degree, customer-built.

Claudia Alsdorf: Another good example of our commitment to our customers is the "Lighthouse Project" concept – a sort of testing ground for new technologies and their potential impact on SAP clients. We are now implementing the Lighthouse Project with several SAP customers across the globe. It is already proving very beneficial.

We talked a lot about innovation and research with external partners. How do you evaluate the potential for innovation within SAP?

Claudia Alsdorf: As head of SAP INSPIRE, the unit responsible for fostering entrepreneurial talent within SAP, I can say that the potential is enormous. With a distinguished pedigree pointing directly back to SAP founder Hasso Plattner, SAP INSPIRE has grown quickly over the last three years and continuously channels employees' innovative thinking in a systemized way. Every year we gather around 1,000 ideas from SAP colleagues. Out of a total workforce of over 33,000, this constitutes more than three new ideas to every 100 employees! These ideas come from people working across all SAP units. The four or five concepts selected for implementation in our SAP INSPIRE Incubator have the greatest potential to bring about innovation. Work on these projects has brought SAP INSPIRE and SAP Research even closer together. We have identified several synergies, especially in the field of Future Manufacturing within the SimCorp and icMap initiatives. With these projects we are creating significant value both for the research field and for our future research portfolio. In the future, we aim to react to – and implement – employee ideas more quickly and flexibly. At the same time, we should not forget that innovation rarely occurs in closed systems. For this reason, we plan to focus on creating a true innovation community, which will reach out to creative minds beyond SAP. This "outside-in" view will help us to support employee ideas more fully and make the best use of SAP's knowledge capital.

Connected to Customers and Society

SAP Research is committed to creating customer value. Being an integral part of SAP's customer-driven business model, SAP Research does all research projects with a hand at the pulse of SAP's clients. SAP researchers are not researching for the sake of research. They explore applied research that leads to breakthrough solutions and processes directly related to SAP's products. In their work they strike a balance between the discipline imposed by the company's goals and the limitless world of creativity.

In many projects SAP customers get involved as partners or early adopters of new solutions. Thus SAP Research is able to include customers' specifications in the design process and make suggestions for future solutions that mirror customers' demands.

SAP Research is also committed to the society at large. It works on projects that help educators in emerging markets to implement information technology to their best advantage. Researchers also look into ways for workers to better do their jobs with the help of computers and software. Society can only benefit from an improved human workplace and human-computer interaction, by increased connectedness between companies, and by the deployment of the next-generation Web technologies.

Connected to Ideas

Researchers at SAP are curious to find out how the technology of tomorrow will look like and how to harness it for better use. For this to happen they need to be open to new ideas and concepts, to be able to have a fresh look at tough old problems. Certainly there is much more to that. There is the delight with exploration and achievement, the satisfaction with experimenting and seeing how the prototypes of today mature into new solutions. No doubt the process of research and innovation can be very fascinating.

SAP researchers are pioneers, scouts and trend-setters. In these multiple roles they look at emerging trends and based on extensive experience decide what would have a long-term impact on SAP's solutions and clients and what will turn out to be a short-lived flicker on the technological radar. Sure this is no easy task. It requires long experience, a keen eye for the new, a discerning mind to analyze future outcomes, and a passion to experiment. Because emotion is also part of their work.

Technological research is a way without a start and with no end. Like technology itself, research has become a vital part of human life. And although not many people think about it, research has prepared the way for all major technological innovations in the last hundred years or so. In this sense it has become a freeway for a better life.

Connected to the World

SAP researchers crisscross the globe in search of best ideas and the brightest talent. Being part of a global company the thinking is global – while taking into consideration the demands of the different markets and national cultures. With research locations spanning the globe this is the best recipe for success. Researchers co-innovate within an elaborate network of research partners coming from academia and business. This geographic and business diversity helps them keep an open mind to new ideas and stay at the cusp of the innovation wave.

SAP certainly makes sure that its own employees retain their creative spirit. Through the SAP INSPIRE unit, which is part of SAP Research, SAP stimulates employees' entrepreneurial spirit and help individual innovation to enrich SAP's solutions.

Research in Dialogue – The SAP Research Network

The beginning of the new century witnessed a profound shift in the influence of information technology on modern society. Companies started to do business in entirely new ways. People became accustomed to using gadgets that seemed unimaginable five years previously. The power of innovation and widening knowledge underpins these changes.

The exploration of new trends, ideas, and breakthrough innovations are the lifeblood of a technology company like SAP. SAP Research supports the company in maintaining its technological edge by looking at new ways to apply technology, develop new technological paradigms, and test new processes and prototypes.

TAPPING THE POTENTIAL OF INNOVATION

Innovative ideas can be found everywhere: in big enterprises, start-ups, university faculties, and employees' or customers' minds. For this reason, SAP Research is exploring new technologies via a global ecosystem. This principle of co-innovation enables SAP's researchers to interact with a widespread network of more than 500 alliances comprising several dozen universities, industrial partners, research institutes, governments, current and future customers, and other development units within SAP itself. It also taps innovative ideas from SAP employees.

The global spread of SAP Research's worldwide research locations helps the company communicate with the most advanced centers of innovation. This wide-ranging ecosystem provides an optimal climate for researchers to invest their best in collaborative research projects.

A Selection of Research Partners Around the Globe

Co-Innovation within a Research Community of Partners

In September 2006, SAP Research and HP Labs signed a mutual agreement for joint research. The agreement not only highlights the importance of creating strategic research relationships, but also showcases SAP Research's dedication to strengthening its existing network.

The very nature of SAP Research's work necessitates the deployment of a multi-tier approach to partnerships within the research network. SAP Research's partnerships range from the very big (such as with IBM) to very small partners (for example with start-ups in Germany and venture companies in Silicon Valley.) SAP Research also works with partners from government-sponsored project consortia and long-term strategic partners. This multitude of partnerships requires different approaches. For example, part of the group's work with strategic technological partners like HP, Intel, and IBM, involves defining a **joint research agenda**. Publicly funded projects (such as the European Commission's Research Framework Program, the Australian Research Council, and the German Ministry of Research & Education) usually involve 20 or more partners. Each of these partners contributes to the research work according to their designated role within the project. The project rules set down by the quasi-neutral funding organization facilitate the smooth running of such complex, multi-partner activities.

GETTING EARLY FEEDBACK

Involving customers at an early stage is key to obtaining accurate feedback. This also allows SAP Research to tailor prototypes that best meet users' future needs. The group's **Lighthouse Projects** are geared towards receiving specific user requirements before ultimately transforming research results into products. Lighthouse Projects involve the collaboration of SAP Research teams with regional field organizations, the respective lines of business, and pilot customers to implement prototypes in (near) real-world environments. SAP Research is currently engaged in discussions with leading chemical companies in Europe and the Asia-Pacific region to specify potential Lighthouse pilots.

SPIN OFFS

In addition, close attention is paid to research results that – though not necessarily in keeping with the direct needs of SAP's portfolio – may yet possess the potential to lead to spin-offs. A good example is the Karlsruhe, Germany-based company, **Particle Computers GmbH**. Particle Computers came into being when researchers at the Telecooperation Office (TecO) of the University of Karlsruhe developed a groundbreaking technology in close collaboration with SAP. As a result of the partnership, some researchers decided to spin off from the university and found the company. Today, Particle Computers develops and commercializes solutions based on sensor network technologies that enable customers to monitor their assets continuously, optimizing usage and reducing operational costs

INTERNATIONAL EXCHANGE

Several activities in 2006 highlight the commitment of SAP Research to the principles of co-innovation. Geographically diverse, they span a wide cross-section of topics.

- On 2006, SAP Research held its **First International Research Forum (IRF)** at the Fraunhofer Institute for Computer Graphics in Darmstadt. Respected researchers, senior executives, and high-ranking politicians came together to discuss major IT trends and challenges, as well as their respective visions for business, politics, and society in the coming years.

  Topics discussed in this exclusive think tank session included:

  - **IT security and security through IT** – a discussion about the ways in which technology can improve public security through observing the production and distribution of dangerous goods and through the analysis of security-related data. The participants also discussed the implications of different dimensions of IT security, such as data protection and defense against hackers and intruders.
  - **Technology as a driver of growth** – a discussion about the enormous opportunities created by the globalization of the world economy. The forum also looked at ways to bridge the "digital divide" and provide equal access to Internet technologies.

Shane Robison,
Chief Technology Officer, Hewlett Packard

Helping Customers Become Flexible with Breakthrough Technologies

"As a result of our new collaboration, we are building on a successful, long-term relationship between HP and SAP. The initial results of our joint research efforts demonstrate the wisdom of tapping into the synergies between HP's Adaptive Infrastructure management technologies and the SAP NetWeaver® platform. We are also better positioned to gear our respective hardware and software solutions to help customers of all sizes reduce IT operating costs and achieve greater flexibility in creating and running business processes using breakthrough technologies."

Running IT as a Business

Martin Curley,
Senior Principal Engineer,
Global Director of
IT Innovation, Intel

"IT provides value to an organization through enabling business continuity, as well as business change and flexibility. IT automation creates business continuity, while the industry is converging on supporting business change and flexibility through service oriented architectures. As a result of the combination of Intel's strength in platform technology and SAP's depth in business processes and Enterprise SOA, we are excited about collaborating with the SAP Research Center in Belfast on enabling IT to 'follow' business requirements automatically, and identify and stimulate new business opportunities."

Realizing Our Vision through Collaborative Research

Emil Wang,
Chief Executive Officer,
Questra

"As a young company, we naturally think about where the industry is heading and how we can provide a unique way of getting there. Our vision that is sufficient to convince venture capitalists to invest in us, and initial customers to purchase from us. But a young company does not have the resources to conduct in depth research and development. By definition, we need to focus on development. Working with the SAP Research team in Palo Alto gives us the ability to explore aspects of our vision with true research capabilities. Because the team is closely aligned with SAP's product groups, we will soon be able to transfer joint research into shipping products."

- **Semantic Webs** – this relatively new term is used to denote the drive towards annotating Internet content through common terminology. The participants debated the technological basis for Semantic Webs as well as recent advances in the field.
- **Internet of things and real world awareness** – the group looked into the extent to which our society is receptive to new, smart technologies such as RFID tags. They also discussed ways for preserving privacy in the new real world awareness landscape as well as the economic potential of the Internet of things.

The results of the IRF will be published in a book, available in 2007.

- The **CEC Curatorship** is another good example for the ongoing communication and exchange with partners. This scientific advisory board for the Campus-based Engineering Centers (CECs) in Germany and Switzerland debates current research strategies and projects. It serves as an early alert mechanism for trends in computer science and puts them into perspective to better meet market needs. The board consists of members from the worlds of academia, industry, and politics. It thus enjoys strong support from a variety of stakeholder groups. Represented companies include Deutsche Post, Deutsche Telekom, Hewlett Packard, Siemens, and Atos Origin. Most of the members have followed the group's developments since the 1990s. The curatorship reports are being published twice a year after the advisory board meetings.

- In Summer 2006, SAP Research pioneered the **Enterprise Services Community (ESC) for SensorNets**. The Community demonstrates SAP Research's commitment to creating a long-term communications platform to help SAP customers and partners in the United States and Europe define and communicate their needs to SAP.

  On September 22, SAP Research invited IBM, Sun and several start-ups including Crossbow, ArchRock, SensorLogic, and MillenialNet, among others, to a workshop in Palo Alto, CA. The session focused on different aspects of sensor networks in the 'cold chain' domain area. Additional meetings were conducted in Karlsruhe and Walldorf, Germany, for example with ABB, Siemens, Infineon, and SAP Industry Business Units, as well as venture capital firms, government bodies, SMEs, and university groups. A European ESC workshop took place from November 21 to 24 at the European Commission's prestigious IST Conference in Helsinki, Finland.

- SAP Research's recent **WearIT@Work** project highlights the importance of collaborating with partners in designing new solutions. Launched in 2004 and running through 2008, the project explores ways to integrate computer systems into clothing within various industrial environments. One of the scenarios dealing with the use of the technology on hospital wards, for example, explores the ways in which wearable technologies will restructure the tasks of doctors and nurses. Since the last quarter of 2004, SAP researchers have been collaborating with medical professionals at the **regional hospital in Steyr, Austria**. The project aims to optimize processes for using – and user-friendliness of – wearable technologies. The hospital operator **Gespag** is a partner in the WearIT@Work project.

▶ **www.wearitatwork.com**

Uniting Business, Applied Research, and Academia

In addition to the SAP University Alliances program that works with educational institutions around the world to create, capture, organize, and disseminate intellectual capital, SAP Research boasts dedicated research relationships with more than 40 leading universities around the globe. This enables SAP to look beyond conventional industry partnerships and tap into a vast treasure trove of talent and ideas. The collaboration with the world of academia spans a broad spectrum of strategic technology research areas and is helping the company improve its innovative solutions.

SAP Research's collaborations with universities often begin with a joint research project. Sometimes the group's partnerships are publicly funded in part, and leverage an area of interest for SAP Research where the particular academic institution has strong expertise. Later, the partnership can grow to embrace other projects and SAP-funded research endeavors.

Over time, long-term collaborations can become cornerstones for the establishment of **Campus-based Engineering Centers (CECs)** located on partner university premises. The establishment of a CEC depends upon a variety of factors including the accumulation of a mass body of joint research work and the alignment of research being undertaken at the university with SAP's own strategic goals. A university can often complement SAP Research's expertise and open a door to its own research networks.

PH.D PROGRAM

Ph.D. candidates interested in writing dissertations in industrial, "real-world" settings find SAP Research to be the ideal research environment. With the group's wide breadth of international projects and areas of discovery, SAP Research offers a broad range of opportunities for doctoral theses. This is why SAP Research established a dedicated **Ph.D. Framework** in close collaboration with several European universities. The projected timeframe for the completion of dissertations is three years. During this period, candidates are assigned to a challenging project within one of SAP Research's programs. The group is planning to establish similar models with additional universities in the Americas and the Asia-Pacific region.

SAP Research also offers opportunities for professors on sabbatical to undertake research work on its behalf. Students can apply for internships at SAP Research Centers. In parallel, SAP's researchers regularly hold lectures and organize workshops and conferences on topics of current interest at universities.

Research work at universities is connected with the company's overall strategy and aims at having a direct impact on SAP's evolving solutions. SAP product groups are involved early on in determining what kind of research will be done and in monitoring research progress. This makes it possible to transfer research results to the relevant product groups fairly quickly after the results come in. In the United States, for example, the involvement of an executive vice president as a sponsor for each academic research project ensures the prompt harvesting of research results by SAP Development.

REGIONAL HIGHLIGHTS

In SAP's Europe, Middle East & Africa (EMEA) region, SAP Research is cooperating with many universities in countries as diverse as the United Kingdom, Turkey, and the Republic of South Africa. There are seven research locations throughout the region. In 2006, the group launched two new CECs: Darmstadt (Germany), and Belfast (Northern Ireland). The first research center in Switzerland – the CEC St. Gallen – is nearing completion and will be officially inaugurated in May 2007. The partnerships support SAP Research's strategy in the EMEA region which aims at harnessing the strength of Europe's IT research capabilities both by implementing a **European collaborative research approach** and using the opportunities offered within EU research initiatives.

Prof. Dr. Hubert Österle,
Director, Institute of Information Management,
University of St. Gallen

University of St. Gallen and SAP Research – a Winning Formula

"Through our collaboration with SAP Research we are reaping the benefits of a very productive and trusting relationship dating back several years. By bringing together the business expertise of our university and SAP's technological know-how, we have created a fertile environment for exploring new approaches to technology and business. We are increasingly discovering that applied research can be best undertaken in an atmosphere of frank exchange of ideas and in a spirit of cooperativeness among all involved partners. It is important to harness the potential of universities and leading companies to get closer to customers' needs. That is why I see the ongoing collaboration with SAP Research as a winning formula for the cooperation between the worlds of academia and IT."

We Drive Innovation for Software Security

Prof. Jeannette Wing,
President's Professor
of Computer Science and
Department Head of
Computer Science,
Carnegie Mellon University

"The partnership between SAP, the world leader in Enterprise Software, and Carnegie Mellon's Computer Science Department, world leader in building real systems for real users with real-world impact, will drive innovation in the area of software security. In being at the forefront of defining and measuring software security, we are excited to help SAP provide its customers with software that is especially secure. We are working on a formal definition of a system's 'attack surface' with the goal of measuring how exposed a system is to attack. We are also proud to be one of the first top US universities participating in SAP's Sponsored Academic Research Program in the US."

An Excellent "Real World" Ally

Professor Simon Kaplan,
Executive Dean,
Faculty of Information
Technology, Queensland
University of Technology

"Having the world market leader of business software as a partner is of immeasurable value for our university. Not only do we enjoy collaborating with top researchers, but also our students reap great rewards from having contact with such an excellent real world ally. Joint projects, bright people, and constant exchange are only some of the factors contributing to the success of our relationship. Over the last few years, we have created a world-class hub of expertise in the areas of Business Process Management, IT Security, and Service Ecosystems."

MAJOR ACTIVITIES

- On March 27 2006, SAP Research officially inaugurated its new **CEC Darmstadt** in cooperation with the **Technical University (TU) Darmstadt**. Research work conducted in Darmstadt focuses on the **working environment of the future** – an umbrella term for four research areas: knowledge work in dynamic environments, new models of interaction, novel software engineering methods, and technologies for emerging economies. The goal is to create intelligent software environments within the business context.

- On September 25, 2006, SAP Research officially inaugurated **CEC Belfast**. Located on the Campus of the University of Ulster, the Center is exploring the novel field of "**Business Grids**," an area of research aimed at developing a general-purpose infrastructure capable of supporting complex business processes and services across virtual organizations. Besides establishing and maintaining close ties with the **University of Ulster** and **Queen's University Belfast**, the lab also collaborates with the e-Science Network of the United Kingdom and GridIreland, a similar institution in the Republic of Ireland. Additionally, the Center is working on a collaborative project with HP Labs Bristol in the area of Adaptive IT.

- The CEC in Brisbane has established strong ties since the late 1990s with key Australian universities, like the **University of Queensland (UQ)** and **Queensland University of Technology (QUT)**. Such links are now extending further afield, to China, India, and Singapore. SAP Research sponsors scholarships at UQ and QUT, with students working on SAP-related projects at the local SAP office. SAP Research also runs Australian Research Council co-funded initiatives, with three new projects instigated in 2006. The group recently completed an ARC linkage project with the University of Queensland. The project investigated the complexities underlying the use of harmonized messaging technology as a vehicle for facilitating interactions between heterogeneous and autonomous applications within and across enterprise systems. Besides working with its Australian partners, CEC Brisbane also teams up with research and industry collaborators from European initiatives and foreign universities.

- In North America, SAP Research is actively sponsoring projects with US universities, harnessing the power of the most advanced educational system in the world via the **University Sponsored Research Program**. SAP Research is engaged in several joint ventures with Ivy League institutions such as the **Massachusetts Institute of Technology (MIT)**, **Carnegie Mellon University (CMU)**, and **Stanford University**. In Fall 2006, SAP Research instigated two research projects with the Eller College of Management, **University of Arizona**. One of the projects will help SAP identify new methods and processes for its software technologies; the other, meanwhile, aims to revolutionize supply-chain efficiency.

- In collaboration with the SAP Suite Optimization team and the **Computer Research Institute in Montreal (CRIM)**, SAP Research is also working on an Adaptive Testing project. The project will adapt automatic testing procedures for applications to fit customers' changing requirements. The project aims to save customers billions of dollars in adapting testing procedures to fit changes in user interface and code.

Spearheading the Research Agendas

In addition to operating at the cutting edge of technological innovation, SAP Research is actively collaborating with governments and governmental bodies across several countries in developing a variety of technological initiatives. These projects will actively shape the respective research agendas of the governments involved.

- In Germany, SAP Research cooperates with the Federal Ministries of Education, Research, Economics, and Technology. SAP Research is also actively involved with a variety of consulting groups, most notably **"New Media in Education"** at the German Federal Ministry of Education and Research, and the **Feldafinger Circle**, an industry think tank which lends its expertise on technological issues to the German Government. It also recently became part of the Federation of German Industries' (BDI) new **"Innovation strategies and knowledge management"** initiative. This initiative aims at identifying and supporting sustainable technology clusters and consulting with the German federal government on opportunities in application-oriented projects within the context of the government's "High-Tech Strategy". SAP Research is also in active discussions and collaborations with the governments of Northern Ireland, France and Switzerland.

▶ **www.feldafinger-kreis.de**

As an active participant in EU-supported projects consortia, SAP Research is in constant dialogue with the European Commission in Brussels and with other EU bodies dedicated to spearheading technological innovation throughout the continent.

- SAP Research was one of the founding members of the **European Technology Platform (ETP) NESSI** (Networked European Software and Services Initiative). NESSI aims to provide a unified outlook for Services Architectures and Software Infrastructures to European research organizations. This overview helps stakeholders to define technologies, strategies, and deployment policies to foster new, open, industrial solutions and societal applications that enhance the safety, security, and well-being of citizens. The work of NESSI is strongly influencing the European Union's 7th Frame Work Program (FP 7) and will certainly lead to the implementation of some major strategic EU projects in software and services.

▶ **www.nessi-europe.eu**

- As the industry driven initiatives are highly welcome by the European Commission to deliver input to the European Research Agenda, other ETPS's such as **ARTEMIS**, **NEM**, **ISI**, **E-Mobility** are tracked by SAP Research to evaluate the potential of those initiatives. So for example ARTEMIS will play a major role in embedded systems research, being critical to the Focus Area of "Internet of Things".

▶ **www.artemis-office.org**

- As a cutting-edge technology organization, SAP Research is also a member of the Information Society and Technology **(IST) Advisory Board** of the European Commission. The IST Advisory Board advises EU authorities on critical parameters of future technological development. SAP Research also participates in the **Next Generation Grids Expert Group**, a European group responsible for drafting strategic directives for the European Union on Grid research every few years. Several SAP researchers function as experts, evaluating the progress of these EU-sponsored projects.

▶ **www.cordis.europa.eu/ist///istag.htm**

WIDE-RANGING COOPERATION

- SAP Research is similarly active on other continents. In May 2006, SAP Research and the Meraka Institute in South Africa announced the launch of the **SAP Meraka Unit for Technology and Development (UTD)**. This new organization will initiate and conduct both basic and applied information and communication technology research, focusing on small and midsized businesses. **Results gleaned from the research are expected to drive emerging economies** and contribute to SAP and the South African government's research, development, human capital development, and business objectives

- In a public-private partnership, (PPP), the Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG) – one of Europe's largest development finance institutions – will co-fund CEC Pretoria. Managed by SAP Research, this project aims to **improve the medical compliance of chronically ill patients in rural areas** of South Africa.

- In the United States, SAP Research is actively engaged in a project sponsored by the **Port Authority of New York and New Jersey** to build a next-generation incident response collaboration system. The consortium includes, amongst others, Rutgers University, SAP, Lockheed Martin, IBM, and the US Army. The Port Authority is one of the largest transportation agencies in the world. As owner of the World Trade Center at the time of the September 11, 2001 attacks, it has become a focal point of public security activities in the United States. Working with the Port Authority will give SAP Research the opportunity to prove its ideas about **public security** in a challenging, real-world environment.

Snapshot from the first IST Africa Conference in Pretoria, May 2006

From left: **Envir Fraser** (Meraka Institute), **Llew Jones** (Managing Director Meraka Institute), **Dr Neville Arendse** (General Manager Department of Science and Technology), **Daan du Toit** (Manager Department of Science and Technology), **Dr Philemon Mjwara** (Director-General Department of Science and Technolgy), **Johan Eksteen** (Technolgy Research Programme Manager), **Lyndall Shope-Mafole** (Director-General Department of Communications), **Danie Kok** (Director SAP Research CEC Pretoria), **Dr Joachim Schaper** (VP SAP Research EMEA)

Transforming Research into Product

In most companies, research and development are collectively lumped together under the acronym R&D regardless of the relationship between the two terms. At SAP, where the internal organization follows the supply chain model, the bridge between the two words – the lively interaction between the world of tomorrow and the realities of today – is of paramount importance and integral to the company's business model. This vital combination has rock-solid foundations at SAP.

SAP Research Business Development has established strong **engagement models** to channel the creative energies of its researchers to meet the demands of product developers. Boasting a significant number of product development units covering the whole range of SAP products, this is no easy task for SAP Research. Nevertheless, the models work.

The core of SAP Research's success lies in involving product and solution management in the research process from an early stage. This ensures that research work is put into context and link to SAP's future product development is built from the get-go.

SAP researchers frequently write technology white papers and discuss the eventual implications of their work with SAP developers. On occasion, SAP Development (and, increasingly, Product and Solution Management) approach SAP Research with specific technological needs. These groups provide (future) inspiration for research projects based on issues they have identified or that have been raised as a result of field research. Technology research questions and business needs are then "**translated**" by SAP Research Business Development and **mapped into research and transfer projects**. SAP Research also contributes to the development of future product maps. In this kind of project, the Research team outlines potential solutions, identifies gaps in those solutions, and then endeavors to close them.

SAP Research frequently looks beyond the immediate horizon of the solution map to offer breakthrough ideas. It acts as the creative driver in this process.

BENEFICIAL LIAISONS

In 2006, SAP Research undertook a variety of projects that demonstrate the value of connecting research and development work.

- **SAP's wide-ranging work in Public Services** shows how the collaboration between research and development can quickly bear fruit. When SAP made the decision to develop a **Public Security Solution Map**, SAP Research offered to incorporate new processes into the map as well as leverage demonstrations of the technology. Researchers were asked to develop demonstrations for the coordination of emergency, medical, and police responses based on available SAP technologies and existing SAP Research prototypes.

- **More than 20 projects in Public Sector, Defense, Public Security, and Healthcare** have already been implemented. Recent successes include the conceptual architecture and prototypical implementation for a semi-automatic **integration of an external rules engine** allowing customers to choose their preferred provider. The next step will involve live testing with external rules engines, such as those of Haley Corticon, Yasu und Ilog, and Ruleburst.

- Other noteworthy projects include **Security and Trust** transfer work on **Aspect-Oriented Software Development**, involving participation in customer groups such as the Defence Interest Group (DEIG) and the Public Sector Advisory Council; and SAP Research's contributions to an eHealth demo reference implementation, which constitutes a major step towards the next generation of Collaborative Health Network Platforms.

- Another example of research in the same area is the **Digital Communities** project in cooperation with Intel and the City of Palo Alto, CA. The project is breaking new ground in the application of wireless broadband networks, especially in terms of better emergency responses and more efficient government services. Digital Communities is a key project for SAP Public Services given the increasing

Jim Hagemann Snabe,
General Manager, Industry Solutions & Corporate Officer,
SAP

Teaming Up with SAP Research is like Being Shown the Future!

"SAP Research is a valuable partner for SAP's Industry Solutions unit. We are working closely together with SAP Research and appreciate the expertise and guidance we get from our research colleagues. Our partnership has grown into a well managed process for collaboration at various levels: on a day-to-day basis within individual research projects, we explore new technologies and paradigms with real-life cases; in joint showcase and prototype development, we anticipate visions of the future today; our collaboration also manifests itself through the alignment of industry thought leadership and roadmaps with SAP's research agenda and portfolio. Through our cooperation with SAP Research we are able to accelerate our industry solution innovation."

Extending Our Leading Position

Klaus Kreplin,
Executive Vice President
SAP NetWeaver and Corporate Officer of SAP Group

"The close collaboration with SAP Research is helping us to further strengthen and extend the leading position of the SAP Netweaver Platform in Business Process Management and Model-Driven Engeneering."

A Source of Inspiration

Rainer Zinow,
Senior Vice President
Cross Development, SAP

"We appreciate working with our SAP Research colleagues. They are always a source of inspiration and are doing a great job of transferring ideas into practice. They add real value to our next generation knowledge transfer platform."

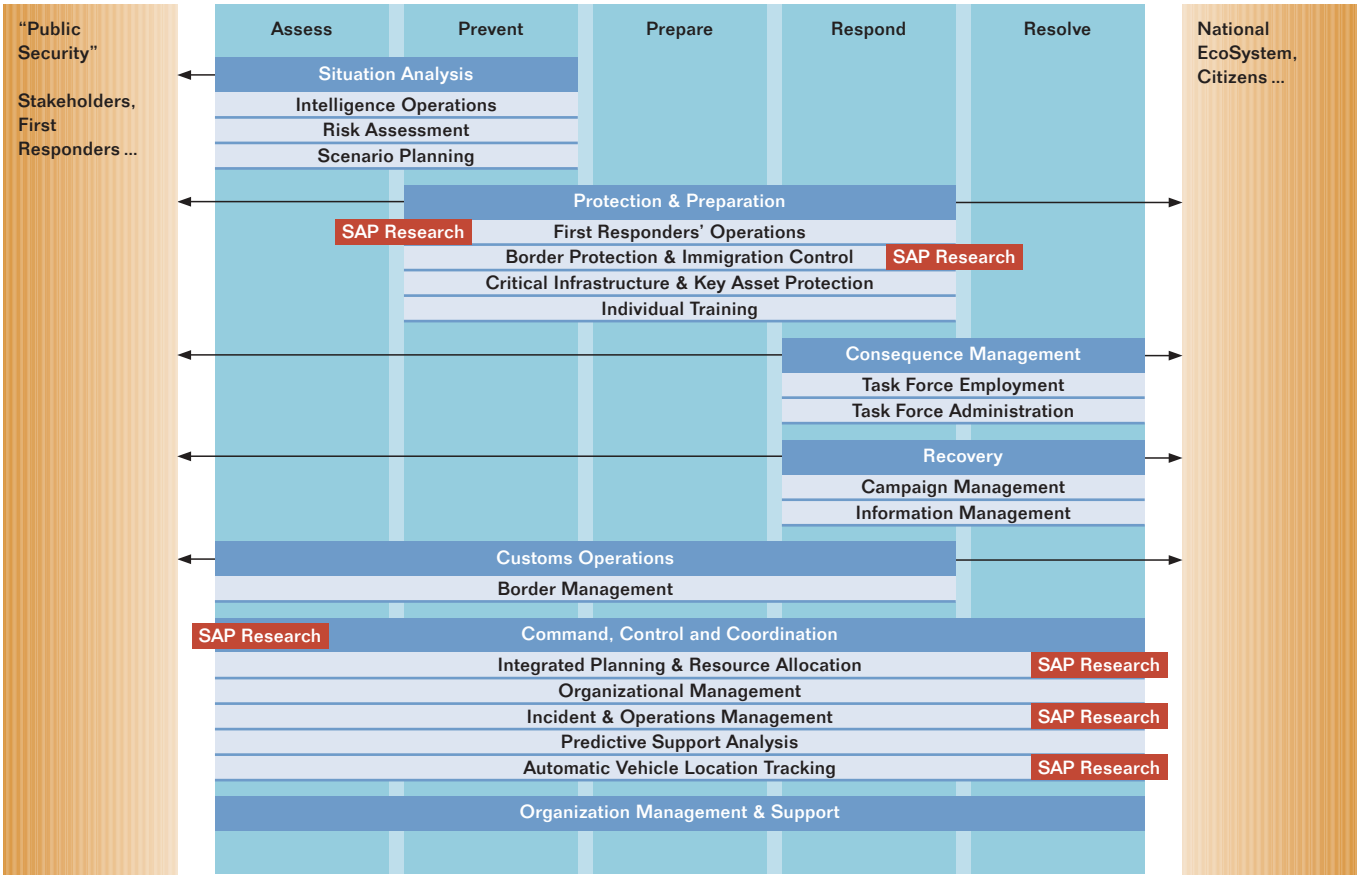
Great Partnership

Vishal Sikka,
Chief Software Architect,
SAP

"As we rethink our product architecture, we truly value the thought leadership provided by SAP Research and enjoy a great partnership on a variety of projects, from next-generation composites, to Web 2.0, to rethinking data management."

Example of SAP Research Integration into SAP Solution Maps

SOLUTION MAP PUBLIC SECURITY 2006



importance of wireless networks. The project's findings may have particular impact for automatic vehicle location tracking, an application currently being piloted in Palo Alto.

- SAP Research Business Development was also able to obtain corporate sponsorship for the key research area of **Corporate Social Responsibility (CSR) reporting**. Researchers developed a demonstrator in close cooperation with the SAP Corporate Citizenship group and the Governance, Risk, and Compliance unit (GRC) which led to SAP's participation at the Global Reporting Initiative (GRI) conference for the launch of the new global reporting standard. Based on SAP's presentations about the CSR project, customers from more than 20 countries requested additional information about the CSR Reporting solution. The technology will become part of the SAP Solution for Governance, Risk, and Compliance.

SAP INSPIRE: Fostering SAP's Entrepreneurial Spirit

Innovation can be a risky business. Searching for funding, hiring the right talent, and finding appropriate project facilities can all stand in the way of bright ideas. SAP INSPIRE ensures that company employees make the best use of SAP's resources while living in a true start-up atmosphere. Although SAP INSPIRE is only one of many idea-gathering outlets within SAP, SAP INSPIRE distinguishes itself as the place to go for the speedy fruition of employee ideas.

SAP INSPIRE helps entrepreneurial SAP employees to develop business plans, create budgets, find people, and access a broad network of experts. It helps employees realize their own ideas without the risks associated with developing an external start-up. 2006 saw the creation of the SAP INSPIRE Incubator implementing employee projects.

HARNESSING EMPLOYEES' INSPIRATION

Although SAP INSPIRE welcomes all employee ideas, only the best see daylight owing to budgetary reasons. In order to ensure these ideas reach the Incubator, SAP INSPIRE has instituted a formal process of gathering and evaluating ideas. After submission, the SAP INSPIRE team assesses the proposals to ascertain whether they are in sync with SAP's existing product portfolio, support work on future trends important to SAP, and are technically and financially feasible.

Selected ideas go on to a **Steering Committee**, where managers and developers provide feedback, hints, and additional information. The best proposals are then presented to the SAP Executive Board for sign-off. Approximately only the top one percent of all ideas find their way into the Incubator. Some of the remaining ideas are handed over to application specific solution managers for their consideration. In 2006, the SAP INSPIRE team processed more than **1,000 new submissions**.

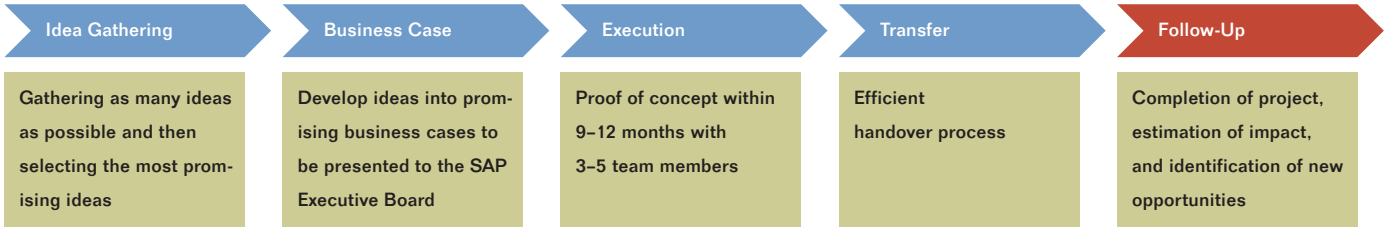
Starting from scratch, project developers have typically 9–12 months to develop a working prototype and release it to Product Development. Each team works under the guidance of an INSPIRE coach to guide them in the right direction and connect them with future harvesting departments.

REACHING BEYOND THE HORIZON

SAP INSPIRE'S five ongoing projects illustrate the broad spectrum of ideas SAP employees are currently striving to implement:

- **askSAP**
  This project will enhance the search capabilities of SAP products. It uses natural language processing to realize an exact search of terms. The technology currently being tested relies on an analysis of the number of hits and takes into consideration the semantics of words. The expected results will lead to more precise searches and will eliminate unrelated search results thanks to a more precise analysis of sentences, attributes, and database content.

SAP INSPIRE



Dr. Zoltán Nochta,
PROVE project lead, SAP

An Exciting Journey to PROVE the Incubator Concept

"The SAP INSPIRE Incubator gave me the chance to gather a team and make an idea become reality. Being part of the first generation of Incubator projects was challenging, as there was no road map marking out the journey. Nevertheless, the process had several landmarks including the creation of an adequate development environment, designing and implementing a system compatible with the SAP software landscape, building a strong and committed partner network, interfacing with the company's so-called harvesting departments, and convincing customers of the advantages of being first movers with PROVE. The process was – and continues to be – exciting. We are still learning a great deal and are enjoying the challenge."

Dr. David Ginsberg,
Vice President,
Industry Solutions
Innovations, SAP

Teamwork and Rapid Prototyping Accelerate Innovative Results

"Through our partnering with SAP INSPIRE and Microsoft, we are able to extend our unique price zoning capability with an innovative visualization interface. The INSPIRE team helped design and deliver a sophisticated yet intuitive prototype which will help retailers fully utilize SAP's patented consumer demand technology more easily. This is a great example of a rapid prototyping approach to innovation, where projects are conceived and executed in a very short space of time with a small team and strategic partners."

Franz Färber
(askSAP/TREX), SAP

A Highly Motivated Team with Outstanding Domain Knowledge

"askSAP addresses an issue that has existed as a vision for a long time. The beauty of this approach is that it uses natural language processing technology to create intelligent and user-friendly searches within business data with fast response times. The askSAP-Team is highly motivated and possesses an outstanding domain knowledge. With the project close to turning into a real product enhancement soon, I see this as a quantum leap forward for TREX. I am confident that the first implementations for pilot customers in 2007 will be successful."

■ **icMap**

Mind-mapping constructs a bridge between the rational and intuitive worlds via visualization of objects in a hierarchical manner. The use of visual elements, like varying colors and shapes, helps users see the "big picture". The icMap project explores ways to use mind-mapping methodologies to visualize mental associations between all kinds of objects from different backend systems (SAP systems, legacy systems, etc). The approach is useful for situations which require human intervention, for example in planning and escalation scenarios, and in the "process-of-me" (visualizing one's own mental processes).

■ **Post-it**

Completion of the Post-it project will enable office employees to dispose of the ubiquitous yellow stickers on all manner of paperwork by exchanging them for digital notes. The digital stickers can be affixed to a wide variety of business applications, annotate documents with text and pictures, function as bookmarks, and replace the tedious workflow of the traditional review process. Over the course of its development, the Post-it team has been closely collaborating with several SAP product development groups with an eye to future implementation.

■ **PROVE**

The SAP Product Verification (PROVE) is an up-and-coming SAP solution. It will give legitimate vendors, distributors, wholesalers, consumers of products, and governmental organizations the ability to distinguish between genuine goods and counterfeits securely, as well as identify tampered or stolen products at any of their lifecycle stages. At ASUG/SAPPHIRE '06 in Orlando, Florida, team members conducted successful usability tests of the application. At TechEd 2006 in Amsterdam, PROVE was presented in the Demo Jam Session. Current development activities address the integration of PROVE services into the next release of mySAP SCM. In cooperation with Hewlett-Packard, the team is also about to build an anti-counterfeiting demonstration facility.

Screenshot from SimCorp

■ **SimCorp**

Decision makers face the uninspiring task of looking at dully-presented sales data on a daily basis. The SAP INSPIRE-ed SimCorp project will change all that. Named after a pun on the 1990s computer game "Sim City," the project will build an interactive visualization and simulation environment for decision makers to view and modify the direction of their business. The environment will display business objects in game-like scenarios and will connect them to SAP applications. The scenes can be two- or three-dimensional, or geographic. An abstraction layer makes the environment platform independent. An initial prototype was tested under the auspices of SAP Retail and Microsoft in Spring 2006.

Selected Highlights 2006

JANUARY

- Transfer of the **RFID demo center**, established in 2004 and initiated by SAP Research Palo Alto, to the SAP Auto-ID Product Team.

FEBRUARY

- Demonstration of SAP Research's comprehensive Industry Research Engagement (Healthcare, Government and Defense including Public Security) at the 6th **SAP Public Services Summit** in Mannheim, Germany.

MARCH

- Launch of the campus-based engineering center **CEC Darmstadt**, Germany at the Technical University Darmstadt. Focus is the Working Environment of the Future.
- Top researchers discuss current IT mega-trends and their respective visions for – and challenges facing – business, politics, and society at the **First International Research Forum** of SAP Research in Darmstadt, Germany.
- **EU Commissioner Redding** visits SAP Research demos of EU projects WearIT@Work and SNOW (Services for Nomadic Workers) at the **CeBIT** fair in Hannover, Germany.
- The **DKOM World Tour** (SAP Development Kick Off) features, amongst other innovations, the SAP Inspire Project **SSDC** (Semantic Service Discovery & Composition), **DIP** (Data, Information, and Process Integration with Semantic Web Services), and a **Digital Communities** Demo.

APRIL

- Opening of the **Enterprise Interoperability Center (EIC)** by the SAP Platform Ecosystem group and SAP Research, together with IBM and several other partners. (www.eic-community.org)
- **Estonian Prime Minister discusses SAP Research university activities** in view of potential collaborations with universities in Estonia during visit to the Technical University of Dresden.

MAY

- First **eMergency project prototypes** in the area of Public Security presented with SAP Public Security at **SAPPHIRE Paris**.
- SAP INSPIRE project **SimCorp** demos the "Retail Demand Intelligence-based Zone Optimization" case study **at SAPPHIRE Orlando and Paris** in cooperation with SAP Retail (Khimetrics) and Microsoft.
- Kick-off of strategic **Partnership with** France's **Institut Eurecom** on Security and Trust Research.
- Participation at EU-supported **Information Society Technologies (IST) Africa Conference** in South Africa. SAP Research presents "Opportunities for Technology Transfer".
- Launch of the **SAP Meraka Unit for Technology and Development (UTD)**, which will initiate and conduct both basic and applied information and communication technology research by SAP Research and the Meraka Institute in South Africa.
- SAP INSPIRE Projects **PROVE, and IcMap present and test prototypes** at the annual conference of the American SAP User Group **(ASUG)**.

Claudia Funke,
Director, McKinsey & Company

The International Research Forum – A catalyst for the Big Picture

"One of the biggest challenges for IT is not technology – it's what might be called the 'limited view'. Each contributor to the process of applying a new technology operates with a little idea of how the technology is to be used and what problem it is intended to solve. This deficiency tends to create problems in the design, implementation, and use of technological solutions. The first International Research Forum of SAP Research turned out to be a catalyst for this big picture view by gathering experts and thought leaders from around the globe in an intense discussion on the future of IT. I am looking forward to re-living this fascinating experience at next year's conference, and I am equally anxious to read the book generated by the discussion!"

Dr. Philemon Mjwara,
Director-General of the
Department of Science and
Technology (DST),
Republic of South Africa

SAP Puts a High Premium on Human Capital Development

"The Department's support for the establishment of the SAP Meraka Unit is part of a concerted effort to internationalize South African science and technology, and make South Africa a preferred destination for the location of global research and innovation capacities – including those of multinational companies. I specifically appreciate the high premium placed on human capital development by the SAP-Meraka partnership, especially in terms of making available training and fellowship opportunities for researchers from disadvantaged communities."

Prof. Dr. Max Mühlhäuser,
Department of Computer
Science, FB20 Telecoopera-
tion, Darmstadt University
of Technology, Germany

The Workplace of the Future

"The establishment of the SAP Research CEC Darmstadt intensifies and enlarges the long-standing, close cooperation between TU Darmstadt and SAP. The focus of our joint projects is the workplace of the future: For desktop users, much smarter and more adaptive interaction is key; for non-desktop users, minimal cognitive load and maximum contextual embedding are crucial. We consider our joint PhD program to be one of our most distinguishing features. A firm footing in the academic world ensures scientific excellence. Meanwhile, the link with SAP provides access to the global network of top-level industrial research and real-world evaluation environment that pure academic environments often lack."

JUNE

- **CoBIS trial at British Petroleum (BP)** United Kingdom – First industrial trial of next generation Radio Frequency Identification (RFID) tags aimed at helping energy providers better manage chemical inventory, increase stock visibility, and reinforce safe-handling business rules. (www.cobis-online.de)

- Decision to focus work in the **SAP Research Center Montreal**, Canada, on mobility research aiming in particular at providing SAP with light clients and middleware components for a low Total Cost of Ownership (TCO).

- **Master Research Collaboration Agreement** between SAP Research and the **Bogazici Universitesi** (Bosphorus University) Istanbul, Turkey, in the area of Flexible Manufacturing.

- SAP Research becomes part of newly established initiative **"Innovation strategies and knowledge management" of the Federation of German Industries (BDI)**. The initiative aims to identify and support sustainable technology clusters and consults with the German federal government on opportunities in application-oriented projects within the context of the "High-Tech Strategy".

- Launch of the **SensorNets Enterprise Service Community** as a platform for SAP partners and customers.

- Launch of the **PreCon project** (Predictive Scheduling and Conflict Resolution) directed by SAP Research's CEC in Dresden. The project involves several departments from the Technical University Dresden in the development of extended systems architecture for future manufacturing.

JULY

- **Think tank session with SAP Research and IBM on Next Generation Professional Services.** Topics discussed include pricing optimization, predictive modeling/demand forecasting/targeted marketing, demand innovation, and services 2.0.

- **"Cops & Robbers Las Vegas Style"** – Research Forum in Walldorf, Germany, with **Jeff Jonas**, Chief Scientist and IBM Distinguished Engineer, on the theme of "detecting unwanted guests even before they arrive at the casino".

- Establishment of **University Sponsored Research Program for North America** to strengthen academic relations in the Americas.

- Representatives of the **European Internet Foundation** (European Parliament) visit SAP Research Palo Alto, California to discuss differences in research and business practices in Europe and Silicon Valley.

- **Mobility Challenge** in Montreal brings together students from six universities and research centers to present and defend their concepts on the theme of mobile enterprise applications.

- **"Trust and Reputation Systems for Online Service Systems"** – Research Forum in Walldorf, Germany, with **Prof. Audun Jøsang**, Queensland University of Technology (QUT), Australia, lecturing about this significant trend in decision support for accessing online services and resources.

AUGUST

- **PROMISE** Trial at Fiat – Demonstration of RFID-enabled recycling in the automotive industry.
- Working with the SAP Supply Chain Management (SCM) Solutions Group, the Advanced Web Technologies Research Team introduces **prototype and demo scenarios for Extended Warehouse Management**.

SEPTEMBER

- **Official inauguration of CEC Belfast** in cooperation with the University of Ulster and Queen's University Belfast. The CEC focuses on Business Grids.
- Work begins at the first campus-based engineering center in Switzerland, **CEC St. Gallen**, in collaboration with the University of St. Gallen (HSG). Official inauguration is planned for the second half of 2007.
- Signing-off of **strategic research agreement between SAP Research and HP Labs**, the research arm of HP for key areas including Enterprise Service-oriented Architecture (ESOA), adaptive computing, and RFID/sensor networking technologies.
- SAP becomes a partner of the **Smart Factory** initiative, a technology program supporting the development, application, and propagation of innovative industrial plant technologies.
- **"Transforming Business Models from Web 2.0"** – Research Forum in Palo Alto, CA, with Nilofer Merchant and Mike Mace, Rubicon Consulting, Inc.

OCTOBER

- **First public subsidy for an SAP-funded academic project in Canada** granted for the Epidemiology project, funded by NSERC (Natural Sciences and Engineering Research Council of Canada).
- Start of collaboration between SAP Research and the German development finance institution Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG) on **South African rural health care**.
- **Annual conference of the German Gesellschaft fuer Informatik** (GI) in Dresden sponsored by SAP Research. Keynote on Business Webs by Lutz Heuser.
- **SAP Research joins the OpenAjax Alliance**, an organization of leading vendors, open source groups, and companies that use Ajax (Asynchronous JavaScript and XML).
- **Paraguayan Vice President** and delegation visit SAP Research in Walldorf to discuss research projects for emerging economies and review SAP public sector solutions.
- A **delegation of Taiwanese researchers** from the Industrial Technology Research Institute visits SAP Research Palo Alto, California to share thoughts and experience regarding product innovation.
- **First PhD Thesis at SAP Research** defended at CEC Dresden The dissertation is prepared under the auspices of the SNOW project.
- The **SNOW project** (Services for Nomadic Workers) successfully closes (www.snow-project.org)

Geraldine McBride,
President & CEO, Asia Pacific Region, SAP

Congratulations CEC Brisbane!

"SAP is committed to investing in the Australian R&D community and nurturing its world-class talent. Our investment is demonstrated by our ongoing support for SAP Research CEC Brisbane. The result has been exceptionally high quality work, which has also made significant contributions to SAP's technology R&D globally. Through connecting its research activities directly to the field, SAP Research CEC Brisbane effectively supports sales processes and strengthens customers' confidence in SAP's innovation potential. SAP Research fosters a positive market perception of SAP in the region. I would like to congratulate Karsten and his team on the 5th anniversary of CEC Brisbane!"

Keeping in Contact with the Real World

Steffen Goebel,
SAP Research, SAP

"While undertaking my Ph.D. at SAP Research, CEC Dresden gave me the opportunity to explore applied research and interesting technologies in an international team. I definitely learned a lot and realized the importance of keeping in contact with the real world while writing a dissertation. The positive working atmosphere in Dresden, the many fruitful discussions with my colleagues, and the tight collaboration with the Technical University of Dresden were always very helpful and inspiring, and finally led to the great results I achieved when defending my thesis."

Impressive Quality and Results

Pierre-Yves Pau,
Associate Director,
Network Investments,
Bell Mobility

"I was impressed with the quality and the results of the Mobility Challenge. Several student teams did very good work and demonstrated a keen understanding of the rising business challenges facing mobile services and solutions providers. The exchanges with fellow judges from various horizons also proved a productive mental exercise for me. Overall, I would qualify such initiatives as instrumental in helping rejuvenate the applications field and attracting the attention of the most talented students."

NOVEMBER

- Recognition of SAP Research's involvement in the **Africa Drive Project** (ADP). CEC Pretoria wins the **"Making Life Easy" Award** at the annual World Usability Day competition in South Africa. (www.adp-org.za)

- **CEC Brisbane celebrates its 5th anniversary** in the presence of university and industry partners and local government representatives. Founded in June 2001, the center has grown from three to 50 researchers.

- First stage of **manufacturing lab** implemented at CEC Dresden together with Festo as a real-world test environment for projects involving manufacturing execution and plant-to-business integration.

- The **MOSQUITO Project** (Mobile Workers' Secure Business Applications in Ubiquitous Environments) successfully closes. (www.mosquito-online.org)

- Working with the SAP Travel Management Solution Group, the Advanced Web Technologies Research Team introduces **prototype and demo scenarios for Hotel Location**.

- **"A new approach for a model-based development of spreadsheet applications"** – Research Forum in Walldorf, Germany, with **Prof. Dr. Gregor Engels**, University of Paderborn, Germany.

DECEMBER

- **Digital Communities project** is **deployed in Palo Alto**, California using the "Advanced Vehicle Tracking" component.

- **"The HEC Montréal ERP Simulation Game"** – Research Forum in Walldorf, Germany, with **Prof. Dr. Jacques Robert**, HEC Montréal, presenting a continuous time-market game where the only interface between players and the market environment is a real-life SAP system.

- SAP INSPIRE project **SimCorp** provides the visual application for SAP's participation at the Microsoft Windows Vista Launch Event. The "SAP Zone Optimization" application helps retailers test zoning scenarios and add their own experience and retail intuition to make informed decisions.

- **SAP donates US$250,000 to the Computer History Museum** in Mountain View, California for the purchase of a large collection of German computer artifacts. Ike Nassi initiated the idea for the donation.

- Decision to establish a **new SAP Research center at SAP Labs China** in Shanghai, beginning January 2007.

- As a result of the national **"IT Summit"**, the German Government launches the **"Theseus"** project focusing on research for the "Internet of Services". In this context, the **"Texo"** project, headed by SAP Research, will be working on solutions for Future Business Value Networks.

The Research Process

What will the technologies of tomorrow look like? How will they shape our society and the way business works? By constantly asking such questions, SAP researchers keep an ear to the ground to try to find out where technology is heading next. Thanks to its wide network of contacts, SAP Research is equipped to carry out the sophisticated trend scouting which lies at the heart of research work. Staying in touch with the research community through extensive contacts in academia and global industry has proven to be a sure way to gather viewpoints, new perspectives, and fresh ideas for future project opportunities.

In the last couple of years, technological research in the IT business has moved alongside a continuum spanning two poles. At one pole lies the model of hiring the best talent and letting them research, invent, and innovate without prescribed limits. At the opposing pole lies business-oriented research, undertaken in close collaboration with customers. SAP's research activities tend to be closer to this second pole, and provide a seamless mix of technical and business expertise.

THE SAP RESEARCH APPROACH

In Europe, most projects follow an integrated, long-term plan and are often executed jointly with groups of external partners, and frequently co-funded by external funding bodies such as the European Commission. In the United States, on the other hand, projects are jointly operated with other technological partners and academia and have somewhat flexible frameworks. A hallmark of projects in the United States is a shorter-term focus and proximity to market trends. A strong commitment to bringing innovation to customers and the active collaboration with customers in piloting emerging technological solutions binds these two research realities together. SAP Research constantly reviews projects and innovative ideas, looking for what works, what is relevant, and what should be discarded. This **screening process** takes the pulse of technological change and influences its direction.

The Group's activities operate according to different timescales. By differentiating between **applied research portfolios** of three years or less and **experimental research portfolios** of seven years or less, SAP Research is able to address technological trends of various durations. Some projects are also extremely short-term, lasting only up to one year. These are mostly transfer projects within SAP and projects run by SAP INSPIRE.

THE RESEARCH PROCESS IN ACTION

The applied research process of SAP Research is a lively process featuring a wide variety of interactions between the various research phases, the overall SAP development processes, and the necessary feedback loops within the product groups. The main focus is on new technological concepts and their potential integration into the SAP software environment.

1. Invent: Screening of technologies and dialogue with the research community leads to the identification of opportunities that will subsequently be expanded into **research plans**. SAP Research also generates many creative ideas internally.

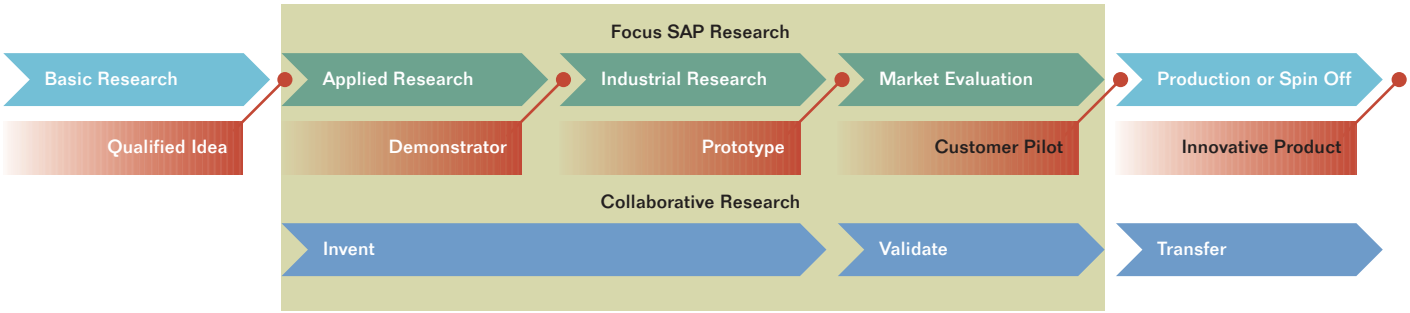
2. Validate: The research plans are then validated against current trends in consultation with technology providers and academic institutions. SAP Research also conducts initial investigations into the business relevance (market verification) of plans. A **research proposal** is written to enable a collaborative research project to commence. At the same time, white papers and conference papers are submitted to instigate further dialogue with the scientific community and the business world.

3. Collaborative Research: This stage marks the start of the collaborative research project. This outside-in-approach may include the preparation of an initial **feasibility study**, anticipated **use cases**, business scenarios, and technical concepts. Demonstrations and **prototypes** are created to showcase a project's technical feasibility, ease of use, or novelty as the project moves forwards. In addition, a **trial or research pilot** evaluates business potential and validates customer requirements in a real-world setting.

4. Transfer: Throughout the research process, the transfer of knowledge is driven by communication between Research Business Development and SAP's internal Development and Solution Management teams. Whitepapers, technical concepts, forums, and workshops facilitate the transfer of knowledge and/or technology decision processes. When the stakeholders have reached a product decision, a dedicated transfer project, based on **terms of engagement**, is implemented.

This linear process by no means captures the complexity of research work undertaken at SAP Research. SAP researchers use these process guidelines as benchmarks to monitor the progress of their work. They also use other methods to try to visualize customer needs.

The Research Process – From Idea to Innovative Product



Research Fields

FOCUSING ON TRENDS

Acknowledging that most innovations begin life as trends, SAP Research has spent the past couple of years focusing on several important new ideas. These trends all have the potential to alter the way business works dramatically. As a result, SAP Research pays attention to the potential of technologies that may be well beyond SAP's current solution portfolio but are still within the scope defined by its corporate strategy. The confluence of **social, business, and technological trends** forms the basis upon which most of SAP's research projects take shape.

FUTURE INSIGHTS

But what exactly is a trend? SAP Research sees a trend as a given market fact whose probable realization lies beyond the influence of SAP. One popular definition attests that a trend is a tendency with a certain statistical probability of occurrence that indicates the direction of a likely development. Trends are long-term changes within an environment. Extrapolating trends enables us to forecast the future. Some trends (globalization is a good example) that have an enormous impact on society are known as **megatrends**. Megatrends very often shape the market of the future.

The study of trends is important: Companies that only pay attention to the needs of today's customers are likely to miss opportunities with tomorrow's customers. Trend analysis complements market research through future insights that help to identify prospective customers and new product ideas. It can also help researchers pinpoint changes in technology that might radically alter one's industry. Companies need trend-based foresight. A wide range of trends influences business. Only companies possessing foresight can anticipate and prepare for these trends, and thus gain a competitive edge.

TREND-DRIVEN INNOVATION

The path from trend to innovation is complex because it involves the analysis of processes in the current environment, the gauging of potential implications, and the laying out of several scenarios in which markets may develop. Because trends can impact businesses and society in many ways, careful study of the market and its future potential is important. Only after close analysis will the forces of true innovative emerge.

Companies should not invest in technologies just because of hype. At the same time, companies should be wary of ignoring technologies that don't currently live up to early over-expectations. SAP Research is well equipped to perform the careful balancing act involved in understanding trends thanks to its basis in sound analysis and awareness of the latest IT research reports.

For example, in a study published in May 2006, the technology consultancy Gartner identified several **emerging trends** with vast potential for IT and business. Examples included the real-world Web (sensor networks and augmented reality), collective intelligence, and microcommerce. The report mentioned proactive business transparency, globalized microbusiness, and the growing role of aesthetics and design among emerging business trends.

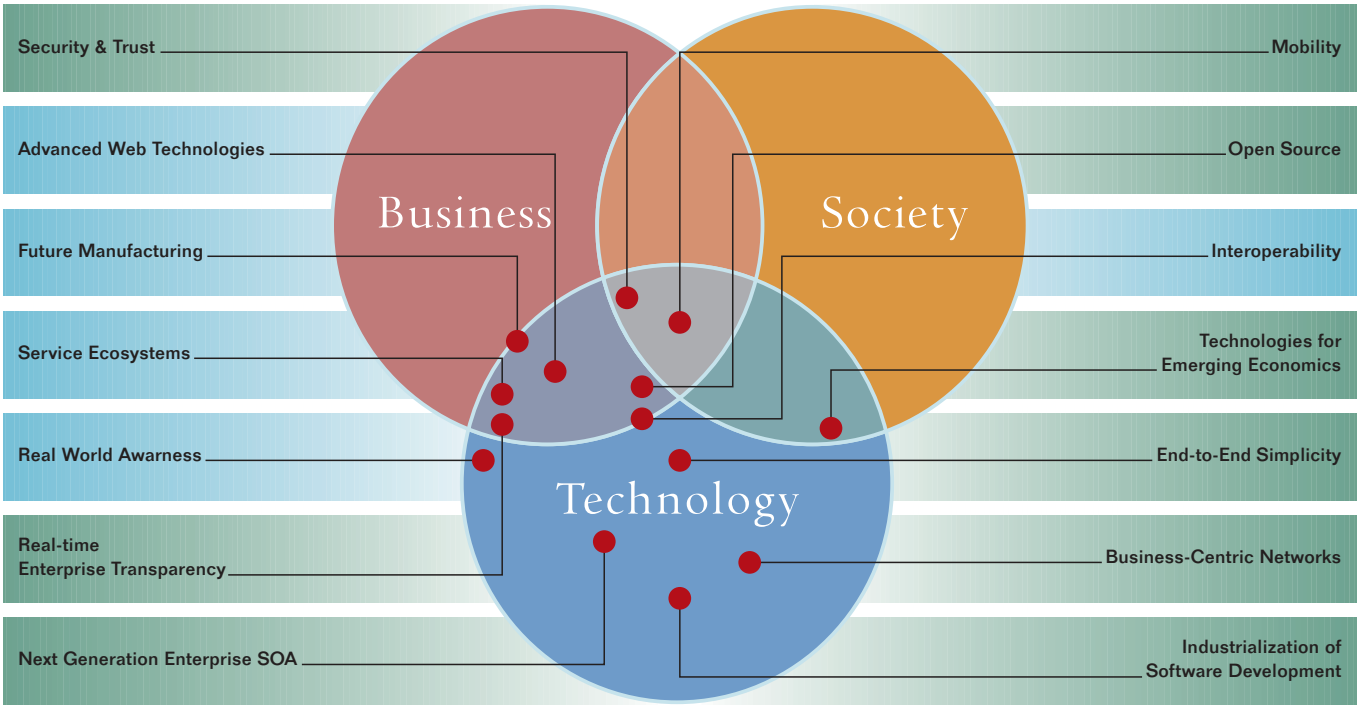
SAP Research collects and screens a wide range of industry reports. This is just the first step in SAP's trend development process. Next, researchers analyze the trends described in the reports and their key factors to gain an understanding of the drivers of change and their impact on future business opportunities. To avoid "a tunnel vision", the researchers frequently discusses emerging trends with external partners in industry and academia, soliciting their input to find the hottest topics and the most qualified partners with which to work.

TURNING TRENDS INTO RESEARCH FIELDS

In analyzing trends, SAP researchers prescribe to the idea that trends follow a specific pattern before they can be turned successfully into products. Researchers at SAP look at the nature of the trend in question – specifically, whether it runs in the same direction as – or opposite direction to – existing SAP Research fields. A new research field is borne when researchers discover a new trend that is not covered by an existing research field. Research fields are prioritized according to the market climate and the likelihood of their turning into a product at some point in the future. Research fields either end up becoming internal transfers or products.

In its exploration of current trends, SAP Research is focusing its activities on a dozen research fields, touching upon different aspects of technological, societal, and business change. **Each research field addresses a strategic field within a specific trend.** Research fields are implemented via research projects and aim at generating a significant product impact within SAP.

Research Fields



The five research fields highlighted in the graphic will be presented in greater detail on the following pages.

Interoperability

Buying an item online is so easy: Select the item, fill out the address form, submit payment, and wait for the courier to ring the doorbell. But what hides behind the flawless facade? A massive supply chain, potentially crossing national or even international boundaries, with numerous stakeholders and systems that need to work together for a product to reach its destination. In the past this process involved excesses of manual, costly, and error prone effort that invariably limit business demand. For a seamless transaction to occur, several companies in the supply chain depend upon enterprise systems working with each other to execute the order. This is called interoperability – the power to make something happen across functional and organizational borders.

With today's advanced technologies, it's hard to believe how difficult it can be for enterprise systems to "talk" to each other. SAP Research is tackling this challenge head-on by exploring the interoperability research field. Over the last couple of years, a network of contacts, technological expertise, and a long list of prototypical solutions was developed to help enterprise systems interact. SAP Research distinguishes business-level interoperability challenges from technical concerns and is dedicating its current research efforts to solving issues on both sides of the equation.

SAP researchers develop interoperability solutions to meet **two important business needs**. Firstly, companies expect and even require systems to be agile so they can react flexibly to changes in the market place and supply chain. SAP researchers address **agility for seamless interoperability** through leveraging Web service technologies. Secondly, because organizations typically boast **highly diverse software infrastructures**, they need interoperability solutions that easily fit in into existing architectures. Interoperability isn't simply an issue facing ICT systems; it concerns business processes and an enterprise's business context too. As such, SAP Research only considers interoperability successful when it addresses all aspects of a business.

PROJECT EXAMPLES

2006 was a very fruitful year for SAP Research in the field of interoperability. **ATHENA**, the flagship project in the interoperability research portfolio entered its mature phase, with several prototypes for modeling and executing cross-organizational business processes up and running by the end of the year. In April 2006, as a result of its work on the ATHENA Project, SAP Research became involved in the development and launch of the **Enterprise Interoperability Center** (EIC). Other activities included:

- **DIP** (Data, Information, and Process Integration within Semantic Web Services)
  Just as the telephone transformed the way we work a century ago, Semantic Web Services will provide a new infrastructure for eWork and eCommerce. Semantic Web Services provide an environment in which different Web services can see and cooperate with each other automatically. DIP aims to develop and extend Semantic Web and Web Service technologies in order to create a **new technology infrastructure for Semantic Web Services**. The project will help Semantic Web Services become a reality. In 2006 the project team delivered a presentation on the theme of "semantic consistency checking of message mappings" at DKOM06 in Frankfurt, Germany. DIP also achieved high marks in a final EU review by the European Commission.
  ▶ **www.dip.semanticweb.org**

- **TrustCoM**
  TrustCoM is a consortium of European companies working to develop a framework for trust, security, and contract management in dynamically-evolving virtual organizations. The framework will enable secure collaborative business process management and sharing in an on demand, self-managed, dynamic value-chain of businesses and governments. TrustCoM oversees three major arenas: **Collaborative Engineering** (B2B applications set in the aerospace industry); ad hoc **Aggregated Services** (such as groups of Web services composed of similar services); and **Virtual Communities** (the creation of credit unions for members of virtual communities).

- **Let's Dance**
  In 2006, SAP researchers in Australia developed a global modeling report outlining how SAP should proceed in terms of supporting global choreography models. In parallel with the findings, SAP researchers also developed a new modeling language, called "Let's Dance," for the high-level analysis and design of service interaction models. Let's Dance has been conceived as an alternative to Web Services Choreography Description Language (WS-CDL) and the Business Process Specification Schema, which similarly address the need to describe service interactions from a global perspective. Let's Dance distinguishes between two types of models: **global models** and **local models**. In a global model (also called a choreography model) interactions are described from the viewpoint of an ideal observer capable of overseeing all interactions between a set of services. A local model, meanwhile, focuses on a particular service, capturing only those interactions with which it is directly involved. Let's Dance local models can be mapped to platform-specific, executable counterparts. To ensure proper handover between analysts and implementers, Let's Dance comes with a set of techniques for analyzing global models and generating local models from global ones.

BUSINESS WEBS

SAP Research is using its experience in the Enterprise Interoperability domain to pioneer the concept of Business Webs.

These are flexibly and dynamically aggregated **future business value networks**. As such they form a wide network of service providers, service brokers, and service consumers. Business Webs build upon, combine, and extend service-oriented architectures, Web 2.0, and semantic technologies with new and innovative business models. They offer benefits for software providers, service providers, platform providers, and service consumers. (Also see "The Internet of Services" on page 38.)

Standards for the Future – ATHENA and the EIC

International companies need to collaborate. For collaboration to occur, heterogeneous enterprise systems must exchange data and link their business processes. Without innovative research results for the interoperability of enterprise systems and applications, companies will continue to waste time and money on ad hoc solutions. SAP Research and 25 leading research centers, technology vendors, and industry users from Europe, the United States, and Asia have joined forces to tackle this problem.

Launched as a three-year project in 2004 with sponsorship of the European Commission, **ATHENA** (Advanced Technologies for Interoperability of Heterogeneous Enterprise Networks and Their Applications) aims to provide comprehensive and relevant results in the field of enterprise application interoperability and initiate an interoperability community in the form of the Enterprise Interoperability Centre (EIC).

ATHENA not only focuses on IT issues such as information, application, and platform interoperability, but also on business processes, seeking to establish an integrated set of research solutions, supplemented with thorough business and economic research.

ESTABLISHING MECHANISMS FOR WORKING TOGETHER

SAP Research's participation in the ATHENA project has the potential to yield tangible results for increased interoperability of enterprises, thus helping SAP customers to facilitate business collaborations.

SAP researchers in Karlsruhe, Germany, and Brisbane, Australia, are working on such topics as:

- Cross-organizational business processes
- Service enablement of applications and business processes
- Compliance and business-requirement verification in business processes
- Semantic technologies for semantic data transformation
- Models for value assessment of interoperability technologies and projects

TANGIBLE RESULTS

The SAP Research team has already delivered prototypes for modeling and executing cross-organizational business processes and prototypes to link business processes into existing applications and systems. The team has also developed a rule-based business-level verification mechanism for cross-organizational business processes and a draft ontology defining selected core business concepts. Research results are already influencing a diverse array of SAP products.

- For example, SAP Research is cooperating with the SAP Automotive Industry Business Unit in the area of **Dealer Business Management**. The aim is to optimize business processes between automotive manufacturers and dealers, especially with regards to ordering cars and assessing the prices of used vehicles. Both teams are working to support communication standards for SAP Dealer Business Management and the automotive manufacturers' equivalents through the use of service-based interfaces. As such, the collaboration with SAP Research has already reaped breakthrough results.

- In 2005, SAP Research teamed up with the **Business Process Renovation** (BPR) team at SAP to capitalize on results and tools developed in the ATHENA, DIP and FUSION research projects:

J. Scot Sharland,
Executive Director, Automotive Industry Action Group (AIAG)

EIC – Towards Cross-company Business Processes

"AIAG has a successful history of working with global partners to ensure that global enterprises become reality. We have collaborated with SAP Research for the past three years on the ATHENA project and are enthusiastic about collaborating with the Enterprise Interoperability Center. With its focus on defining cross-industry processes, the EIC will eliminate conflicting implementation alternatives like optional data fields and message variants, and reduce ambiguities in the original standard specifications. We have a trusted and highly valued partner in SAP Research. We are looking forwards to extending this relationship to solve industry business problems, ensure interoperable solutions, and reap mutual benefits."

Prof. Michael Rosemann, Faculty of Information Technology, Queensland University of Technology

Advanced Conceptual Solutions for Inter-organisational Business Processes

"Within the last few years, Brisbane has gained an international reputation for its competence in Business Process Management. Growing maturity in this area has recently triggered an emerging interest in the design of inter-organizational business processes. Collaborative research projects between SAP, UQ and QUT have led to a number of advanced conceptual solutions in this area and a corresponding set of process-aware information systems. These support an increasing need for the collaborative modeling simulation and automated execution of inter-organizational business processes."

Kari Korpela, eBusiness Development, Lappeenranta Innovation Ltd. Finland

Addressing Interoperability Needs for eCustoms

"The overall aim at ITAIDE is to provide a roadmap addressing all interoperability needs for eCustoms. Based on our key findings in the paper industry we need to broaden our view how to reach SMEs. The major tasks are common naming and structuring conventions, resulting in the harmonization of eCustoms processes and the ability to compare industries and countries. The collaborative approach among the partners at ITAIDE like UPM, IBM Finland, Lappeenranta Innovation, SAP Research and Websoft Finland, is one of the key success factors to achieve that mission."

xCarrier is a service-oriented solution that enables shippers to integrate services from different carriers, ranging from parcel carriers to ocean carriers/portals, seamlessly. The solution, which leverages the SAP Enterprise Services Infrastructure, demonstrates how a shipper can integrate and orchestrate Web Services from SAP and different carriers for end-to-end collaboration. The project makes use of Business Process Management approaches and Semantic Web Technologies, including semantic annotation of Web Services and semantic reasoning techniques. These techniques enable machines to exchange data and make decisions without (or with only limited) human intervention.

▶ **www.athena-ip.org**

THE ENTERPRISE INTEROPERABILITY CENTER (EIC)

Initiated by the ATHENA project, the Enterprise Interoperability Center (EIC) was established in April 2006 under the auspices of the SAP Platform Ecosystem group. The EIC is an **independent consensus-building platform** consisting of major stakeholders in interoperability.

The EIC initiates business forums that bring together users, vendors, and standard organizations to address specific cross-company (or cross-industry) business scenarios.

The forum results in three successive deliverables:

- Use case description
- Business process specification
- Interoperability Profile, including the specification of a set of message and platform standards.

The EIC will use ATHENA's research and recommendations for the development of **EIC Interoperability Profiles** specifying how open message and platform standards should be applied and interpreted to implement pre-defined business processes. The ultimate goal of EIC Interoperability Profiles is to foster the implementation of existing open **B2B standards**.

They are intended to provide guidance regarding implementation alternatives, sharpen verbal specifications and reduce ambiguities in the original standard specifications. Identified gaps or weaknesses are then reflected back to Standards Development Organizations by providing them with a gap report.

"EIC will eliminate conflicting implementation alternatives like optional data fields or message variants and reduce ambiguities in the original standard specifications," says Michael Bechauf, Vice President of Industry Standards, responsible for SAP's participation in the EIC as part of SAP's Platform Ecosystem team.

To ensure high-quality standards, researchers evaluate interoperability profiles in prototype implementations before releasing them. SAP products benefit from using the EIC interoperability profiles thanks to their enhanced support of cross-industry business processes.

EIC membership includes (but is not limited to) founding members SAP, IBM, the International Alliance for Interoperability (IAI), and the University of St. Gallen (HSG) in Switzerland.

▶ **www.eic-community.org**

Service Ecosystems

More than 80 million people worldwide use PayPal, the online payment and money transfer service. Several million more buy books and other items on Amazon.com. What lies behind these remarkable numbers is the increased use of Web-based intermediaries and the surge of on-demand applications (software-as-a-service). Service ecosystems provide the framework that make these services possible by bringing together applications syndicated from different service providers. These complex structures offer service providers increased service visibility and market channels, increased efficiency from outsourced service delivery, and economies-of-scale support for SME (Small and Midsize Enterprise) re-sellers. Service ecosystems enable competitive pricing for consumers, as well as flexible sourcing, and resilience against service outages at individual providers, among other benefits.

Where does SAP stand in relation to this important service ecosystems movement? As a pioneer of service-oriented architecture research, SAP Research has been actively exploring the service ecosystems trend with a clear strategy to build flexible service procurement networks.

The road ahead holds numerous challenges. Issues include the time-lag inherent in delivering services to new, unforeseen markets, difficulties in outsourcing service delivery to third parties or credible suppliers, and limited marketplace style transactions, to name only a few. But because SAP Research's current activities cover a broad arena of untapped potential, it won't be long before these problems are relegated to the past.

NEXT-GENERATION "APPLISTRUCTURE"

SAP researchers explore requirements for service ecosystems, emerging service delivery roles such as service brokers (e.g. iTunes), and exposed business models. In so doing, SAP Research is actively shaping the debate on service ecosystems and is contributing to the upgrade of the state-of-the-art service delivery platform (SDP) – a subject of intense investigation by service-intensive industries including the media, and the telecommunications and public sectors. SAP Research is working to solve complex research problems that go beyond current architecture and interoperability research developments.

The bottom line is that service-oriented architecture offers greater flexibility to clients, opens up new business horizons, and creates innovative, revenue-generating functions. Whereas solutions provided by most online sellers are legacy or hosted solutions, SAP's next-generation applications and infrastructure, currently being explored by SAP Research, will support service provider heterogeneity. SAP Research is playing a key role in bringing SAP's business applications to a point where they can support service ecosystems for SAP clients with next-generation "applistructure".

EXAMPLES FROM 2006

- **SUPER** (Semantics Utilized for Process Management within and Between Enterprises)
  SUPER is driving a quantum leap in business process management by improving the modeling and managing of business processes through integrating and utilizing semantics. SUPER operates within a couple of architectural layers (corresponding to today's de-facto layering of application systems) to combine Semantic Web Services and business process management technologies.

  SAP Research accomplished two major milestones in 2006: the development of a comprehensive **framework for (semantic) Web service composition** and the development of a comprehensive **ontology stack to describe semantic business processes** across all modeling levels.

  ▶ **www.ip-super.org**

- **Australian Research Council : Service Ecosystems Management for Collaborative Process Improvement**
  Streamlining cross-organizational processes based on service-oriented solutions is a promising way to leverage organizational performance. However, the establishment and improvement of intra-organizational processes depends upon the development of an overarching methodology for such a service ecosystem. This project seeks to provide a general framework and methodology for the consistent definition of services, design of user-centered service repositories, corresponding incentive and accountability structures, and efficient service discovery mechanisms in service ecosystems. In collaboration with two external partners, SAP Research plans to design and test a prototype for a cross-agency service ecosystem within governmental structures.

- **Collaboration with SAP IBU Communications: Seamless integration of networking and communications infrastructure**
  Under the auspices of its "Service Ecosystems" and "Business Centric Networks" research fields, SAP Research is investigating new ways of supplying, composing, brokering, mediating, and delivering web services. In addition to flexible ways of supporting service delivery intermediaries from the supply side, new models for the demand side are emerging, including service-targeting of users and innovative multi-modal presentation mechanisms.

  Working in collaboration with SAP's Industry Business Unit (IBU) Communications (the group responsible for telecommunications and media industries) SAP Research is investigating future business opportunities to support **innovative web services in converging networks for consumer and business environments**.

  Working with SAP customers and partners, researchers from Brisbane, Australia, and Darmstadt, Germany, are analyzing both existing and emerging processes, including professional information publishing through convergent business channels such as digital IPTV via broadband Internet. The researchers are also examining ways of achieving a seamless integration of networking and communications infrastructure with classical middleware.

A New Dimension: The Internet of Services

In most countries, moving house involves announcing the change to a host of different authorities. Registering with the police, re-directing mail, and installing a new phone line are among the most time-consuming tasks. What if all those administrative chores were handled through a single platform? Welcome to the Internet of Services.

The Internet of Services is a relatively novel concept. All people, machines, and goods will have access to it by leveraging the network infrastructure of tomorrow. The Internet will thus offer services for all areas of life, such as virtual insurance, online banking and music, and so on. Those services will require a complex services infrastructure including Service delivery platforms bringing together demand and supply. Building blocks for the Internet of Services are SOA, Web2.0 and Semantics on the Technology side as well as novel business models, and approaches to systematic and community based innovation.

Current Web services offerings demonstrate the importance of enabling services to connect to each other to create added value for clients. It won't be long before service ecosystems, where not a single service but an entire network of services, are considered to be the most economically beneficial model.

SAP Research is currently involved in two major initiatives in this area: The **THESEUS Program**[1)] in Germany and the **Smart Services Cooperative Research Center (CRC)** in Australia. Thanks to the cross-fertilization of these initiatives, SAP researchers are looking into ways of linking up work on the two projects and thus form one of the largest research clusters in the world in this field.

THE LIGHTHOUSE: THESEUS

The THESEUS Program is a lighthouse initiative of the German government and forms part of the German High-Tech-Strategy. It is an umbrella for several projects aiming to develop products, business models, and markets that will allow users and companies to access services, content, and knowledge around the clock and all over the world.

SAP Research plans to launch the TEXO project within THESEUS. Partners include **industry heavyweights and renowned academic institutions in Europe**. Most of the partners are leaders in their fields and can guarantee the implementation of project results. Furthermore, they have extensive networks of their own and strong growth potential. Early prototypes and numerous case studies ensure industry relevance. Technological challenges include the use of semantics to describe content easily and efficiently, provision of personalized service offerings and ensuring the interoperability of serviceoriented architectures.

Europe itself is a fertile ground for such research work. Through long years of targeted research activities, the continent has accumulated a significant wealth of experience and knowledge, e.g. in the field of semantic technologies, which boast clear economic potential.

BUSINESS VALUE NETWORKS

Research in the **TEXO** project will focus on Future Business Value Networks which will be characterized by applications that are flexibly and dynamically aggregated, and a wide network of service providers, service brokers and service consumers. They are based on an architectural framework

[1)] On the condition that EU notification is given

Prof. Darrell Williamson,
CEO & Research Director Smart Internet CRC

A Rapid Shift in the Media Space

"We are witnessing a rapid shift in the media space which requires an understanding of social science, new business models and usability beyond technology. Software tools must be constructed in a more user-friendly way, be capable of scaling to thousands of individual consumer needs, and encapsulate security, trust, and privacy requirements. Personalized media, financial and eGovernment services will all have different requirements while the implementation must remain commercially cost-effective. Further challenges include the ability to create and orchestrate 'aggregated services' involving multiple providers quickly to deliver long-distance services while maintaining a consistent look and feel irrespective of the particular Internet and/or mobile channel being used."

Harald Hinderer,
Vice President IBU
Communications, SAP

Adapt Quickly to New Technology and Business Models

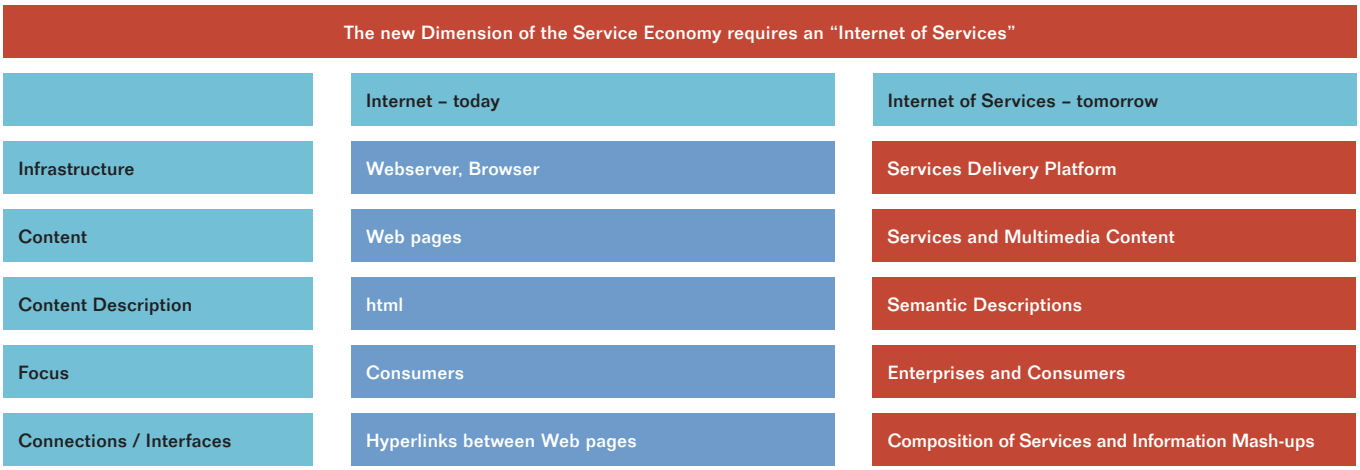
"Classic telecommunications and media markets are heading towards digital service distribution via user-centric broadband. Technological changes are swiftly spawning new business models; agile new market entrants are demanding their piece of the pie. Existing players have no choice but to adapt quickly and radically to capture new opportunities in this highly competitive environment. IBU Communications and SAP Research demonstrate collaborative innovation at work by addressing these issues in their joint research project. I am confident that the team will master the challenges involved successfully."

Carsten Ziegler,
Development Architect and
Project Manager,
Application Platform, SAP

Simple, Pragmatic Cooperation

"In the beginning, we challenged SAP Research with a concrete technological need. On the basis of expertise already gathered in other projects, SAP researchers were able to provide a conceptual framework and experiment with prototypical solutions for the efficient integration of third-party Business Rule Management Systems with existing Formula & Derivation Tool functionality. I really appreciate our pragmatic and uncomplicated alliance with SAP Research, the results of which go far beyond my expectations of what a research organization might provide."

The Internet of Services



associated with service marketplaces, dynamic business chains, semantic technologies, service ecosystems, and mash-up technologies. Future Business Value Networks also enable service providers to react quickly to service demands and allow for the wide availability of provided services. They will provide an opportunity to create and drive a **new service "industry"** for producing, changing, adapting, (re-)selling, and operating services.

SAP Research will be closely involved in the development of new business models for the various stakeholders (i.e. software providers, service providers, and brokers as well as service consumers), flexible service composition approaches, and prototyping of platform and business services.

Other important areas are the management and fostering of innovation in value networks, rich interactive UIs, service community support and the semantic enablement of business applications for easier integration in value networks.

A NEW DIMENSION OF SERVICES

Semantic infrastructures developed within the THESEUS Program will bring about **novel commercial applications on the Internet**. The project will focus on business services, online media, and healthcare. For private users, THESEUS will develop **customizable interactive services** that will facilitate access to multimedia content, services and knowledge. Specifically, it will create innovative solutions to promote easy access and handling of multimedia and business-related content and services over the Internet. These solutions will include technological modules, business models, services, and applications.

THESEUS is expected to contribute to the service-oriented economy of tomorrow. All the major industrial partners support the diverse and innovative potential of Web technology. For example, SAP is spearheading the development of so-called **Business Webs**. By bringing SAP's expertise to the project, researchers will create a very different, new dimension of the service-oriented economy.

What will this new dimension look like? The Internet of Services will use a **service delivery platform** in place of today's web server and browser. Content will not be delivered via web sites, but in the form of services and multimedia. This change will necessitate the use of semantic descriptions instead of HTML code. Hyperlinks will be complemented by information mash-ups and service compositions.

Single users, businesses, and authorities will all benefit from this new Internet. The service spectrum of THESEUS encompasses virtually represented services (like logistics processes in supply chain management), virtual products (like insurance), and entirely virtual services (like electronic municipal elections).

SMART SERVICES COOPERATIVE RESEARCH CENTRE (CRC) IN AUSTRALIA

Since early 2006, SAP Research in Australia has been collaborating with 23 partners from Australian industrial, academic, and governmental organizations to set up a "Cooperative Research Centre" (CRC), dedicated to investigating "Smart Services". Partially funded by the Australian Department of Education, Science, and Training (DEST), the Center will provide another cutting-edge platform for exploring the value of **semantic Web services** and their deployment as "smart services". Having been accepted by DEST shortly before Christmas 2006, the Center will officially commence work in July 2007. The CRC would perfectly complement SAP Research's efforts within the THESEUS Program. Research on Smart Services will be conducted in six programs: two in the media sector, two in finance, and two in governmental services. Efforts will focus on three research themes: Smart Business Choices for Disruptive Service Economies, Disruptive Services Ecosystems, and Richly Interactive Service Interfaces.

TRENDSETTING COOPERATION ...

The CRC program refers to a national funding scheme entitled Cooperative Research Centre (CRC). The system was established to **bring together researchers and research users**. CRCs are funded in part by the Australian Government for up to seven years. SAP Research has been invited by its long standing research partner Queensland University of Technology (QUT) to contribute research on Smart Services through the CRC. Expected outcomes include a dramatic shift in how services are run in modern societies, emerging new business models, the idea of software as a service, and the exploitation of enterprise service-oriented architecture opportunities.

Smart Services CRC will develop and deliver **innovative, high-value online services** that strengthen Australia's services economy by significantly increasing productivity. It will also enhance global competitiveness in sectors that are poised for dramatic growth. The focus will be on the enhancement of service delivery in the finance, digital media, and government service sectors. These sectors have significant impact on other sectors in the service industry. While each sector has its own structure and characteristics, developing and implementing online services that are profitable, fulfill customer expectations, and work effectively with existing business models presents common challenges for researchers, no matter the sector. Smart Services CRC will provide its current and new participants with the means to anticipate and **take advantage of the rapid transformations in service industries** based on the impending ubiquitous availability of broadband Internet and mobile communications.

There are several reasons behind SAP Research's participation in the project. Not only has Smart Services CRC attracted **a strong consortium of Australian and international players**. It also fits well in the SAP Research portfolio and with the planned work in the **THESEUS** Program, especially in the media branch.

... TOWARDS A SERVICE-ORIENTED BUSINESS MODEL

Within the CRC, SAP Research will develop Smart Services technology for eventual incorporation into SAP products. SAP will be involved in the development and trial of relevant software and will also gain expertise and access to technology and training for building systems as well as educating its customers and staff in the deployment and development of online services. Specifically, SAP intends to develop a **portfolio of dynamic supply chain service software** incorporating Smart Services technology for discovering and aggregating services, handling security and multi-level payments, and integrating with fleet management software for just-in-time delivery.

Both the THESEUS Program and Smart Services CRC – by attracting partners in industry and academia from around the world to collaborate in the area of Smart Services Technology – will help to shift the IT industry towards a (software) service-oriented business model.

Advanced Web Technologies

Although the general public may not be familiar with the buzzword "Web 2.0", technologies linked to this much-hyped phrase are becoming commonplace for consumers who use Wikipedia, Google Maps or Yahoo Widgets. Coined in 2004 by Tim O'Reilly, Web 2.0 refers to a second generation of Internet-based capabilities—such as widgets, mashups, wikis, social networking sites, and folksonomies (user-generated categorization)—that emphasize richer user experiences and collaborations. These technologies are defined by user empowerment and choice, as opposed to the first wave of Internet technologies where users were passive consumers of Web technologies.

SAP Research has been collaborating with other groups within SAP to understand how these technologies might be applied to business software. Initial efforts have focused on Rich Internet Applications using capabilities such as **widgets** (interactive user controls), **Ajax** (technologies for more responsive Web interactions), and **mashups** (compound services that enhance the user experience, such as showing business locations on maps).

PIONEERING NEW TECHNOLOGIES

SAP Researchers defined scenarios and built prototypes with SAP Supply Chain Management (SCM) on an **Extended Warehousing Management Demo** that involves workers moving products guided by mobile devices, with supervisors monitoring activities and resources in real time. The Warehouse Demo illustrates type-ahead (helps users fill in fields), mouse-over (shows worker information when users scroll over worker icons), mapping for warehouses, and mashups combining worker locations in warehouses with text messaging and phone calls. In addition, researchers are working with SAP Travel on **hotel booking scenarios** and prototypes to help people find hotels in their price-range in a specified location. Hotel Demo capabilities include external services linking (so that changing an address automatically changes lists of hotels near that address, as well as a mashup displaying maps with hotel locations), dynamically-changing distance and price criteria (using sliders), showing room rates for a particular hotel (using the mouse-over function), and pre-filled input fields based on a user's profile.

SAP Research also leads internal company efforts to use **wikis and blogs**. SAP Research's use of MediaWiki, the technology behind Wikipedia, has been emulated by a number of other SAP groups. SAP researchers have created a tagging prototype and expect to further their work on collaborative software and social Web projects in the future.

INVESTIGATING OPPORTUNITIES FOR WEB 2.0 IMPLEMENTATION

SAP Researchers are currently addressing several key Web 2.0 implementation projects aimed at enterprise users. One project revolves around the incorporation of such features as security and privacy, transactions and processes integration, real-time notification, and manageability, into advanced Web technologies with business services from both SAP and other companies. Another important project will address the needs of **mobile users**, who may not always be connected to the Web. The research challenge is to integrate flexible capabilities associated with Web 2.0 while retaining business requirements such as stability, reliability, and predictability. SAP Research has identified and is investigating significant opportunities for industry leadership, product impact, and enhanced customer experience.

SAP Research is also keenly interested in thinking about the future of both the industry and customer needs. As such, SAP Research frequently participates in industry consortia and standards groups. SAP Research hosted two **Web 2.0 think tanks** in 2006. The first, involving Web 2.0 companies, was held in Palo Alto, California, in August. A second Palo Alto think tank in September involved selected SAP customers. Both meetings produced insights into the level of awareness and acceptance of Web 2.0 among companies, and helped SAP Research define key enterprise Web 2.0 challenges such as stability and reliability, security and privacy, flexibility, scalability, manageability, and auditing. SAP Research has also presented its work at external forums including SDN Day at SAP TechEd in Las Vegas, Nevada, and at AjaxWorld in San Jose, California.

Screenshot from "Travel 2.0 Hotel Booking Scenario"

OPEN SOURCE

SAP Research is an active participant in the **OpenAjax Alliance**, an organization of leading vendors, open source groups, and companies that use Ajax. OpenAjax's activities are geared towards accelerating adoption of open and interoperable practices using Ajax-based Web technologies. The group's primary objective is to drive success of the Ajax ecosystem by improving customers' ability to mix and match solutions from Ajax technology providers.

▶ **www.openajax.org**

Real World Awareness

Imagine a future where everyday objects, assets, and machines are able to communicate with their environment, as well as among themselves. Described as the "Internet of Things," this scenario is not so distant a possibility as one might think. The information gap between the physical and virtual worlds is narrowing fast and research into developing the futuristic environments described above is actually quite advanced. SAP Research's Real World Awareness project is playing a major role in the realization of the Internet of Things.

BUT WHAT EXACTLY IS REAL WORLD AWARENESS?

In the past, physical assets have generally worked in isolation with functions and services acting locally within limited physical environments. Today, the status quo is changing dramatically, fueled by the convergence of low-cost computing and the increased availability of ubiquitous networking (Internet, wireless communications) as well as by devices becoming smaller and handier to use. Thanks to these developments, physical assets are evolving into networks of interconnected, interactive systems. In the future, such **embedded systems** are expected to become even more pervasive than desktop computing.

Sensor networks and embedded systems promote increased levels of "**collective intelligence**," embracing a vision of environments in which intelligent objects work together towards common goals. Increased connectivity spawns real-time awareness – the pervasive availability of data and information in real time. Simultaneously, the use and integration of sensor and mobile devices into business application scenarios increases the accuracy of data. Despite huge breakthroughs in usability, the revolution in networked embedded systems brings with it new challenges. These include interoperability, increased complexity, and vulnerability to attacks.

SAP is already investing in the field of networked embedded systems and RFID-related technologies. SAP Research understands the importance of real-time awareness in optimizing business process automation. The group therefore focuses on new ideas, adding a business context to sensor events and real-world data.

TANGIBLE RESULTS

As part of its efforts to shape the Real World Awareness revolution, SAP Research launched the **Enterprise Service Community (ESC) for SensorNets** in 2006. The community program allows SAP Research to bring industry leaders like IBM, Intel, SUN, SIEMENS, and ABB, as well as promising innovative start-up companies together as a community. This allows ongoing discussions about business models, architectural concepts, and customer opportunities. Currently boasting more than 20 members, the success of the community program already exceeds expectations.

Scott Allen,
Industry Segments Director – SAP Alliance,
Intel Corporation

Leading Edge Technologies for Public Safety

"Our work with SAP Research directly benefits SAP and our customers by developing innovative use models, testing leading edge platform technologies to help make future products work better together, and finding areas where we can jointly drive technology forward. A great example is our work in Digital Communities with the City of Palo Alto. We are developing a system for tracking city owned fire engines and helping improve those units' ability to respond to urgent citizen needs. This project offers a glimpse of how, in the future, SAP and Intel might help mid-size communities worldwide improve public safety and maximize the use of city owned assets through the application of jointly developed technologies."

Dr. Andreas Backhaus,
Director Agricultural
Products, BASF

SAP Research will Bring New Value to Our Collaboration with SAP!

"SAP is a long standing partner for our IT landscape and a trusted advisor to our business and future strategy. When SAP's global account director introduced SAP Research to us we developed a new perspective on our relationship with SAP. The Lighthouse pilot model introduces a way to pick up research results and apply them to the processes within our enterprise and learn about the immediate impact technology will have on our business. We are looking forward to this great opportunity and are currently working on identifying our first project."

Richard Bravman,
Chairman and CEO,
Intelleflex

Partnerships Take us Forwards

"As an early-stage company, it is important for us to be able to partner successfully with industry heavy-weights like SAP. Conversely, we're committed to bringing SAP the benefit of our applied technology experience in RFID and sensor networks. (Our capabilities have recently been recognized by Boeing, who chose our RFID tags for the "smart labeling" of maintenance-significant parts.) We're delighted to participate in the SAP RFID and SensorNets community, which we see as a powerful new approach to forging relationships that benefit SAP Research, SAP overall, and emerging companies like Intelleflex alike."

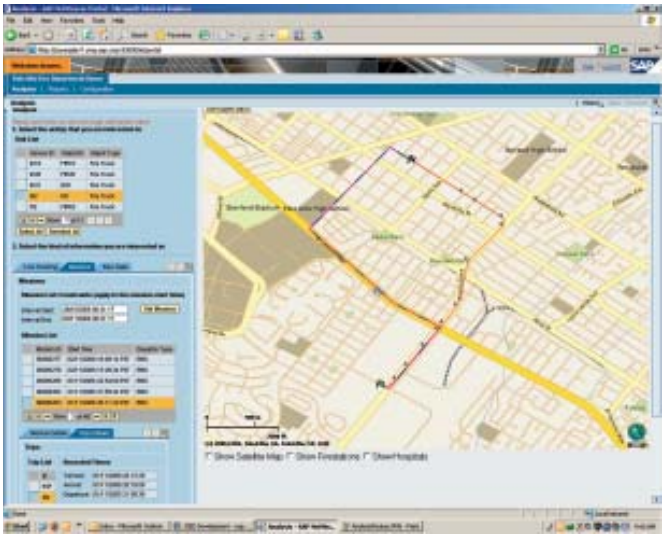
The following projects and their results stood out in 2006 from a very broad project portfolio established to tackle a wide array of Real World Awareness research areas:

- Kicking off with the **Automatic Vehicle Tracking** service component, the **Digital Communities** project is built on SAP NetWeaver and allows post-incident analysis of real-time location data gathered from network-enabled and specially-equipped fire trucks in Palo Alto, California. All data gathered during emergency situations is fed back to SAP and the resulting reports are given to the fire department in Palo Alto. SAP Research is now extending the project to encompass a **"water monitoring" component**. This component will enable the early-stage detection of water leaks and spills as well as water contamination in civic areas. Authorities will then be able to react accordingly with the help of highly specialized sensors that form a mesh network and relay data back to the SAP system.

- Several research activities are underway in the telematics domain area, using sensor and diagnostic information from "smart" vehicles supporting business processes in the fields of predictive maintenance, product lifecycle management, and fleet management. One project with the code name **CarWeaver** is also investigating the potential to use vehicles as work environments in collaboration with mobile devices. **PROMISE** is an EU-funded project in the same domain. In collaboration with numerous partners, among them Italian automaker FIAT, the project is investigating how RFID and other technologies might help companies create new revenue streams from scrapped vehicles.

▶ **www.promise.no**

- From its inception in June 2006, the **ATLAS** project aims to develop a prototype for a Master Control Center (MCC). The MCC manages and controls everyday incidents and catastrophes involving several security agencies (e.g. the intelligence community, customs, the police force, fire fighters etc.) that require secure, cross-site views, decision processes, and end-to-end workflow processing. ATLAS will connect and integrate the prototype to whatever is feasible within the SAP landscape. In so doing, ATLAS will demonstrate the quantity and type of existing solutions and technologies that might enable the basic functionality of the MCC, using maps as the user interface and sensory data as one possible input channel.



Screenshot from "Automatic Vehicle Tracking" (Digital Communities)

AWARD-WINNING COLLABORATION

Besides working with external research partners and customers to develop the projects described above, SAP Research emphasizes its strong alignment with SAP's product technology groups. For example, the cooperation between SAP Research and SAP Product Technology Group's Supply Chain Management was recognized as **SAP Labs Most Valuable Player Award** in the "Innovation" category in Summer 2006. The award acknowledges the team behind the greatest innovative breakthrough of the last 12 months.

An Innovative Concept: Collaborative Business Items – CoBIs

BUSINESS LOGIC FOR PHYSICAL ENTITIES

CoBIs is one of SAP Research's most high-profile projects. The EU-funded research initiative aims at determining **how RFID and sensor network technologies can help to manage chemical inventory, increase stock visibility, and reinforce business safety rules**. Partners in the project include SAP, Infineon Technologies, BP, TecO (University of Karlsruhe), Ambient Systems, Lancaster University, and the University of Twente.

CoBIs focuses on developing a new approach to business processes that involve physical entities such as goods and tools in enterprise environments. The project aims to use advances in networked systems to **embed business logic into these physical entities**. The creation of "Collaborative Business Items" (CoBIs) – the project's ultimate goal – will enable enterprises to better understand the relationship between the state of their business processes and what is actually happening in the real world.

CoBIs will facilitate the application of networked embedded systems technologies within large-scale business processes and enterprise systems through developing a platform for directly **handling processes at the specific "point of action"** rather than via a centralized back-end system.

Project objectives include:

- modeling of embedded business services,
- developing the necessary collaborative and technology frameworks,
- matching management support,
- investigating and evaluating CoBIs through real world application trials within the oil and gas industries.

This **service-oriented approach** is novel within the arena of wireless sensor network research. It will enable the seamless integration of the technologies into enterprise software systems like the SAP Environment, Health & Safety solution, thus supporting important business processes involving physical entities in large-scale enterprise environments. The distribution and execution of **business logic** locally at the "point of action" – coupled with the maintenance of a centralized management and monitoring functionality – offers great benefits to industry in terms of scalability and response time, as well as network and infrastructure independence.

CoBIs Sensor Node

TRUE "SMART ITEMS"

The architecture of CoBIs was completed in 2006. The design includes components that deploy business logic in the form of services to physical entities, as well as components that manage and monitor the entire network of sensor nodes. SAP Research completed the first application trial of CoBIs at a BP chemical plant in the United Kingdom.

Research activities focus on the development and integrated application-driven operation of Collaborative Business Items that utilize a wide spectrum of sensor network technologies. Since these Items are considered to be much **"smarter" than systems tagged with regular RFID transponders**, they can play a more active role in business processes. The project aims to delegate well-defined components of business logic functionality (that is, process execution) from resource-intensive backend systems to relatively low-cost networked, embedded systems that run at the point of action. These tiny systems utilize sensor network technologies. The sensor network technologies enable them to develop **collaborative "teams"** in order to reach particular results determined by the needs of the supported business processes.

Ken Douglas,
Technology Director BP

Laying the Groundwork for the Solutions of Tomorrow

"BP is actively exploring new technologies to improve safety, solve business problems, and improve efficiency. As a key part of this strategy, we are investing greatly in a variety of development and applied research projects around sensory networks. Our collaboration with SAP Research within the CoBIs project is helping to overcome the challenge of handover and adoption by looking at how to integrate technology with business processes. During a recent trial at one of our plants, CoBIs helped us better manage chemical inventory, increase stock visibility and reinforce safe-handling business rules. I clearly see the CoBIs project as laying the groundwork for the solutions of tomorrow."

Amar Singh,
Senior Vice President
Development
SCM/PLM/Manufacturing,
SAP

An Unbiased View is Critical for the Development of Innovative Products

"As an SAP product group, it's critical for us to work with SAP Research on cutting-edge topics such as Real World Awareness and Advanced Web Technologies. We and our customers both benefit from the unbiased view and technical excellence that researchers add to our collaboration, which is critical to the transformation of complex ideas such as RFID and Web 2.0 technologies into innovative products. Researchers help us develop new ideas and prove their value by working with selected customers. The deployment of an RFID system to manage the storage of hazardous goods at BP was made possible by the leadership of SAP Research."

Krish Mantripragada,
Senior Director,
RFID & SCM Solutions,
SAP

We Need Our Researchers Close by

"I am very proud that the collaboration between the Product & Technology Group and SAP Research in the area of Real World Awareness received the first ever 'SAP Labs Most Valuable Player Award' in the 'Innovation' category. This internal award recognizes the greatest innovative breakthrough in the last 12 months and is an excellent sign of how SAP researchers are helping us turn new ideas and technologies into products. A good example within the RFID space is the Auto-ID infrastructure which has been successfully positioned in the market."

BP TRIAL AT U.K. PLANT

On June 12, the British energy company BP began the first application trial of the CoBIs project at its chemical plant in Hull, UK. The energy provider hopes the pilot will help it to better manage chemical inventory, increase stock visibility, and reinforce safe-handling business rules.

Safe-handling business rules include preventing highly reactive materials, such as peroxides and other oxidizing agents, from being stored together. BP currently prevents this hazard through the implementation of manual processes and staff training, but these methods can be improved. In the CoBIs trial, chemical drums are tagged with sensor nodes enabling them to **detect any 'incompatible' materials** in close proximity. The system triggers an alert when highly reactive materials come within range of the sensors. During the six-week experiment, around 20 drums were tagged. The results showed that both hardware and software can be successfully deployed in a real world setting.

PEER-TO-PEER COMMUNICATION

The **University of Karlsruhe** developed the sensor nodes used in the trial. The nodes are designed to monitor the ambient conditions around them and provide alerts when required, according to predetermined business rules. Each node carries several sensors (for example, a temperature sensor) a wireless transceiver, 128 kilobytes program memory, and other computing components for storing and processing business rules. The tags use a peer-to-peer protocol to communicate with each other. Each node not only transmits its unique ID number, but also communicates details of its environment and drum content (both type and volume) to all other nodes.

The **peer-to-peer communication** between the nodes allows each individual node to determine whether any business rules – such as the aforementioned incompatibility, total volume of a specific chemical stored in a certain location, or environmental conditions such as temperature changes – have been violated. If a business rule is breached, the system raises an alarm, both on the node (via a warning light) and in the management application software. The network of nodes communicates with the wider corporate network via base stations and is managed and monitored using SAP-developed software. For example, storage regulations are set in the SAP Environment, Health & Safety (EH&S) solution and transmitted via the CoBIs middleware to the sensor nodes.

WIDE, MULTI-INDUSTRY POTENTIAL

The same sensor network technology could be applied in other sectors, such as food, pharmaceuticals, and healthcare, where monitoring the condition of a product is crucial.

For example, CoBIs has the potential to protect workers in hazardous environments through its use in **smart clothing**. Sensors embedded in a suit could be used to check whether a person meets certain criteria to access an area of a factory where – for instance – a gas leak has occurred. The sensor nodes would communicate with other nodes in the building as well as in other people's clothing and equipment to determine access rights, thus ensuring compliance with safety regulations. In such a scenario, the door would only open to workers possessing the requisite training certificates and safety and maintenance equipment.

Crucially, the CoBIs sensor network can be easily deployed and is **highly scalable and cost effective** to meet the needs of a wide variety of companies and industries.

Particle Computer GmbH, a spin-off company set up by the University of Karlsruhe and SAP Research to commercialize the project's results, is currently selling the sensor nodes for between €20 and €200 per node, depending on capability. The battery life of the reusable device is estimated at several months if employed to carry out communications every few seconds, although the project partners are studying ways to provide alternative power sources.

In recognition of its innovation, Particle Computer was awarded the **CyberChampion Prize** by the Research Center for Information Technologies (FZI) in Karlsruhe. Additionally, the High-Tech Gründerfonds, a German government-backed venture capital fund for young, high-opportunity technological companies selected CoBIs as a **flagship project**. So far the technology has attracted around 25 clients.

For more information, please visit
▶ **www.cobis-online.de**.

Future Manufacturing

What will the factory of tomorrow look like? Will people interact with machines in a different way than they do now? With a clear remit to look beyond the horizon of the tried and tested, SAP Research has wholeheartedly embraced the field of Future Manufacturing as one of the most promising and demanding areas for innovation.

The current market for business solutions for the manufacturing industry is fragmented and dominated by small vendors. SAP towers above its competitors with a broad offering of manufacturing solutions – after all, one of the company's core competencies. But the manufacturing market is in no way static. For SAP to stay competitive, it must constantly look for innovative ways to address customer demands in this field and open up new opportunities.

SAP must also consider the growing role of "information" in manufacturing. This takes on two primary dimensions. First, is the increasing amount of information "content" in products (ranging from embedded information technology to simple but critical traceability data frequently included in today's consumer products). Second, are the opportunities inherent in transforming "industrial workers" into **"information workers"** by empowering them with extended information and knowledge that enhances their ability to perform their jobs.

TOMORROW'S FACTORY

The main characteristic of the future manufacturing plant will be its connectedness to all its vital components: workers, machines, and products. Recent statistics indicate that less than 1% of manufacturing data is automatically integrated into enterprise systems. This will change very soon.

In order to accomplish the automatic integration of manufacturing data, SAP Research is widening the view of manufacturing in both vertical and horizontal dimensions. As is typical, the SAP Research approach takes into consideration the **end-to-end process** from the supplier via the plant to the customer.

In the vertical dimension, SAP Research is looking at so-called **"flexible manufacturing"** (plant-to-business), where automation, manufacturing execution, and enterprise systems will be seamlessly integrated into each other.

The horizontal dimension covers two important areas: The first is the material flow along the value chain. Adaptive manufacturing benefits from the increased visibility provided by next-generation supply chain management. The second is the information flow along the product lifecycle. Enterprise-centric product lifecycle management, extended product information management, and digital manufacturing are among the topics SAP Research addresses under this umbrella.

MEDIATOR AND CATALYST

SAP Research has dubbed the pilot project that combines these two dimensions **Future Fab**. Although still in its first phase, the project will be a testing ground for the proposed research approach and will draw on work already undertaken in several other related projects.

Projects within future manufacturing feature a beneficial mix of external and internal cooperation. They exemplify SAP Research's commitment to act as a mediator within SAP and as a catalyst within the broader manufacturing community. One of the SAP INSPIRE projects, SimCorp, is also closely linked to ongoing work in the field of future manufacturing.

Several internal transfer and external projects in future manufacturing reached different important stages in 2006.

- Currently SAP Research is developing a prototype for an **SAP Manufacturing Lab**. This prototype is based on an automotive parts commissioning scenario planned for demonstration early in 2007. The scenario will illustrate the integration with automation hardware as well as a user interface for the shop-floor worker.

- SAP researchers in Dresden and colleagues from the Supply Chain Management team in Rot, Germany are running a joint project entitled **Automation Integration**. Its goal is to develop a bi-directional integration layer to connect equipment on the factory floor to the business process platform via existing and new tools and concepts. Proof of concept was presented at a jam session at the SAP Development Kick Off Meeting (DKOM) in February 2006. Currently, the joint team is developing a prototype based on an automotive parts commissioning scenario, planned for demonstration early in 2007.

- **PROMISE** (Product Lifecycle Management and Information Tracking using Smart Embedded Systems) aims to bridge the information gap between enterprise applications and the world of physical products. The project also hopes to make product lifecycle management solutions work more effectively. With different components of the PROMISE prototype tested by the project partners in 2006, the team is now working on integrating them into a comprehensive solution for the real-world application scenarios of big manufacturers like FIAT, Caterpillar, and Bombardier. PROMISE's breakthrough contribution is the development of **next-generation product information tracking** and a **flow management system**. The system will allow information **flow management** to track, manage, and control product information at any phase, time, and place during its life cycle.

▶ **www.promise.no**

- In June 2006, SAP Research launched the **PreCon Project** (Predictive Scheduling and Conflict Resolution) directed by the SAP Research CEC in Dresden. The project involves five faculties at the Technical University in Saxony's capital: Software Technology, Technical Information Systems, Database Technology Group, Computer Networks, and Industrial Communications. PreCon aims at developing and prototyping extended systems architecture for future manufacturing.

- **SNOW** (Services for NOmadic Workers) is geared towards providing a large-scale industrial diffusion of multimodal documentation for maintenance operations. The project tackles two challenges: how to author multimodal mobile maintenance documentation in an efficient way, and how to exploit documentation through robust interaction modalities. The project is dedicated to mobile workers. SNOW aims to facilitate easier access to – and sharing of – instructions and procedures in any situation and location. This will lead to significant time savings, the enhanced capture of – and access to – technical facts and knowledge, and the reduction of maintenance equipment and the number of personnel deployed.

▶ **www.snow-project.org**

- **PABADIS' PROMISE** investigates how production control systems can be made more flexible and adaptive through the use of agents and RFID-based technologies. The project is driven by new trends and requirements such as mass customization, late order freeze, and the need for increased visibility in manufacturing operations. The project will produce a new architecture for Manufacturing Execution Systems (MES) as well as a set of interfaces for ERP.

▶ **www.pabadis-promise.org**

COLLABORATION WITH BOSPORUS UNIVERSITY

In Spring 2006, SAP Research and the Bogazici Universitesi (Bosphorus University (BU)) in Istanbul, Turkey, officially signed a **Master Research Collaboration Agreement**. The new alliance is the first for SAP Research in the aspiring European Union candidate country, and the first in Turkey between a university and a commercial company for developing IT know-how and intellectual property. A joint project in the area of **Flexible Manufacturing** began on June 1 under the guidance from CEC Dresden.

The first joint project, "Integrated Planning and Control for Managing the Fast and Flexible Manufacturing Enterprise", explores planning methodology in manufacturing. The project will help manufacturing companies modify their planning in response to changes in customer demand, supplier capacity, and other factors. Researchers at the university's Industrial Engineering School are executing the project. SAP is project sponsor.

A Success Story: The Campus-based Engineering Center (CEC) Dresden

At the Campus-based Engineering Center (CEC) Dresden, twelve SAP researchers and fourteen PhD students are exploring ways to make technology and processes generate greater value for manufacturers.

Since its inception in January 2005, the Center has enjoyed fruitful collaborations with a variety of SAP units. As a result of these partnerships, SAP researchers in Dresden are now on the verge of rolling out research in the field of Future Manufacturing on a global scale, pulling together the efforts of many different SAP Research locations.

SILICON SAXONY

Being the center of the "Silicon Saxony" initiative, Dresden is an ideal location for such research. This initiative, which has attracted 214 semiconductor, electronic, and micro systems companies, including such industry heavyweights as AMD, Infineon, and ZMD. Silicon Saxony generates €3 billion in revenues per year and provides a good match for the CEC's manufacturing focus. In collaboration with T-Systems, MMS, and other software companies with locations in or around Dresden, SAP Research and SAP Consulting (formerly SAP SI) are supporting the launch of a **Software Action Group** within this initiative. CEC Dresden also boasts excellent partnerships with several industry leaders such as HP, BASF, Siemens, Caterpillar, and Bombardier, to name just a few.

Microelectronics/IT in Saxony ("Silicon Saxony")

Researchers and Students at the CEC Dresden

Owing to its location, the Center also serves as **a hub for the new EU member states in Central and Eastern Europe**. In May 2006 the Estonian Prime Minister, Andrus Ansip, visited the CEC and the TU. He showed enthusiasm for the activities of SAP's research organization. In addition, the CEC is developing contacts with the **University of Poznan**, Poland, the Bogazici Universitesi Instanbul, and others, with a view to creating PhD exchange programs.

Aiming towards the launch of new partnerships in Eastern Europe, the Center is helping to organize the **International Research Forum Eastern Europe**, a meeting geared towards stimulating the exchange of ideas between Eastern European experts in the field of Business Web Applications. This local event of the International Research Forum (IRF) will be part of the 10th International Conference on Business Information Systems and will take place in April 2007 in Poznan.

A BROAD PROJECT PORTFOLIO

CEC Dresden is exploring a wide range of topics including Future Manufacturing, software engineering and service-oriented architectures, and data management.

In the area of Future Manufacturing (the Center's main focus) researchers are making a significant contribution to the field by increasing process transparency for higher flexibility and faster decision-making and by improving existing supply chain and product lifecycle management processes.

A new program at the Center, **Data Management and Analytics**, relates to all aspects of data management, data flow, and data quality. A project entitled **QuickMig** is already underway and is geared towards exploring the mapping of data in cooperation with SAP Research Centers in Karlsruhe and Brisbane, as well as with other SAP units.

Internal transfer initiatives such as the **Automation Integration** project, are of the most direct relevance to SAP's product portfolio. The Automation Integration project deals with areas like smart device integration and shop floor connectivity. Researchers are collaborating with their colleagues from Palo Alto on the RFID-enablement of SAP products.

Software engineering is another important research field. Topics in this area currently being explored in cooperation with the TU Dresden and other partners include service engineering and model-driven development. Transfer projects in this field are also underway. Examples include occasionally connected applications and process agents. These efforts will improve the quality of the software development process and contribute to the creation of model-driven software development.

Gesture Recognition in a Mobile Working Scenario

Michael Kleinemeier,
President EMEA Central, SAP

SAP Research Brings a New Value to Our Engagement with Customers

"SAP Research has been a well-known partner to our customers for quite a long time. SAP Research has proven to be an excellent partner in demonstrating thought leadership at our regional customer events, and frequently tops the agenda with its advanced demonstrations and visionary talks, giving a solid glimpse into the future. The newly introduced Lighthouse project bears the potential to realize the value of thought leadership. The union between our customers and SAP field, business, IT and Research promises to unlock resources that will quickly turn research into real-life, future solutions, and or blueprints for new business processes."

Prof. Dr. Taner Bilgiç, Department of Industrial Engineering, Bogazici University

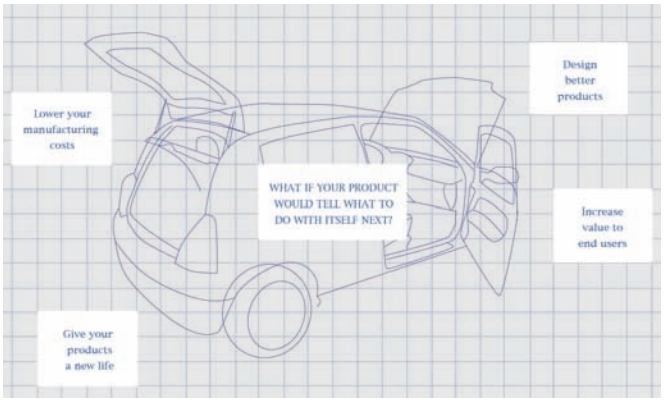
Integrated Planning and Control for Managing the Fast and Flexible Manufacturing Enterprise

"Together with SAP Research, we are currently investigating ways of exploiting the flexibility of manufacturing systems. The focus lies on reacting to a highly unpredictable environment and integrating feedback from the shop floor into the planning phase. Our goal is to provide reliable Available To Promise (ATP) information and enable late freeze of planning outputs on the basis of uncertainty and shop floor data. The project has the potential to develop models and technical infrastructures that can be incorporated into SAP's scheduling tools such as SAP PP/DS."

Nicolas Chevassus, Robotics, Mediated Workers and VR Lab, Senior Research Manager, EADS Corporate Research Centre

Taking Mobile Aircraft Maintenance to a New Level

"Quality and efficiency are crucial in our business, especially when it comes to aircraft maintenance. The expertise of SAP Research in enabling applications for device independence and multimodality has helped EADS to build a successful prototype for supporting mobile aircraft maintenance. This prototype brings maintenance work to a completely new and intuitive level providing each worker with exactly the information he needs. We enjoyed partnering with SAP and are very interested in leveraging the results of the SNOW project for our future products."



Smart Products with PROMISE (from www.promise-plm.com)

LONG-TERM PARTNERSHIPS WITH A GLOBAL SCOPE

The strength and variety of the many projects currently underway at CEC Dresden are testimony to the Center's **healthy partnership with the Technical University (TU) Dresden**. At the end of April, the Center moved to new premises both to be closer to the Information Sciences Faculty of TU Dresden and to improve the level of collaboration on projects. The year-long PreCon (**Predictive Scheduling and Conflict Resolution**) project, the most recent project instigated by the two partners, involves five university departments.

The Center and TU Dresden run a **joint Ph.D program**, enabling the best postgraduates to work on research projects. The first PhD thesis was recently defended at the Center, with another defense in preparation. The Center and TU Dresden also boast a joint **Center of Excellence on Advanced Software Architectures** as well as a dedicated SAP-endowed **Chair of Entrepreneurship and Innovation** at TU Dresden. SAP associates run lectures, seminars, and lab courses within the framework of the program.

CEC Dresden collaborates closely with CEC Karlsruhe as part of the global SAP Research network. Joint projects include presentations at CeBIT, prototype development, and personnel exchanges within the CoBIs and Promise teams.

Recently the centers in Dresden, Palo Alto, and Montréal joined forces in a manufacturing project alongside the Ecole Polytechnique de Montréal. The project promises to harness the synergies of those three locations. Furthermore, it highlights the importance of working across boundaries and cultures.

In addition, SAP Inspire and CEC Dresden began to cooperate on visualization and simulation techniques for manufacturing.

CEC DRESDEN: PROJECT PORTFOLIO

- **PROMISE:** Closing the product information loop in PLM
- **SNOW:** Mobile maintenance in aerospace industry (completed in 2006)
- **E-MODE:** Context-aware user interfaces for manufacturing and in-car IT
- **Pabadis' Promise:** Integration ERP, MES, Shop Floor & Agent-based production control
- **LogNetAssist:** Intelligent logistics and material flow in Supply Chain Networks
- **Ko-RFID:** Efficient collaboration in RFID-enabled logistics networks
- **FeasiPLe:** Software product line engineering
- **AMPLE:** Traceability in aspect-oriented, model-driven software product line engineering

UNIVERSITY GRANT PROJECTS:

- Predictive Maintenance (TU Dresden) (completed 2006)
- PreCon: Predictive Scheduling and Conflict Resolution (TU Dresden)
- Distributed Planning and Scheduling (BU Istanbul)
- RFID and Sensor Data in Manufacturing (HU Berlin)
- Lean Scheduling (Ecole Polytechnique de Montréal)

Appendix

A SELECTION OF SAP RESEARCH PROJECTS 2006

ADVANCED WEB TECHNOLOGIES

- **PROMISE**

Close the product lifecycle information gap through transforming real-time product information to knowledge. **http://www.promise.no**

END-TO-END SIMPLICITY

- **APOSDLE**

Develop a software platform for supporting the process of learning @ work by providing practical guidance, learning content and expert advice whenever and whereever it might be needed. **http://www.aposdle.org**

- **Content Sharing**

Enforce electronic marketplace and tool-support for the exchange of modular e-learning content among content providers and content users. **http://www.contentsharing.com**

- **ECOSPACE**

Empower every Professional in Europe with an enabling integrated infrastructure for seamless, dynamic and creative collaboration across teams, organizations and communities through a personalized collaborative working environment. **http://www.ip-ecospace.org**

- **eJustice**

Look into cross-border and workflow security. **http://www.ejustice.eu.com/**

- **EUDISMES**

Develop techniques enabling end-user driven software adaptability for small and medium enterprises. **http://www.eudismes.de**

- **FIT**

Use semantic technologies and analyse user interactions in order to personalize and improve the delivery of e-government services. **www.fit_project.org**

- **MOSQUITO**

Ensure easy-to-use business applications security for mobile workers in ubiquitous computing environments. **http://www.mosquito-online.org/**

- **NessiGRID**

Provide a unified view for European research in Service-oriented Grid Infrastructures that underpin future Services Architectures and Software Infrastructures for fostering new industrial solutions and societal applications that enhance the security and well-being of citizens.

- **Post-It (SAP INSPIRE)**

Improve the workflow within SAP by getting rid of the ubiquitous yellow stickers on any kind of paperwork and exchanging them for digital notes.

- **TrustCoM**

Provide a management framework enabling the definition and secure enactment of collaborative business processes within Virtual Organisations. **http://www.eu-trustcom.com**

- **wearIT@work**

Develop a set of new solutions that are based on wearable computing technology in order to support the workers of the future. **http://www.wearitatwork.com**

- **XTREEMOS**

Investigate and propose new services that should be added to current operating systems to build Grid infrastructure in a simple way. **https://www.xtreemos.org**

FUTURE MANUFACTURING

- **Design of Delta Tool**

Combine business, engineering, and IT know-how of several partners in a research and teaching collaboration in order to provide an out-of-the-box approach for designing the experience a user has when he plays his role in a SAP-supported process. **http://me310.stanford.edu**

- **Integrated Planning and Control for Managing the Fast and Flexible Manufacturing Enterprise**

Provide reliable (ATP) information and enable late freeze of planning outputs on the basis of uncertainty and shop floor data.

- **PABADIS'PROMISE**

Increase the flexibility of manufacturing systems, allowing them to better respond to changes in load and late order changes, as well as to handle the manufacturing of products with a large number of variants as needed for mass customization. **http://www.pabadis-promise.org**

- **PreCon**

Develop a flexible framework for predictive maintenance and conflict handling in manufacturing environment.

- **RFID in Manufacturing**

Examine the benefits and challenges of using RFID in production logistics.

- **SCM Trading Agents**

Train MBA students in computing technologies, combining courses on strategic and management issues with training in cutting edge computation & software technologies including a practical project with a client.

- **SNOW**

Provide a large-scale industrial diffusion of multimodal documentation for maintenance operations. **www.snow-project.org**

- **Supply Chain Risk Management**

Extend the existing models that integrate production decisions, inventory control and pricing strategies and to test the performance of the algorithm on data provided by SAP.

- **UMOD**

Define and validate a method that allows easy and reliable match of customer requirements and system capabilities. In order to do so customer requirements and system capabilities are mapped onto an ontology.

INDUSTRIALIZATION OF SOFTWARE-DEVELOPMENT

- **AMPLE**

Provide a Software Product Line (SPL) development methodology that offers improved modularization of variations. **http://www.ample-project.net**

- **Automating 4GL Program Transformations**

Analyze existing ABAP environments in SAP R/3 for identification of business semantics and for mapping these into new stable environments presented by ESOA.

- **EMODE**
Simplify the development of adaptive multimodal applications by providing an integrated development and runtime environment.
http://www.emode-projekt.de/

- **feasiPLe**
Develop model-driven approaches for software product lines to better cope with variability in software. **http://www.feasiple.de**

- **Model-based approaches for Security and Testing**
Automate verification and validation activities targeting security properties of SAP applications with Model Checking Technology.

- **MODELPLEX**
Define a coherent infrastructure for the application of Model-Driven Engineering (MDE) for complex systems. **http://www.modelplex.org**

- **More**
Develop and design run-time tools for modeling, analysis and prediction of performance and resource consumption of software components fitting into SAP's enterprise service architecture.

- **ORKA**
Develop a role- and workflow-based organisational control architecture and system.

- **Secologic**
Find a better supported integration of quality requirements and test methods within the Product Innovation Lifecycle (PIL). **www.secologic.de**

- **Testbalance**
Evaluate the existing models and approaches on the development processes and business side, and integrate them into an overall framework, which supports quality aspects of all development stages. **www.testbalance.de**

- **VIDE**
Develop behavioral models and tools to allow even non-programmers to specify or modify the business logic of business applications.
https://vide.tnmsoft.de

INTEROPERABILITY

- **Adaptive Services & Biz Processes**
Develop the next generation of a service-oriented architecture that will allow enterprise processes to be both very flexible, robust, and easily managed.

- **ATHENA**
Make a major contribution to interoperability by identifying and meeting a set of inter-related business, scientific & technical, and strategic objectives.
http://www.athena-ip.org

- **DIP**
Develop and extend Semantic Web Services by creating a new collaborative technology environment in which different web services can discover and cooperate with each other automatically. **http://dip.semanticweb.org**

- **FUSION**
Improve business collaboration between enterprises by developing innovative technologies for the semantic fusion of service-oriented businesses applications. **http://www.fusionweb.org/fusion**

- **GENESIS**
Develop needed methodologies, middleware software and an exchange platform that will allow small and medium enterprises to conduct business transactions over Internet. **http://www.genesis-ist.eu**

- **HMT – Harmonized Messaging Technology**
Investigate the complexity underpinning the use of harmonized messaging technology as a vehicle for facilitating interactions between heterogeneous and autonomous applications within and across enterprise systems.
http://www.itee.uq.edu.au/~dke-hmt/

- **MODILA**
Explore issues and solutions for large modeling projects.

- **PICTURE**
Enable high quality service delivery for European citizens and businesses by strengthening information and communication technology (ICT) diffusion in European Public Administrations. **http://www.picture-eu.org**

- **R4eGov**
Create a basis for a major evolution needed for eGovernment interoperability, while preserving the autonomy of existing institutions and diversity of basic principles. **http://www.r4egov.info**

- **Smart Vending**
Improve vending business processes by connecting smart vending machines to SAP backbone and exchanging data in real time.

- **SUPER**
Make a quantum leap in business process management by improving modeling and managing of business processes, by integrating and utilizing semantics for business process management. **http://ip-super.org**

REAL-TIME ENTERPRISE TRANSPARENCY

- **Duplicate Detection using Associative Memory**
Demonstrate the ability of SaffronScope to achieve more robust performance using a SAP-specific similarity metric and to show the benefit of customizing associative memory technology for SAP.

- **FRODO**
Identify internal fraud scenarios that impact SAP systems and devise solutions for detecting fraud patterns.

- **InCoCo-S**
Manage the interdependency between the manufacturing supply chain and service providers by developing cost-minimizing coordination strategies based on advanced planning systems (APS) of each collaborating partner.
http://www.fir.rwth-aachen.de/projektseiten/incoco

- **Ko-RFID**
Support the usage of RFID and related technologies in real-world scenarios, especially in cross-company cooperation and logistic processes.
http://www.korfid.de

- **Laboranova**
Enable the knowledge workers to share, improve and evaluate ideas across teams, companies and networks, thereby increasing the innovative output of organisations. **http://laboranova.com**

- **LoCostix**
Develop basic technology and applications for ultra low-cost RFID systems to be used for item level tagging.

- **NEPOMUK**
Develop a comprehensive solution for extending the personal desktop into a collaboration environment. **http://nepomuk.semanticdesktop.org**

- **PASS**
Develop a service-oriented architecture: semi-automatic interface adaptation, spreadsheets for rapid prototyping of service compositions and the use of rules systems for enhancing the detection of duplicate invoices.

- **Productivity and IT**
Understand how top performing SAP customers generate greater business value and prodoctivuty from their enterprise software investments using benchmarking, organizational and large sample econometric analysis.

- **SToP**
Provide solutions for the authentication of products based on RFID and related ambient intelligence technologies. **http://www.ist-stop.eu**

- **Unique Product Identification**
Develop a prototype software system using SAPs products to see how some of ideas on Universally Unique Identifiers can be implemented in one or two application areas such as Asset Management and Audit compliance.

REAL-WORLD AWARENESS

- **BRIDGE**
Create a standard interface for the lookup services that will provide secure access to sets of links to information services across the entire supply chain or lifecycle for each unique serial number.

- **CarWeaver**
New research area concerning topics related to cars and other vehicles, and their connection to SAP Enterprise systems.

- **CoBIS**
Develop a new approach to business processes involving physical entities, called Collaborative Business Items (CoBIs). **http://www.cobis-online.de**

- **Data Mgmt for distributed Systems**
Design a conceptual model based on requirements for cross-site and cross-organizational communications of RFID and sensor data in specific manufacturing and supply chain Use Cases. **http://epcis.mit.edu/cs/**

- **Digital Communities**
Develop high speed wireless networks that improve existing business operations and enable many applications for city governments and citizens.

- **eMergency**
Provide a comprehensive cockpit (Common Operating Picture) for situation awareness and emergency response management.

- **Enterprise Search**
Asses the quality of open search tools in an enterprise (e.g. link analysis, search quality, performance, etc.) and to deploy the Nutch open source enterprise search engine inside Research.

- **NextGRID**
Develop an architecture for the next generation of Grids by creating a dynamic marketplace for new services and products. The project addresses security as well as legal and privacy issues. **http://www.nextgrid.org/**

- **Nokia Field Force Solution Integration**
Focus on cost-effective data management solution for field service companies to send locationally relevant information to and from the field – in real-time through the use of RFID technology.

- **SAP people search and skill/interest discovery**
Provide a tolerant retrieval model when searching for people or skills within a company, built completely with open source components.

- **Service Composition & Home Land Security**
Improve Business Knowledge Management and Accessibility through the use of Semantic Web Services and Smart Items Technology.

- **Socrades**
Develop a design, execution and management platform for next-generation industrial automation systems, exploiting the Service Oriented Architecture paradigm both at the device and at the application level.
http://www.socrades.eu

- **WASP**
Narrow the mismatch between research at the application level and the node and network level. The project will provide theory, methods, hardware and software to construct highly optimised applications on a network of generic and flexible nodes. **http://www.wasp-project.org**

- **Water Monitoring – Thames Water**
Demonstrate how bridging advances in wide area communication and data acquisition, sensor networks, and hydraulic and water quality modelling tools with business processes and enterprise level decision scenarios can improve the operational management of large scale water supply and sewer systems.

SECURITY &TRUST

- **ESFORS**
Bring together the European stakeholders for Information and Communication Technologies (ICTs) and to address the security and dependability requirements of emerging software service platforms. **http://www.esfors.org**

SERVICE ECOSYSTEMS

- **ITAIDE**
Solve the increasing data complexity in the area of cross-border and cross-country trade by reducing at the same time the administrative overhead carried by commercial and public administration organisations. **www.itaide.org**

- **MOBIUS**
Develop technologies for establishing trust and security for the next generation of global computers, using the ProofCarryingCode (PCC) paradigm.
http://mobius.inria.fr

- **POLITESS**
Develop methodologies and tools that allow to formalize security policies, deploy these policies on the different system elements and verify if they have been deployed correctly. **http://www.rnrt-politess.info**

- **SERENITY**
Design and develop specifications, methods and a suite of tools enhancing security and dependability in emerging IT infrastructures and future Ambient Intelligence systems. **http://www.serenity-project.org**

TECHNOLOGIES FOR EMERGING ECONOMIES

- **ADP**

Develop, implement and monitor new learning strategies and technologies (ICT) to improve the knowledge, skills and competencies of secondary school educators. **http://www.adp.org.za**

- **Bundestag Study (TA project)**

Determine the use of ICT by NGOs in Sub-suharan Africa, identfying the potential and support needs of NGOs in the region and to draw conclusions and provide recommendations for the German Development Cooperation.

- **C@R**

Boost the introduction of Collaborative Working Environments (CWE) as key enablers catalyzing rural development. **http://c-rural.eu**

- **DERIVE**

Provide appropriate and innovative virtual classroom technological infrastructure for conducting education and training activities amongst remote Demographic Surveillance Sites.

- **HeaDMan**

Develop a common transparent data model and data warehouse, that will provide regulated and user-friendly access to relevant data from various international Demographic Surveillance Sites (DSS) throughout the developing world.

- **INNOVA**

Determine the most suitable pedagogical, technological and organizational approaches for the successful development of large scale countrywide blended-learning projects in Paraguay.

- **NeST**

Provide an affordable, accessible and user-friendly software solution to capacitate Civil Society Organisations to manage their daily activities while concentrating on service delivery.

- **PatHS**

Develope a user-friendly patient health software solution for managing diseases and improve the quality and efficacy of a primary healthcare system in rural communities

OTHER

- **Adaptive Test Accelerator**

Trace changes made to a Business Process and to adapt an available test suite to the modified Business Process.

- **askSAP (SAP INSPIRE)**

Develop more precise searches that will eliminate un-related search results thanks to a more precise analysis of sentences, attributes and of data base content.

- **Attack surface measurement & policy extraction**

Focus on the question faced by both industry and consumers today: How can we quantify a software system's security?

- **Compression by layers**

Study specific algorithms for syntactic compression of XML messages between mobile client and SAP server.

- **Defect Prediction Modeling**

Build a Defect Prediction model that will provide SAP with a formalized, data-driven model suitable to enhance decision making during software development.

- **Epidemiology**

Develop a simulation-based industrial propagation model used to analyze the patterns of adoption of an industrial software technology characterized by intensive network externalities.

- **Ethnic power distance in workflows**

Explore the issue of software workflows and approvals within the Chinese culture through a series of user research activities in China.

- **icMap (SAP INSPIRE)**

Explore ways for using mind-mapping methodology to visualize mental associations between all kinds of objects from different backend systems.

- **LogNetAssist**

Optimize and increase the flexibility of manufacturing processes through development of an 'assisting system' for intelligent logistics with pilots in consumer goods and automotive industries. **http://www.lognetassist.de**

- **NessiSOFT**

Provide a unified view for European research in Services Architectures and Software Infrastructures that will define technologies, strategies and deployment policies.

- **One Way and 1.x Way Communication**

Focus on a novel technology implementation augmenting a telephony system with an one-way calling feature and applying this technology in a field study within a business context.

- **PROVE (SAP INSPIRE)**

Provide legitimate vendors, distributors, consumers with services to distinguish between genuine goods and counterfeits, to identify tampered or stolen products as well as to detect illcit trading activities at any of the products' lifecycle stages.

- **SimCorp (SAP INSPIRE)**

Framework for an interactive 3D visual environment, which allows decision makers to view business situations and processes.

A SELECTION OF PUBLICATIONS IN 2006

ADVANCED WEB TECHNOLOGIES

- **Anke, Jürgen; Sundaram, David;** Personalisation techniques and their application; Encyclopedia of E-Commerce, E-Government, and Mobile Commerce, by Mehdi Khosrow-Pour (Editor); Idea Group Reference; Hershey; USA; 2006; ISBN 1591407990; Inbook

BUSINESS CENTRIC NETWORKS

- **Franke, Carsten;** Virtual Organizations: a Business Perspective; Proceedings of the UK e-Science Workshop: Virtual Organisations And Grids; Edinburgh; UK; 2006; Inproceedings

- **Jackson, Andrew; Franke, Carsten; Neidecker-Lutz, Burkhard; Theilmann, Wolfgang;** An SAP perspective on Busness Grids; Proceedings of the 5th UK e-Science Programme All Hands Meeting; Nottingham; UK; 2006; Inproceedings

END-TO-END SIMPLICITY

- **Aitenbichler, Erwin; Lyardet, Fernando Daniel; Austaller, Gerhard; Kangasharju, Jussi; Mühlhäuser, Max;** Engineering Intuitive and Self-Explanatory Smart Products; Proceedings of the ACM SAC '06; Darmstadt; Germany; 2006; Inproceedings

- **Bergstraesser, Sonja; Faatz, Andreas; Rensing, Christoph; Steinmetz, Ralf;** A Semantic Content Representation Supporting Re-Purposing of Learning Resources; Proceedings of the I-Know 2006; Graz; Austria; 2006; Inproceedings

- **Betz, M; Heß, J; Pipek, V; Rohde, Mark; V. Wulf; Scheidl, Stefan;** End-User Development in Small and Medium Enterprises: Research and Development Issues; Online proceedings of "The Next Step Workshop: From End-User Programming to End-User Software Engineering"; Montreal; Canada; 2006; Inproceedings

- **Borggräfe, B; C. Dörner; Scheidl, Stefan; M, Hofmann; V. Pipek; D.T. Vogel;** EUDISMES – End-User Development in Small and Medium Enterprise Software Systems; Statusreport Forschungsoffensive "Software Engineering 2006" des BMBF; Leipzig; Germany; 2006; Inproceedings

- **Carlsson, Victoria; Klug, Tobias; Ziegert, Thomas; Zinnen, Andreas;** Wearable Computers in Clinical Ward Rounds; Proceedings of the 3rd International Forum on Applied Wearable Computing; Bremen; Germany; 2006; Inproceedings

- **Hofmann, Paul; Reiner, Gerald;** Efficiency analysis of supply chain processes; International Journal of Production Research, Vol. 44, No. 23, pp. 5065–5087; Taylor and Francis Ltd; 2006; ISSN 0020-7543; Article

- **Lyardet, Fernando Daniel; Grimmer, Jan; Mühlhäuser, Max;** CoINS: Context sensitive Indoor Navigation System; Proceedings of IEEE International Symposium on Multimedia ISM 2006. pp. 30–37; IEEE Computer Society Press; Los Alamitos, CA; USA; 2006; Inproceedings

- **Lyardet, Fernando Daniel; Mühlhäuser, Max; Lauff, Markus; Austaller, Gerhard; Hartl, Andreas;** Technology-aware Web Application Design; In Web Engineering: The Discipline of Systematic Development. Gerti Kappel, Birgit Pröll, Siegried Reich, Werner Retschitzegger (Hrsg.), pp. 85–110; John Wiley & Sons; New York, NY; USA; 2006; ISBN 0-470-01554-3; Inproceedings

- **Meyer, Marek;** Modularization of Existing Learning Resources for Repurposing; Proceedings of the 1st Doctoral Consortium in Technology Enhanced Learning; Crete; Greece; 2006; Inproceedings

- **Meyer, Marek; Bergstraesser, Sonja; Zimmermann, Birgit; Rensing, Christoph; Steinmetz, Ralf;** Modeling Modifications of Multimedia Learning Resources Using Ontology-Based Representations; Proceedings of the International MultiMedia Modeling Conference 2006; Nanyang Technological University; Singapore; 2006; Inproceedings

- **Meyer, Marek; Hildebrandt, T; Rensing, Christoph; Steinmetz, Ralf;** Requirements and an Architecture for a Multimedia Content Re-Purposing Framework; Proceedings of the First European Conference on Technology Enhanced Learning; Crete; Greece; 2006; Inproceedings

- **Meyer, Marek; Rensing, Christoph; Steinmetz, Ralf;** Modellierung eines generischen Prozesses für die Modularisierung von Lernressourcen; Proceedings of the Pre-Conference Workshops der 4. e-Learning Fachtagung Informatik DeLFI 2006; Bonn; Germany; 2006; ISBN 3-8325-1330-2; Inproceedings

- **Meyer, Marek; Rensing, Christoph; Steinmetz, Ralf;** Supporting Modularization and Aggregation of Learning Resources in a SCORM Compliance Mode; Proceedings of the 7th IEEE International Conference on Advanced Learning Technologies; Niigata; Japan; 2006; Inproceedings

- **Meyer, Marek; Rensing, Christoph; Steinmetz, Ralf;** Towards Using Wikipedia as a Substitute Corpus for Topic Detection and Metadata Generation in E-Learning; Proceedings of the 3rd annual e-learning conference on Intelligent Interactive Learning Object Repositories; Montreal, Quebec; Canada; 2006; Inproceedings

- **Roth, A; Scheidl, Stefan;** End-User Development for Enterprise Resource Planning Systems; Proceedings of the "Informatik 2006", Christian Hochberger, Rüdiger Liskowsky (Hrsg.), Informatik für Menschen GI-Edition – Lecture Notes in Informatics (LNI); Bonner Köllen Verlag; 2006; ISSN 1617-5468, ISBN 978-3-88579-187-4; Inproceedings

- **Scheidl, Stefan;** Proceedings of the Workshop on End-User Development in "Informatik 2006" (Herausgeber); Proceedings of the "Informatik 2006", Christian Hochberger, Rüdiger Liskowsky (Hrsg.), Informatik für Menschen, GI-Edition – Lecture Notes in Informatics (LNI); Bonner Köllen Verlag; 2006; ISSN 1617-5468, ISBN 978-3-88579-187-5; Inproceedings

- **Schnelle, Dirk; Lyardet, Fernando Daniel;** Voice User Interface Design Patterns; Proceedings of the 11th European Conference on Pattern Languages of Programs; (to appear); 2006; Inproceedings

- **Theilmann, Wolfgang; Gerteis, Wolfgang; Abbing, Jana;** User-defined Learning Strategies; Proceedings of the "DeLFI 2006: 4. e-Learning Fachtagung Informatik"; Bonn; Germany; 2006; ISBN 978-3-88579-181-2, ISSN 1617-5468; Inproceedings

- **Zielinski, Marek;** Guiding the release of microdata by using support and confidence of association rules; Proceedings of the the eGovernment PhD colloquium at the DEXA 2006 conference; Cracow; Poland; 2006; Article

- **Zimmermann, Birgit; Bergstraesser, Sonja; Rensing, Christoph; Steinmetz, Ralf;** A Requirements Analysis of Adaptations of Re-Usable (E-Learning) Content; Proceedings of the World Conference on Educational Multimedia, Hypermedia; Orlando, Florida; USA; 2006; Inproceedings

- **Zimmermann, Birgit; Rensing, Christoph; Steinmetz, Ralf;** Formatübergreifende Anpassungen von elektronischen Lerninhalten; Proceedings of the DeLFI 2006 – die 4. e-Learning Fachtagung Informatik 2006; Bonn; Germany; 2006; ISBN 3-8325-1330-2; Inproceedings

- **Zimmermann, Birgit; Rensing, Christoph; Steinmetz, Ralf;** Patterns for Tailoring E-Learning Material; Proceedings of the VikingPLoP; Helsinör; Dänemark; 2006; Inproceedings

FUTURE MANUFACTURING

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Munich, Germany, 21st September 2006
http://www.hcc.in.tum.de/ssi/public/hcc/about.shtml
Round Table with SAP University Alliances; Oliver Christ, Uwe Kubach, Christoph Schroth, Orestis Terzidis

- **ASUG Americas' SAP Users' Group**
Orlando, USA, 17th May 2006
www.asug.com/2006orlando
Demo: icMap Prototype (SAP Inspire); Alexander Rausch
Demo: PROVE Project Prototype (System for Secure Product Verification) (SAP Inspire); Zoltan Nochta

- **IRF (International Research Forum) of SAP Research**
Darmstadt, Germany, 21st May 2006
http://www.international-research-forum.de/index.php?sid=84
Think Tank: IT Megatrends; Lutz Heuser

- **SAP TECHED '06 – Amsterdam**
Amsterdam, Netherlands, 18th – 20th October, 2006
https://www.sdn.sap.com/irj/sdn/sapteched
Demo: PROVE Project Prototype (System for Secure Product Verification) (SAP Inspire); Eric Wannemacher, Zolt†n Nochta

- **SAP TECHED '06 – Las Vegas**
Las Vegas, USA, 12th -15th September 2006
https://www.sdn.sap.com/irj/sdn/sapteched
Workshop: Web2.0 Services for Enterprise Applications; Shel Finkelstein, Rama Gurram, Brian Mo
Demo: SimCorp Project Prototype (Retail Prize Zone Optimization) (SAP Inspire); Rüdiger Bachmann, Uwe Sodan

- **SAPPHIRE '06 – Orlando**
Orlando, USA, 16th – 18th May 2006
http://www.sap.com/community/pub/events.epx
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Demo/Booth: Three Prototypes in the Area of Public Security; Cedric Ulmer

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- **20th IFIP DBSec 2006**
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Keynote: Business Process Security Research Directions; Volkmar Lotz, Andreas Schaad

- **23rd British National Conference on Databases 2006**
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Panel Discussion; Wolfgang Gerteis

- **4th International Conference on Trust Management**
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Demonstrations Chair; Yuecel Karabulut

- **4th Minema Workshop**
Sintra, Portugal, 2nd – 3rd July 2006
http://dialnp.di.fc.ul.pt/Plone/sintra06/
Presentation: A Service-Oriented Middleware for Integration and Management of Heterogeneous Smart Items Environments; Jürgen Anke, Jens Müller, Patrik Spieß, Leonardo Weiss Ferreira Chaves

- **ACM SACMAT 2006**
Lake Tahoe, USA, 7th – 9th June 2006
http://www.sacmat.org/2007/index.php
Panelists: Security in Enterprise Resource Planning Systems and Service-Oriented Architectures; Future Directions in Access Control; Volkmar Lotz
Talk: Security in enterprise resource planning systems and service-oriented architectures; Andreas Schaad, Volkmar Lotz

- **AjaxWorld Conference**
Santa Clara, USA, 3rd – 4th October 2006
http://www.ajaxworldexpo.com/
Talk: Real-time Location Tracking Mashup for the Enterprise: Rama Gurram, Louenas Hamdi, Samir Raiyani

- **Ambient Intelligence Conference (AmID 2006)**
Sophia Antipolis, France, 20th – 22nd September 2006
http://www.strategiestm.com/conferences/amid/06/index.htm
Presentation: SAP Labs France and SAP Research: Anne Hardy
Presentation: Security @ SAP Research; Volkmar Lotz
Demo: Emergency Response; Cedric Ulmer
Demo: Context-Aware Security; Konrad Wrona
Demo: Business Process Security; Pascal Spadone
Presentation: Developing Ambient Intelligence; Volkmar Lotz, Anne Hardy

- **Annual Conference of 'Gesellschaft fuer Informatik e.V.' (GI Jahrestagung)**
Dresden, Germany, 4th – 6th October 2006
http://www.gi-ev.de/english/
Keynote: The Business Web: Value Proposition and Research Challenges; Lutz Heuser

- **BPM 2006**
Vienna, Austria, 7th – 9th September 2006
http://bpm2006.tuwien.ac.at/
Presenation: Adapt or Perish: Algebra and Visual Notation for Service Interface Adaptation; Marlon Dumas

- **Challenge the Experts on Web2.0**
Palo Alto, USA, 1st October 2006
http://www.worldinternetcenter.com/Programs_and_Pubs/index.htm
Presentation: Visual Notation for Service Interface Adaptation; Nolwen Mahe, Susan Duggan

- **CommunicAsia 2006**
Singapore, Singapore, 20th – 23rd June 2006
http://www.communicasia.com/
Presentation: Result of TrustCom Project & 3 Demos; Yücel Karabulut

- **Conference on Data and Applications Security**
Sophia Antipolis, France, 31st July – 2nd August 2006
http://cimic.rutgers.edu/ifip113/2006/
Paper: Consolidating the Access Control of Composite Applications and Workflows; Martin Wimmer, Alfons Kemper, Maarten Rits, Volkmar Lotz
Paper: From Business Process Choreography to Authorization Policies; Philip Robinson, Florian Kerschbaum, Andreas Schaad
Conference Chair; Andreas Schaad
Keynote: Security Research in as Regards Enterprise Service-Oriented Architecture (eSOA); Volkmar Lotz

- **CoopIS 2006 (Cooperative Information Systems)**
Montpellier, France, 1st – 3rd November
http://www.cs.rmit.edu.au/fedconf/2006/index.html?page=coopis2006cfp
PC co-Chair: Rainer Ruggaber

- **CUSEC 2006**
Montreal, Canada, 19th – 21st January 2006
http://cusec2006.soen.info/
Presentation: OSGi:The open source and standard platform of choice for restrained devices
Tutorial: Software Start-ups; Louenas Hamdi, Guillaume Dubeau, Laurent Seiter

- **DeLFI 2006**
Darmstadt, Germany, 11th – 14th September 2006
http://www.delfi2006.de/
Talk: Technical and Didactical Aspects of the Re-use of Learning Resources; Wolfgang Theilmann, Wolfgang Gerteis
Paper: Nominated for the Best Paper Award, Augmented Learning and Re-authoring as E-learning Trends; Brigitte Zimmermann
Talk: E-learning Systems in the IT Education; Andreas Faatz

- **DW 2006**
Friedrichshafen, Germany, 21st – 22nd September 2006
http://www.dw2006.ch/
Talk: Integration of Embedded Data into Enterprise Service-Oriented Architecture; Lutz Heuser

- **EDOC 2006**
Hong Kong, China, 16th – 20th October 2006
http://www4.comp.polyu.edu.hk/~edoc06/
Paper: Integrated Configuration of Enterprise Systems for Interoperability; Christian Janiesch, Alexander Dreiling, Ulrike Greiner, Sonia Lippe

- **Enterprise Interoperability Cluster Workshop**
Brussels, Belgium, 21st September 2006
http://cordis.europa.eu/ist/ict-ent-net/ei-meetings.htm
Presentation: Enterprise Applications Integration using Semantic Technologies: the FUSION approach; Andreas Friesen
Presentation: Addressing the Challenges of Business Process Interoperability Peter Mayer; Presentation: Utilizing Semantics to Improve Business Process Management; Christian Brelage
Final Workshop Report; Andreas Friesen

- **e-Science All Hands Meeting**
Nottingham, U.K., 18th – 23rd September 2006
http://www.allhands.org.uk/
Talk: Perspective on Busness Grids ; Wolfgang Gerteis, Andrew Jackson

- **ESWC 06**
Budva, Montenegro, 11th – 14th June 2006
http://www.eswc2006.org/
Talk: Automating BPM with SWS Technologies; Christian Drumm, Jens Lemcke

- **EU Grid Workshop**
Brussels, Belgium, 18th – 22nd September 2006
http://cordis.europa.eu/fetch?CALLER=FP7_NEWS&ACTION=D&SESSION=&RCN=EN_RCN_ID:26470
Presentation: Strategic Research Agenda for Business Grids, Developped by the NESSI-Grid Consortium under the Lead of SAP; Wolfgang Theilmann

- **Eu-GridResearch**
Brussels, Belgium, 19th September 2006
http://www.eu-gridresearch.org/
Keynote: Will Europe lead the evolution of the service-oriented infra-structures?; Lutz Heuser

- **European Grid Policy Workshop**
Linz, Austria, 27th – 28th February 2006
http://www.eu-gridresearch.org/
Panel Discussion;
Talk: Grids in Business Applications?; Wolfgang Gerteis

- **European Grid Technology Days**
Brussels, Belgium, 19th September 2006
http://www.eu-gridresearch.org/
Talk: NESSI/NESSI-Grid; Wolfgang Gerteis
Hosted Workshop :Towards Business Grids; Burkard Neidecker-Lutz, Wolfgang Theilmann, Carsten Franke

- **Formal Methods 2006 Conferences**
Hamilton, Canada, 21st – 27th August 2006
http://fm06.mcmaster.ca/
Conference Chair; Volkmar Lotz

- **ForTIA Industry Day**
Hamilton, Canada, 23rd August 2006
http://www.fortia.org/iday06/
Conference Chair; Volkmar Lotz, Asuman Suenbuel

- **GridNets 2006**
San Jose, USA, 1st – 2nd October 2006
http://gridnets.org/2006/
Program Committee; Wolfgang Gerteis

- **Humans and the Semantic Web**
Maryland, USA, 2nd June 2006
http://ebiquity.umbc.edu/blogger/2006/03/24/humans-and-the-semantic-web/
Presentation: Pragmatic ontological maps; Matthias Kaiser

- **ICDE 2006**
Atlanta, USA, 4th – 8th Aril 2006
http://icde06.cc.gatech.edu/
Program chair; Elmar Dorner

- **ICEBE 2006**
Shanghai, China, 24th-26th October 2006
http://www.mis.coventry.ac.uk/research/dsm/icebe06/index.htm
Workshop: Configuring Processes and Business Components – An Integrated Approach to Enterprise Systems Collaboration; Christian Janiesch, Alexander Dreiling, Ulrike Greiner, and Sonia Lippe

- **ICIES 2006 (8th International Conference on Enterprise Information Systems**
Paphos, Cyprus, 23rd - 27th May 2006
http://www.iceis.org/iceis2006/workshops/tcob/tcob2006-cfp.html
Talk: Research on Enterprise Interoperability – Aspects and solution approaches, Rainer Ruggaber

- **ICT Forum 2006**
Singapore, Singapore, 19th – 23rd June 2006
http://www.eusea2006.org/
Presentation: Result of TrustCom Project & 3 Demos; Yücel Karabulut

- **ICWE 2006**
Menlo Park, USA, 11th – 14th July 2006
http://www.icwe2006.org/
Papers: Semantic Web Service Discovery Services; Semantic Service Selection for B2B Integration; Andreas Friesen, Paul Hofmann

- **ICWS 06**
Chicago, USA, 18th – 22nd September 2006
http://conferences.computer.org/icws/2006/
Talk: A Mixed Initiative Approach to Semantic Web Service Discovery and Composition: SAP's Guided Procedures Framework; Paul Hofmann
Presentation: Augmenting Web Services Composition with Transactional Requirements; Frederic Montagut

- **IEEE**
Hong Kong, China, 10th – 20th October 2006
http://www4.comp.polyu.edu.hk/~edoc06/
Talk: Towards Transactional Pervasive Workflows; Frederic Montagut, Refik Molva
Talk: Service Interaction Modelling: Bridging the Gap Between Local and Global Views; Gero Decke

- **IEEE Int. Conference on Granular Computing**
Atlanta, USA, 10th – 12th May 2006
http://www.cs.sjsu.edu/~grc/
Program chair; Ming-Chien Shan

- **IEEE IWSC 2006**
Chicago, USA, 18th – 21st September 2006
http://paris.utdallas.edu/iwsc/
Talk: Semantics to semi-automatically orchestrate web services in SAP_s Guided Procedures; Paul Hofmann

- **IEEE Joint Conference**
San Fransisco, USA, 26th – 29th June 2006
http://linux.ece.uci.edu/cec06/
Presentation: The Present Research Standpoint and Remaining Obstacles in Regards to Auto-ID Solutions; Krish Mantripragada

- **IEEE Services Computing Conference (APSCC 2006)**
GuangZhou, China, 12th – 15th December 2006
http://conferences.computer.org/apscc/2006/
Program chair; Ming-Chien Shan

- **IESA 2006 conference**
Bordeaux, France, 22nd – 24th March 2006
Booth: ATHENA Project; Rainer Ruggaber, Sonia Lippe

- **IFAWC**
Bremen, Germany, 15th – 16th March 2006
http://spring.bologna.enea.it/ifawc/2006/index.htm
Presentation: Wearable Computers in Clinical Ward Rounds; Victoria Carlsson, Tobias Klug, Thomas Ziegert, Andreas Zinnen

- **I-Know Conference – International Conference on Knowledge Management**
Graz, Austria, 6th – 8th September 2006
http://i-know.know-center.tugraz.at/ast
Talk: A Semantic Content Representation Supporting Re-Purposing of Learning Resources; Andreas Faatz, Ralf Steinmetz (TU Darmstadt, Germany)
Paper: Service-Oriented Task Management; Olaf Grebner, Uwe Riss

- **Industry Day @ FM Symposium 2006**
Hamilton, Canada, 23rd August 2006
http://fm06.mcmaster.ca/ataglance.htm
General Chair; Volkmar Lotz, Asuman Suenbuel

- **INI-GraphicsNet – Innovation Week**
Darmstadt, Germany, 29th May – 3rd July 2006
http://www.inigraphics.net/innovations-woche/prog_ws.html
Workshop: Challenges and Frontiers in Computer Graphics; Lutz Heuser

- **IST 2006**
Helsinki, Finland, 21st – 23rd November 2006
http://europa.eu.int/information_society/istevent/2006/index_en.htm
ATHENA: Exhibition Stand (incl. multiple demos): Ulrike Greiner, Rainer Ruggaber/Co-Organisation of and presentation in Networking Session "Enterprise Networks: How to overcome the obstacles to their effective diffusion"; Rainer Ruggaber, Maria-Jose Nunez

- **IST Africa Conference**
Pretoria, South Africa, 3rd – 5th May 2006
http://www.ist-africa.org/conference2006/
Presentation: Opportunities for Technology Transfer; Joachim Schaper
Presentation: Research Requirements for Security and Dependability for Services; Volkmar Lotz

- **MCETech 2006**
Montreal, Canada, 17th -19th May 2006
http://www.mcetech2006.org/
Presentations: Web Service Technologies in a Real-Time SOA;
An Open and Scalable Smart Items Infrastructure, OSGi one of the enabling technologies; Matthias Winkler, Louenas Hamdi

- **MCISME 2006 – Managing Context Information and Semantics in Mobile Environments**
Nara, Japan, 9th – 12th May 2006
http://lsirwww.epfl.ch/mcisme/
Program chair; Elmar Dorner

- **National eScience Centre Edinburgh**
Edinburgh, UK, 21st – 22nd November 2006
http://www.nesc.ac.uk/
Talk: Virtual Organizations – a business perspective;
Workshop: Virtual Organizations and Grids; Carsten Franke

- **Northern Ireland RFID conference and exhibition 2006**
Belfast, Northern Ireland, 13th September 2006
http://www.investni.com/rfid_agenda.pdf
Talk: From RFID to networked embedded systems; Gregor Hackenbroich

- **Pragmatic Web**
Hohenheim, Germany, 21st – 23rd September 2006
http://www.pragmaticweb.info/
Keynote: SAP-Research Beyond the Hypes; Torsten Leidig

- **Questra Customer Conference**
Monterey, USA, 10th – 11th October 2006
http://www.questra.com/newsroom/events.asp
Presentation: A perspective on device-to-business integration; Harald Weppner, Thoma Odenwald

- **Semantics 2006**
Vienna, Austria, 28th – 30th November 2006
http://www.semantics2006.net/
Program Chair; Elmar Dorner

- **Trendforum Conference**
Wiesbaden, Germany, 27th – 28th September 2006
http://www.vhb.de/trendforum/index.html
Presentation: SAP Inspire – Culture, Organization & Incubation Internal Corporate Venturing at SAP; Claudia Alsdorf

- **UK eScience All Hands Meeting**
Nottingham, UK, 18th – 21st September 2006
http://www.allhands.org.uk/
Hosted Workshop;
Presentation: An SAP perspective on Busness Grids; Andrew Jackson

- **UTHF (US Taiwan High Tech Forum)**
Santa Clara, USA, 14th October 2006
http://www.natea.org/sv/conferences/index.php
Talk: Smart Item – An Advanced RFID Application; Thomas Odenwald

- **Value Chain Forum 2006**
Friedrichshafen, Germany, 9th – 10th November 2006
http://www.value-chain.net/
Keynote: Enterprise SOA – Succeeding in a world of rapidly changing value networks; Peter Zencke
Booth: ATHENA Project; Ulrike Greiner, Peter Mayer
Workshop: Retail/CPG; Oliver Christ

- **VLDB Conference**
Seoul, South Korea, 12th – 15th September 2006
http://aitrc.kaist.ac.kr/~vldb06/
Committee chair ; Ming-Chien Shan

- **WEBIST 2006**
St. Setubal, Portugal, 11th – 13th April 2006
http://www.webist.org/2006/index.htm
Talk: A Model for Automatic Matching of Security Requirements during Semantic Web Service Discovery; Andreas Friesen

- **Where 2.0 Conference**
San Jose, USA, 13th – 14th June 2006
http://conferences.oreillynet.com/where2006/
Demo: Digital Communities; Joella Paquette, Samir Raiyani

OTHER

- **CeBIT**
Hannover, Germany, 9th – 15th March 2006
http://www.cebit.de/homepage_e?x=1
Demos: MICA, SNOW, WearIT@work (Projects); Thomas Ziegert, Christoph Pohl, Petra Hochstein
Various joint talks/forums with customers; Petra Hochstein

- **EIC Launch Event (Enterprise Interoperability Centre)**
Brussels, Belgium, 27th April 2006
http://www.eic-community.org
Presentation: EIC – The Hub for Interoperability; Petra Frenzel, Peter Mayer, Jochen Friedrich, Stephan Schuster
Presentation: From ATHENA to EIC; Dr. Joachim Schaper

- **Geschäftsmodelle 2010 – CEO meets CIO**
Zurich, Switzerland, 23rd November 2006
Talk: CEO meets CIO – Innovation through re-combination; Oliver Christ

- **GRI Launch Event**
Amsterdam, Netherlands, 4th – 6th October 2006
www.grig3.org
Presentation: SAP Corporate Citizenship Program and the Work on a CSR Solution Within the Governance, Risk, and Compliance unit; Christian Berg

- **Karlsruher Sicherheitsarbeitskreis**
Karlsruhe, Germany, 7th February 2006
Presentation: SECOLOGIC Project; Rosemaria Giesecke

- **Leaders Club of Innovators**
Winterthur, Switzerland, 16th November 2006
Presentation: Process Innovation & IT; Oliver Christ

- **Mobile Enterprise Application Challenge**
Montreal, Canada, 25th May – 10th June 2006
http://www.socialtext.net/nlw/login.html?redirect_to=%2Fmobility-challenge%2Findex.cgi%3Fmobility_challenge
Organizing Committee; Nolwen Mahe

- **QLD-German Science and Technology Week**
Brisbane, Australia, 26th – 28th April 2006
http://www.uq.edu.au/events/docs/Scienceweekbrochure.pdf
Talk: IT Innovations – Local partnerships for the global market; Karsten Schulz

- **SWESE 2006 – 2nd International Workshop on Semantic Web Enabled – Software Engineering**
Athens, USA, 6th November 2006
https://km.aifb.uni-karlsruhe.de/ws/swese2006
Organizing Committee; Daniel Oberle

- **W3C Workshop**
Ispra, Italy, 17th – 18th October 2006
http://www.w3.org/2006/07/privacy-ws/
Presentation: Compliance and Privacy in Enterprise SOA Ecosystem; Jean-Christophe Pazzaglia

- **Web2.0 Series**
San José, USA, 10th August 2006
http://www.worldinternetcenter.com/Programs_and_Pubs/index.htm
Think Tank 1: Web 2.0 Technologies and Opportunities in the Enterprise Space; Nolwen Mahe, Brian Mo and Rama Gurram

- **Web2.0 Series**
Palo Alto, USA, 21st September 2006
http://www.worldinternetcenter.com/Programs_and_Pubs/index.htm
Think Tank 2: Web 2.0 Technologies and Opportunities in the Enterprise Space; Shel Finkelstein, Rama Gurram, Brian Mo

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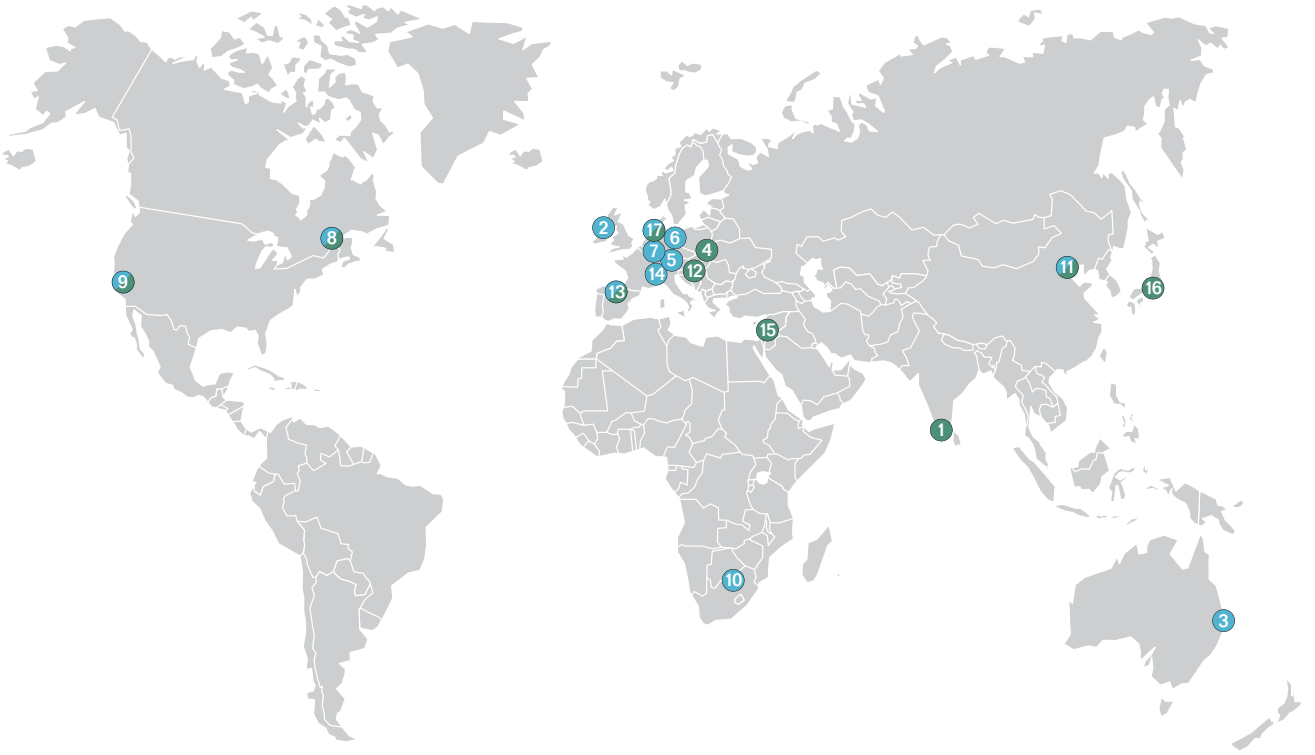

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