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Péter Pázmány programme

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BME INNOVATION AND KNOWLEDGE CENTRE OF INFORMATION TECHNOLOGY

CONTENT

MISSION STATEMENT

Dr. Péter Károly Risztics
associate professor of BME,
director of BME (IT)²

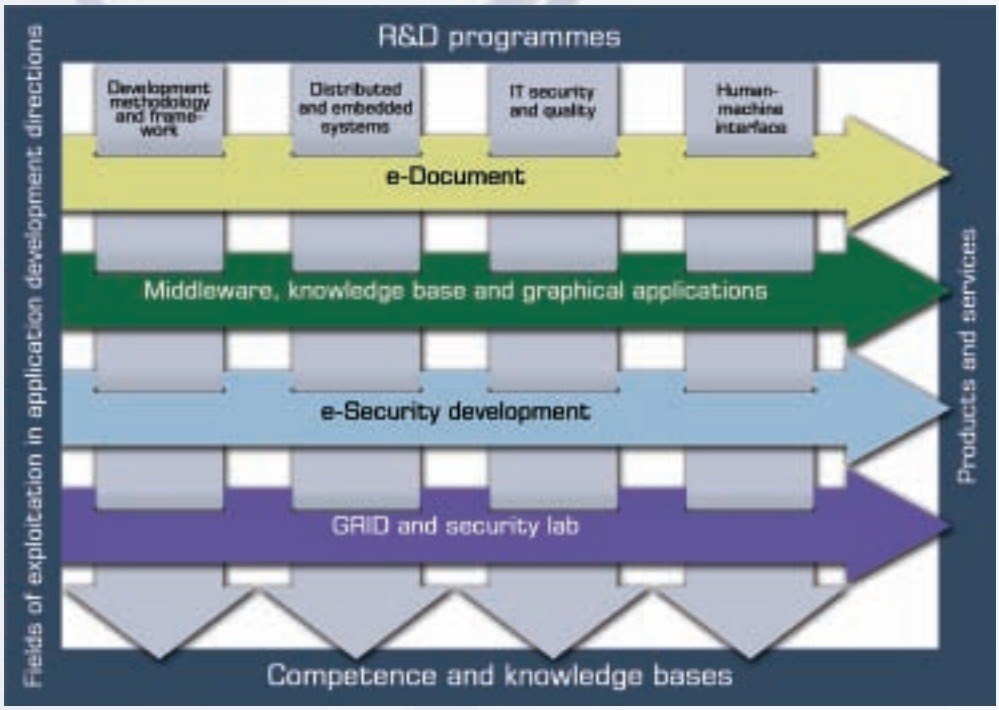
The strategic objective of the BME Innovation and Knowledge Centre of Information Technology is clear: while keeping the favourable traditions of Budapest University of Technology and Economics (BME) and its industrial partners to increase the competitiveness of the region, and in a broader context, of the Hungarian economy, to increase the knowledge content of products and services, to create knowledge-intensive jobs, to increase the number and profitability of technology-intensive small and medium-sized enterprises in the field of information technology and its applications.

A direct means of achieving this strategic goal is exploiting the results of the joint R&D programmes in actual market economy application development projects. The jointly developed, continuous and focused R&D programmes, in addition to reaping new scientific achievements, value-added applications (products and services alike) and major economic developments, provide the members of the Knowledge Centre with a source of revenue, thus lay the economic foundations of sustainable long-term financial support.

The results of the Knowledge Centre have a direct impact on the curriculum of the university as well. By taking part in the work of the Knowledge Centre, BSc, MSc and PhD students gain first-hand experience and insight into up-to-date and relevant industrial practices.

EXECUTIVE SUMMARY

The co-operation between the university and its industrial partners within the frameworks of the BME Innovation and Knowledge Centre of IT, or BME (IT)² for short, has twofold objectives: on the one hand, it aims at creating research and development intensive, value-added products and services for use with complex IT systems applications; on the other, it expands the scope of co-operation between the university and its partners, and renders it self-sustainable by setting up practical innovation automatisms and business models.



The results of the R&D programmes are utilised in four major (product and service oriented) fields of exploitation and in the developments they give rise to. To attain the innovation objectives, the rules and procedures were formulated with the requirements of the application development projects borne in mind:

Objectives of the application development portfolio:

1. e-Document

- Content and document conversions
- Authenticity and quality audit
- Document management

These projects, linked with the existing products of the industrial partners, aim at updating existing modules and developing new ones by putting into practice the theoretical achievements of the research. This group of projects fall within the primary field of experimentation and application for the research into development methodology and frameworks, thus setting the development direction of the framework as well. Moreover, the model-based methodology, framework and technology capable of efficient generation of applications using the set of operations developed for e-Document management become marketable products themselves.

2. Middleware, knowledge base and graphical applications

- Transport logistics
- Geographic information system databases
- Internal security algorithms
- Real time rendering methods

Service-oriented companies are often "forced" to co-operate with each other, whether through the market rationale or statutory obligations. At such times, the interoperability of their information systems has to be guaranteed - for instance to facilitate the settlement of accounts. To this end, a meta-layer providing the appropriate services and functionality has to be implemented. This involves analysing the processes and systems, as well as defining the required data export and import functionalities. Based on the early results, the development of a widely usable interoperability framework with a user-friendly graphical user interface seems to be entirely feasible.

In the field of image synthesis, major difficulties arise from partitioning the tasks requiring immense processing capabilities (in this case, global illumination algorithms and volume visualisation) into smaller pieces that can be executed separately, and then compositing the results back together. The clear-cut visualisation of the results remains internationally unsolved. The difficulty lies in the graphical representation of the vast amounts of data (many Giga- or Terabytes) of the result set as it by far exceeds the storage, procession and display capabilities of any graphical device. Our project sets out to solve this problems based on the tools of our industrial partner.

3. e-Security development

- IT quality lab
- Log-gathering and analysis
- Virtually closed networks

Due to the increasingly sophisticated nature of attacks, information security calls for scientifically grounded answers. Within the frameworks of e-Security development, we work on procedures and tools that protect against the leaking of information from the premises of the company, which are capable of processing status reports of sizeable networks and making them manageable as well as capable of setting up secure channels of communication from node to node in an insecure network environment. Besides developing new procedures, their proven security must also be ensured. The security lab is charged with making the new products Common Criteria compliant, along with IT security analysis and certification of existing products.

4. Grid and security lab

- Distributed and extended file systems
- Industrial application of Grid systems
- IT security lab

With the rapid development of network technologies, it has become possible and, indeed, desirable to use high-capacity storage drives such as Grid resources. Remote network connections, however, have significant bandwidth bottlenecks and delays, thus rendering the planning of distributed file systems more difficult. Accordingly, we set up a knowledge base on the usage and configuration of sizeable distributed and scalable file storage systems hitherto unknown in Hungary. With the use of Grid technologies, previously unimaginable algorithms and methods can be used. These algorithms - for instance the Parallel Hybrid Algorithm, or PHA for short, developed by BME - give a whole new way of solving limit value problems. Based on the experience gained from the PHA algorithm, we intend to develop an easy-to-configure service that helps to determine the size of trussed bridge-beams.

The members of the consortium have reached a consensus in framing the organisational statue of the Knowledge Centre, established the Directing Body and the Scientific Council and appointed the one-person manager of the BME (IT)^2. The manager, with the consent of the Directing Body, has appointed the members of the Board of Managers of the Knowledge Centre. The organisational statute provides for the tasks, rights and obligations of the

bodies and the management. The management, with the consent of the Directing Body, has drafted the research, development and innovation work schedule, the organisational development plan and the regulations for handling the intellectual property.

The area of operation of the BME (IT)² is provided by one of the in-house university partners, the Centre for Information Technology of the University. The investment in infrastructure, resources, working environment and personnel necessitated by the co-operation has already taken place.

With the help of process descriptions and statutes, the management regulates in detail the financial and administrative operation of the BME (IT)², as well as the supervision method and procedure of the development projects. The Secretary is responsible for handling the financial and administrative tasks, whereas the supervision and administration of the internal processes of the projects are seen to by the Project Office. The Board of Managers has set up the entire quality management system of the Knowledge Centre, which has been audited and accordingly BME (IT)² has been awarded the ISO 9001 quality assurance certification.

For seamless co-operation between the University and its partners, we have created - within the Knowledge Centre Hungary's first joint university-industry IT research, development and innovation workshop, where the researchers and developers of the University work together with experts from small, medium and multinational IT firms, resulting in a team of about 30 to 40 researchers and developers.

The 'R&D&I workshop' of BME (IT)² is the scene of actual and continuous collaboration, as this is where the industrial partners advise the University on the innovation needs of the market. The University's experts then provide the industrial partners with the latest methodology, model-based development frameworks and software production line, which in turn are used in the actual development of technology and application through the joint efforts of the University and its partners.

The products and services our R&D activity has given rise to are presented in detail in a chapter on application development projects of the present report, and a summary is also given in the table of indicators. However, we would like to seize the opportunity to review the achievements we believe are of particular importance:

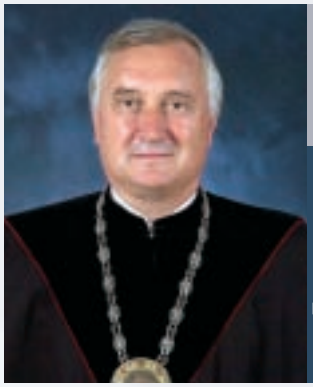
- Development of pilot model application for offline signature identification and verification (Autograph 2.0)
- Development of new technology software application for logging and analysing IT systems (Syslog-NG.)
- Two implementations of meta-layer in the field of knowledge base (on FORTE-Integrity UNIFACE technology, on three-tier architecture, and on MidGispro ArcGIS Data Interoperability technology)
- Development of pilot model software application assisting CMMI software quality audit (CMMI Assistant software)
- Significant international publications in the fields of graphical applications and IT security (5 international publications)
- Participation in international projects on e-Document handling, image processing and Grid technology (Boston, Budapest, Chicago, Nashua, Grenoble)
- Operation of a portal service for computation intensive planning for the construction industry based on Grid technology (www.grid.it2.bme.hu)
- Using the results of the R&D programmes, we have upgraded the syllabi of five courses with significant student involvement (590 participants).

During the first three years, the so-called incubation period, BME (IT)² relies primarily on community sources. Its efficiency can be demonstrated by setting the foundations for a long-term, lucrative operation and by helping to realise specific social objectives. Accordingly, BME (IT)² helps achieve specific strategic objectives of the National Development Plan, such as stepping up economic competitiveness, the creation of innovative, knowledge based economy and increasing the revenue generating capabilities of small- and medium-sized enterprises. Through training, BME (IT)² fosters the development of innovation potential, and with the help of its professional expertise, it contributes to the modernisation of public services by means of creating electronic public services.

Dr. Risztics Péter Károly
director

DIRECTING BODY OF BME (IT)^2

The general management of the Knowledge Centre is performed by the Directing Body. The University and the industrial members of the consortium delegate three members each. The body is chaired by the Rector of the University.



Dr. Károly Molnár

rector of the Budapest University of Technology and Economics, chair of the Directing Body

Dr. György Beck

general manager of Hewlett-Packard Hungary Ltd., chair of the Forum of the Hungarian IT Organizations for Information Society, member of the Board of the Hungarian Association of IT Companies

Dr. Ákos Detrekői

professor at the Budapest University of Technology and Economics, member of the Hungarian Academy of Sciences, chair of the National Council for Communications and Information Technology

Imre K. Szabó

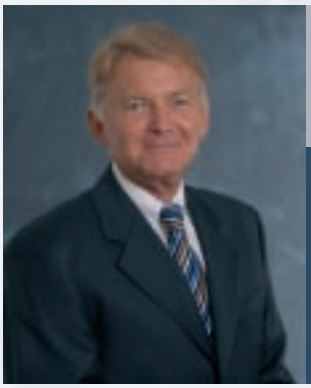
general manager of Megatrend Co.

Dr. Gábor Péceli

professor and head of department at the Budapest University of Technology and Economics, dean of the Faculty of Electrical Engineering and Informatics

Dr. Ákos Reszler

general manager of Nuance-Recognita Corp., honorary chair of the Board of the Hungarian Association of IT Companies



Dr. Péter Károly Risztics

associate professor at Budapest University of Technolgy and Economics, director of BME (IT)^2

SCIENTIFIC COUNCIL, SCIENTIFIC FORUM

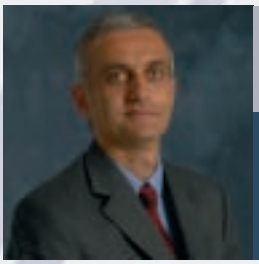
The Scientific Council reports on the R&D and innovation strategy and projects of the Knowledge Centre, and furthers their implementation. It continuously monitors and evaluates the projects' scientific achievements and publications.

Dr. Péter Arató

chair of the Scientific Council, member of the Hungarian Academy of Sciences, professor and head of department at BME

Dr. András Czifra

managing director of DSS Consulting Ltd.



Dr. Gábor Domokos

member of the Hungarian Academy of Sciences, professor and head of department at BME

Attila Haraszti

head of Competence Centre at Hewlett-Packard Hungary Ltd.

Dr. Károly Kondorosi

associate professor at BME, director of science at BME (IT)²

Antal Kuthy

managing director of E-Group Ltd., member of the Board of the Hungarian Association of IT Companies

Dr. István Vajk

professor and head of department at BME

János Zelenák

development manager of Secfone Ltd.

The work of the Scientific Council is supported by the Scientific Forum, the members of which are:

Dr. Károly Kondorosi - associate professor, BME IIT, director of science at BME (IT)²

Dr. Jenő Hetthéssy - associate professor, BME AAIT

Dr. László Szirmay-Kalos - professor, BME IIT

Dr. Béla Fehér -associate professor, BME MIT

Dr. Imre Molnár - honorary lecturer, BME IIT

Tihamér Levendovszky - senior lecturer, BME AAIT

Szabolcs Szigeti - research fellow, BME IK

Scientific Forum session

THE CONSORTIUM

1. 1. Budapest University of Technology and Economics

BME considers its mission to have diversified, multi-level, high-quality education as well as technical research and development based on strong basic education. The university ensures that its curricula provide both theoretical and practical training. Accordingly, sound academic foundations are accompanied by practical training with the help of its industrial partners. Besides education, the university lays emphasis on research. As a participant in international research programmes and leader of the national research trends, the activity of BME spans the whole range of basic and applied research, technical product and service development and complex quality assurance.

The high-quality knowledge base present at the university is a firm foundation for the implementation of the R&D projects of BME (IT)². Owing to the diverse fields of expertise required by the current R&D projects, BME (IT)², the BME Centre of Information Technology, the Department of Automation and Applied Informatics and the Department of Control Engineering and Information Technology at the Faculty of Electrical Engineering and Information Technology and the Department of Mechanics, Materials and Structures at the Faculty of Architecture, are in close communication with one another. Moreover, other departmental research groups that have references and competencies in the fields of expertise crucial to achieving the objectives also take part in the work.

2. Balabit Ltd.

BalaBit IT Security is a developer of special network security solutions satisfying the highest standards. BalaBit is owned by Hungarian individuals. As the only firewall manufacturer in Central Europe, BalaBit has a leading role in the Hungarian market. The company has customers in North America, Australia, and in several European countries. BalaBit IT Security is committed to open standards and is an active member of the open source community. The syslog-ng system logging software, which is the main open-source project of the company, is the world's most widely used alternative syslog solution for the UNIX/Linux platforms.

3. DSS Consulting Ltd.

DSS Consulting Ltd was founded in 1998, its strategic specialty is data mining research and development. A prominent leveled development workshop has been set up at the company where a tool, algorithm and methodology-irrespective development is being run. There is a close coherence between projects and developments. Theoretical knowledge and research results of the company's experts are applicable for solving problems occurring during practice. The company has developed and is continuously developing independent intelligent applications on its more significant researches often implemented by involving university partners. This is the way the company's products such as the Bayes Generation bayes network-based data mining tool, the AutoGraph dynamic signature-verification tool, and the WebWatch web-mining system has come into existence. The company has researches on several further fields (i.e. bioinformatics) financed by subsidies obtained from various EU and national tender programs.

4. E-GROUP-Services Ltd.

EGROUP researches, designs, develops integrates, launches, represents and operates for its Clients and Partners innovative, IT-based solutions and products generating high business value. Complying with the legal regulations and the international standards EGROUP is a specialist of protected transaction and document management procedures representing high business value, as well as of the supporting IT-transaction, document management and information protection solutions and products. On the Company's cleared-out, triple scale of products, portfolio and technological direction the eDOX™ file and document management system, the Transform™ authentic and safe form and document handling system and the DocMark™ printed document protection system can also be found, among other things. Pursuant to Act XXXV of 2001 on the Electronic Signature EGROUP developed an innovative document authentication and e-signature technology named Signed Document eXpert, SDX™, being the first in Hungary that was awarded in January 2004 the title "qualified electronic signature application". The success and the value of the solution is indicated by the fact that since that time this technology has been developed into an application platform and it has also become the initiator of several new areas.

5. ESRI Hungary Ltd.

ESRI Hungary Informatics Technical Developer and Commercial Ltd. Was founded in 1989 under the name of GEOCOMP Ltd., and it has been working on this professional area since there are geographic information systems (GIS) in Hungary. Its story is in connection with ESRI (Environmental Systems Research Institute, Inc.) - the leader

world wide of the GIS market, American company with 35 years experience - from the beginning.
Our firm is the authorized distributor of ESRI in Hungary. Our target and basic task is distribution and representation of the products and GIS culture of ESRI. Every activity in connection to GIS and ESRI products - commerce, consultation, support, training, system analysis and planning, system development is included in our profile.

6. Hewlett-Packard Hungary Ltd.

HP is a technology solutions provider to consumers, businesses and institutions globally. The company's offerings span IT infrastructure, global services, business and home computing, imaging and printing. HP holds a number one position in the markets of fault-tolerant servers, UNIX®, Linux and Windows® servers, storage solutions, system management software, imaging and printing devices and PCs, and it is a dominant player of the system integration services market.

The company has operations in more than 178 countries across the word. Since the HP-Compaq merger, it has been serving over 1 billion users on five continents. The development of easy-to-use, innovative products and solutions is fuelled by an annual R&D budget of USD 3.9 bn.

HP leads the Hungarian market of IT services and it has the second largest IT services organization in Europe. In recognition of its efforts, HP Hungary was granted numerous awards including the National Quality Award for business excellence, the Business Ethics Award, the Innovation Award and the Kármán Tódor Award for sponsorship in education.

7. Megatrend Co.

Megatrend Co. specializes in the development and operation of information systems supporting the most important operational, management and security processes of enterprises, public administration and government.
Megatrend provides business solutions in all fields of economy, reached a decisive market share in food industry, by the help of its unique production systems more thousands products are available for customers on the shelves in a day. Its specific integrated administration and production solutions operate in the area of heavy, chemical, pharmaceutical, and light industries. By the help of its Financial and Accounting systems monthly ten billions value of invoices are handled securely. Bank and leasing references prove that the competence of Megatrend's specialists fulfils the requirements of critical business and management processes. The information security product of Megatrend protects business, banking and state secrets.

8. Nuance-Recognita Corp.

Nuance-Recognita Corp. was established in November, 1989 under the name SzKI Recognita Corp. and has been engaged in software development, more specifically, in the design of image processing products, applications, and technologies. Nuance-Recognita Corp. is the subsidiary of Nuance Communications, Inc. (Burlington, MA, USA), the leading provider of speech and imaging solutions for businesses and consumers around the world. Nuance runs operations in many countries, has 2000 employees and its annual turnover reaches 500 million US dollars per year.

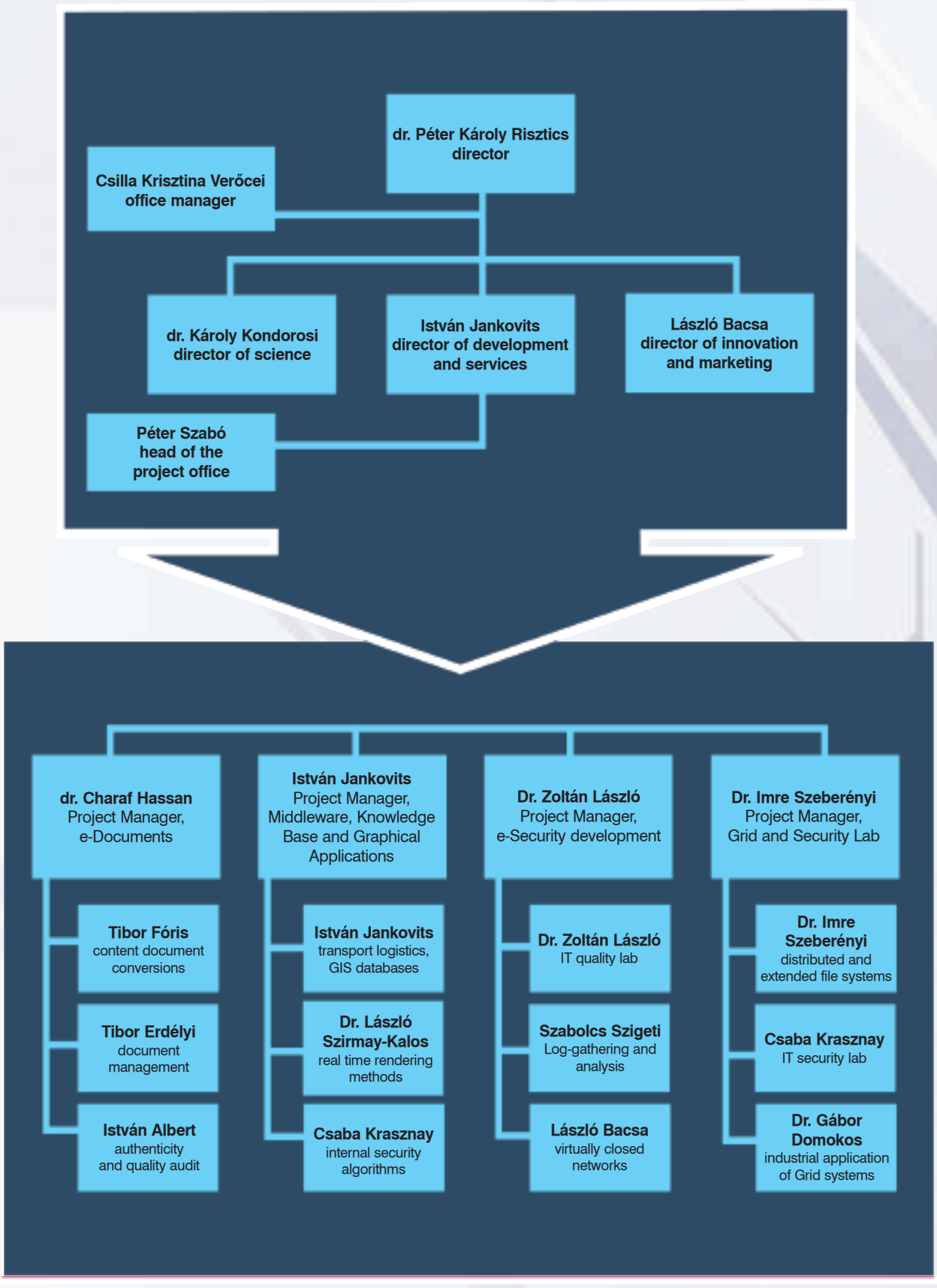
9. Secfone Research and Development Ltd

Secfone Research and Development Ltd was established in 2004 to put a patent, describing a special, virtually closed network protocol in use. Beside developing MVCN network (Manageable Virtual Closed Network) the company is going to be in the market with comprehensive proprietary MVCN solution, server and endpoint products. Secfone presented the MVCN technology at Cebit 2005, the first MVCN network endpoint - a proprietary equipement under codename Secbox - at Cebit 2006 with great success.
Secfone's mission is to present and propagate the technology, to broaden the productline, to enhance the functionality and usability of Secbox, and to develop new MVCN equipments. Hence Secfone do research and development in specified target areas (performance enhancement, mobile communication, video transfer, IP based voice transfer etc.).

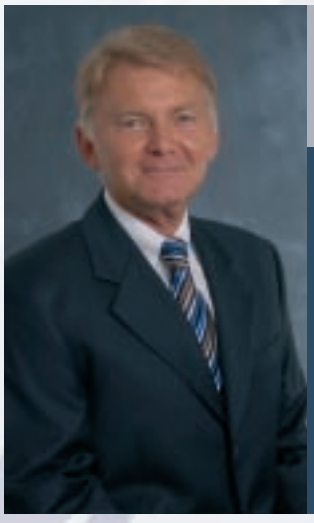
10. T-Systems Hungary Ltd.

Starting date in Hungary is 1994, the first name of the company was Unisoftware Ltd., from March 2004 onwards its name is T-Systems Hungary Ltd. The company plans, develops and installs complete information-communication solutions. Scope of activities covers not only TSH project management but all elements of the IT systems' life cycle: advising-planning, implementation service, developing, system integration, and maintaining the ready systems - even outsourcing - these are all included in the portfolio of the company. As a result of the close connection with TSI the mother company TSH can rely not only on its own resources but on the experience, knowledge and human resource of an international information communication service company.

ORGANISATIONAL STRUCTURE



MANAGEMENT



Dr. Péter Károly Risztics

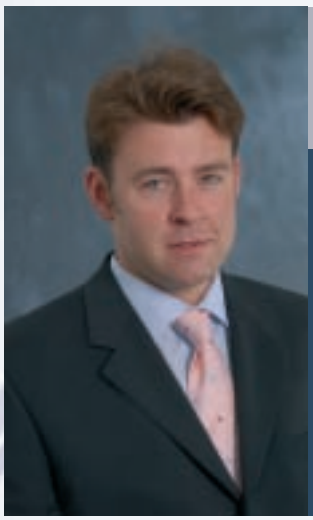
director

Dr. Károly Kondorosi

director of science

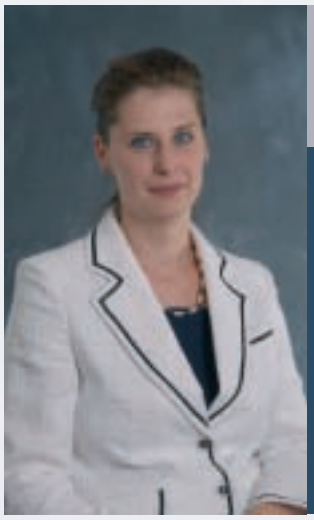
István Jankovits

director of development and services



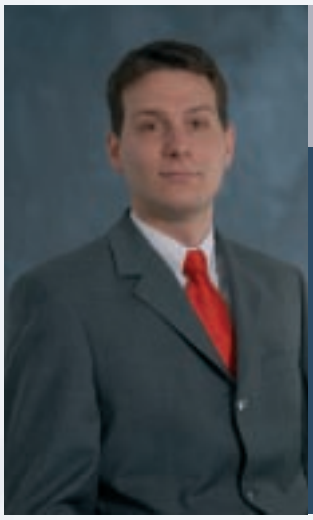
László Bacsa

director of innovation and marketing



Csilla Krisztina Verőcei

office manager



Péter Szabó

head of the project office

QUALITY POLICY

The most important objective of the BME Innovation and Knowledge Centre of Information Technology - BME (IT)² is forging a partnership between academia and industry with outstanding research and development activity and innovation, thus enhancing the R&D programmes of enterprises, bolstering the economic and technical development of the region and consequently improving the economic competitiveness of Hungary.
BME (IT)² fulfils its duties in full conformity with the statutory and contractual obligations, as well as other regulations, and as a result of its conscientious and organised work, meets the demands of its partners to a full extent.

To this end, we use an MSZ EN ISO 9001:2001 compliant quality management system. Quality assurance tasks are dealt with by the quality manager vested with the necessary scope of authority. The management is deeply committed to quality and requires all its colleagues and partners to comply with the quality regulations.
BME (IT)² believes that highly trained researchers with up-to-date knowledge are indispensable to high quality technology and application development. Therefore, the continuous training and self-education of its colleagues are not only required, but also supported. Their progression is systematically assessed and acknowledged.

The cornerstone of our quality management system is the presententation of an optimal outcome. For that reason, we require that our partners and suppliers also comply with quality regulations, and perform their obligations on time. Therefore we constantly monitor our partners and assess them on the basis of how they fulfilled their obligations. In the long run, we intend to co-operate only with those who conform to our quality standards.

For the sake of continuous development, we reveal the discrepancies in our processes and see to their resolution.

We also see to it that our colleagues and partners get to know and understand our quality policy, that they apply it in their everyday work, and that they be aware of their role and importance in achieving the quality objectives.
At the same time, it is our ambition to make our colleagues aspire to quality work.

July 1st., 2006 Budapest

Dr. Risztics Péter Károly
director

THE R&D PROGRAMMES

The research and development programme of the Knowledge Centre is based on the premise that the achievements of information technology have not been utilised in the everyday life of society to the extent it would be possible by the present technical and scientific level of the field. The main reasons for this are:

- The applications are not well adapted to the needs of the users. It is partly because of the lack of established, consensual domain models. Their lack is not well understood, and the problems arising from this fact appear to be flaws in IT systems themselves. On the other hand, these systems are difficult to master, and they are not well accommodated to the workflow and the work environment, thereby placing an unnecessary burden on the user.
- The security and quality of IT systems are not satisfactory. Substantial functionalities may fail and important data may be lost due to system crashes, while security holes make users vulnerable. There is little support to secure operation, and joints to other systems are lacking. However, these apparently simple problems can only be solved by complex developments.

For these reasons, BME $(IT)^2$ is focusing its professional activity on trying to provide users with IT systems that satisfy their needs and that can be used efficiently.

IT development projects generally require expertise in several fields of speciality. At the same time, independent research can be done in these fields, and the experience gained can be applied in numerous other domains as well. The present consortium unites experts from a variety of disciplines allowing them not only to carry out intertwined research programmes, but also to nurture a wide range of applications in other domains as well.

The work of the Knowledge Centre can be categorised into research programmes and application development projects. Research programmes are organised on the basis of professional rationale and provide a steady framework for long term work. Each field of speciality is led by a head of programme. Application development programmes on the other hand aim at developing specific products or services and, as such, are generally developed in co-operation with our industrial partners. These programmes put into practice the achievements of the research, while raising new research problems as well. Application development programmes are intermittent, and are subject to the time and resource constraints typical of projects. These programmes have been categorised into groups of projects on the basis of fields of expertise and organisational considerations. The research and development work of the groups are led by project managers.

The Knowledge Centre has set up four research programmes and four groups of projects. The relationships between the research programmes and the application development projects can be seen in the matrix of the executive summary. This shows that the scientific achievements of the research trends are used in various projects and each project relies on the results of several research programmes.

The organisational hierarchy of the Knowledge Centre was formed with the project structure borne in mind, as the projects require firm management due to their money and time constraints. Research programmes are operated by means of another organisational channel (Scientific Council, deputy manager in charge of scientific affairs, heads of programme) mainly using co-ordination devices.

Accordingly, in this chapter we set out to present the objectives of the research programmes and the most important activities of the accounting period, and finally, we describe how the programmes relate to application development projects. The specific achievements (publications, documents, products and services the projects gave rise to) are described in detail at the presentation of the projects.

1. DEVELOPMENT METHODOLOGY AND FRAMEWORK

Head of programme: Dr. Charaf Hassan, associate professor at BME AAIT

Objective

Scientifically grounded methodology is indispensable to developing complex and modern IT systems, and methodologies are in constant change.

The latest trends develop object-oriented programming into component-based, model-based and aspect-oriented development. To create the most generalisable and recyclable solutions possible, meta models are defined and design templates are created. The practical implementation of methodologies is helped by development frameworks. These frameworks can be continuously upgraded with the modules of new fields of application with the help of meta-models. The developments aim at attaining seamless development technologies, which would eliminate or minimise the current technological and conceptual gap between requirements and models, and source codes and models.

Our most important goal is working out a development methodology based on multi-layer and multi-dimensional meta-models - M(LD)M - and a development framework based on this methodology.

The framework is of modular structure and can be upgraded with domain-specific modules based on the unified meta-models. This makes application development for the specific domain fast and efficient.

The insertion of legacy codes is still also to be solved. This expression refers to the problem of integrating older program codes into systems developed using model-based methodology and tools. Legacy codes are often valuable, tried and tested, but have been developed using other methodology and accordingly pose a problem of compatibility.

These objectives designate research tasks such as: developing the methods of domain specific modelling, and making models of the domains connected with the project (document management, traffic logistics, town management, etc.); development of the algorithms and tools of information management; development of the algorithms of data mining for systematic analysis of the data gathered during operation and development to work out the quality features and assessment criteria.

Activities

We have taken stock of our achievements and have settled on the division of labour.

Amongst the members of the Knowledge Centre, the following university departments had a research history in the field of methodology, frameworks and domain specific modelling: AAIT, IIT and IK. However, we also studied the latest results of other domestic and international workshops.

On 3 March, 2006, we organised a workshop entitled 'Methodologies and frameworks' on research history and tasks to be completed.

The framework is primarily used in the application development projects of the e-Document project group. We have carried out a task analysis of the workflow management compliant document management system and have accordingly designed a framework module capable of generating client applications. A pilot model of this module has already been developed. We managed to use the methods of domain analysis on the interoperability and traffic logistics projects of another project group (middleware, knowledge base and graphical applications). Based on the first year's experience we can state that the methodology and framework programme has yielded the expected results (efficient, logical and manageable development, unified methodology, readable source codes).

In the field of information management we have developed models for the performance analysis of client-server applications that are in use with document management systems as well. These models lay the foundations of design and operation metrics.

We have developed the meta-model based description method of transformation between aspect-oriented models, source code models and source codes, as well as a compiler generator for Meta-Object Facility compliant source codes models. These achievements can be used both in developments using multi-dimensional modelling and in handling legacy source codes. The results were presented at a number of prestigious conferences.

2. DISTRIBUTED AND EMBEDDED SYSTEMS

Head of Programme: Dr. Béla Fehér, associate professor at BME MIT

Objective

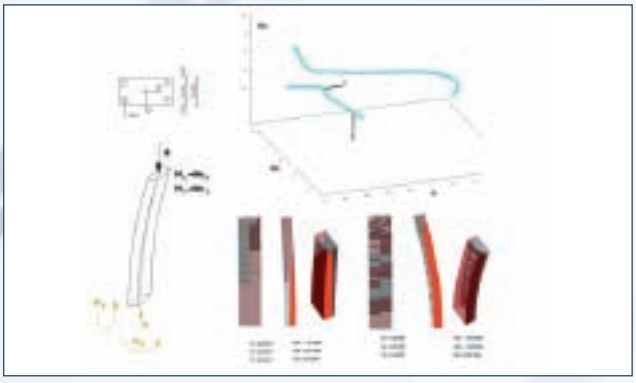
Distributability and embedability are indispensable to today's IT systems and they require that certain design criteria be borne in mind. The reasons behind designing distributed IT systems are manifold: on the one hand, it is because of the geographical separation of its constituents, but on the other hand, it can also be due to the design considerations of decomposing the system components. The presence and dynamic development of the Internet has made clear that extensive distributed systems are only to be designed on the technological basis of the Internet. Furthermore, the design of closed virtual networks of organisations should also be based on this technology. As a result of the advancement of network technologies (bandwidth doubles every 15 months), distributed and parallel systems have become one of the most important means of implementing virtual supercomputers and increasing the performance. Embeddedness means that IT devices are integrated into our environment, i.e. are "embedded" in our personal belongings. Adapting these devices to the users' needs and creating appliances that can be used without IT skills result in systems that conceal the underlying methods and tools. These novel scopes of application often result in new design priorities, such as minimising energy consumption or providing protection from interference. From the beginning, we have allocated significant resources from the research programme towards fostering a service-oriented implementation of Grid systems. As a result of the improvement of network technologies, researchers have come up with algorithms and methods previously unthought-of, or with those whose implementation was expected to become possible only with the advancement of supercomputers. By combining network resources, immense computing and storing capacities can be created, which then can be used in many applications. Our objective is developing and implementing web-based services of this kind.

Various standards have been created for the interoperability of the components of distributed systems. The most widespread technology amongst the latest trends is the so-called service-oriented architecture, or SOA for short. Our main ambition is developing the design and implementation methods of service-oriented components in a way that is compatible with our development framework.We work out the means of integrating the isolated applications, data sources and data stores into our system. The problem of integration crops up in different abstraction layers, from among which semantic integration, appearing at higher levels, raises open questions.

Activities

Within the frameworks of the research programme special emphasis has been placed on two topics related to the reference system of the Grid and security lab project group, which are capable of solving computation intensive engineering problems. One of these topics is the implementation of the Grid infrastructure of the reference system. During its development, the following tasks yielded generalisable results and gave rise to applied research tasks: exploring the factors affecting the efficiency of distributed file systems, designing scalable file systems, creating web service and SOA-based file synchronising solutions and designing an ergonomic Single System Image user interface for the portal.

The other topic is the development of parallel algorithms for use with limit value problems. These algorithms take advantage of Grid systems and form the basis of the intended service of the reference system. The service is meant to help designers of reinforced concrete structures determine the shape of objects to be used. As a result of the research programme, we have come up with an algorithm that models bridge beam deformation reliably and is also favourable in terms of convergence and stability. Preparatory work has been performed in the subject of semantic integration, which served dual purposes: aside from preparation and getting acquainted with the problem, it was also me ant to study two practical problems that arose with two projects of the middleware, knowledge base and graphical applications project group. The first problem was the integration of the heterogeneous geographical information systems used in town management. The other problem was the compatibility between the IT systems of major transport companies. Genuine research results are expected next year.



3. IT SECURITY AND QUALITY

Head of programme: Dr. Károly Kondorosi, associate professor at BME IIT

As IT systems are increasingly becoming part of all walks of life, information security is becoming more and more important. The security of current IT systems is not satisfactory, while security solutions are difficult and over-complicated. International standards and regulations are being drafted to classify security systems and to certify compliance with standards (e.g. Common Criteria). Hungary accepts these standards and intends to apply them (c.f. MIBÉTS). Besides technical approaches, organisational level approaches are also gaining ground (COBIT, BS7799). Quality and quality assurance are no exception to this, as in addition ISO certifications CMM-rooted certifications are also becoming increasingly popular. The ultimate purpose of the programme is the creation of an IT security and quality attesting laboratory which by the end of the project could become an IT certification laboratory. A university organisational unit is ideal for such purposes, owing to its independency of market participants. Our particular research topics include analysis of new threats, techniques of identification and attestation, secure payment protocols, audit methodologies and their computerised support, as well as determination of quality attributes, metrics and measurement methods of products, resources and processes.

Considering that security and quality requirements arise in almost every project of the Knowledge Centre, and knowing that meeting these requirements is by no means trouble-free, we seek solutions to the actual problems of the projects within the frameworks of the programme as well.

Activities

The Development of information security algorithms project of the e-Security development project group aims at recognising patterns of behaviour characteristic of security attacks. The research task is the compilation of behaviour profiles based on the behaviour elements of everyday use of the system, as well as development of methods of risk analysis and assessment to recognise attacks reliably. As a result of the research we have managed to define a mathematical model for assessment using numerous independent variables.

A Common Criteria assessment of certain products developed as part of two other projects of this project group has emerged. As an applied research task, we designed the appropriate security profile of these products.

Regarding the subject of IT quality, we have started doing research into methods of ISO 9126 compliant software attestment. Product based quality attestment has no convention, and thus no methodology either.

We have selected a general methodology of attestation relevant to the problem (Goal-Question-Metric, GQM), which could form the basis of all subsequent work. We have specified a set of metrics according to the standard: external, internal and in-use. We have recognised that our achievements in the field of model-based development are applicable and could form the basis of a scientifically grounded methodology of attestation. We have selected a software product (Statistical Process Control program), with which we could test our concepts of metrics and methods. Communication has been initiated with the research fellows of a partner university (University of Szeged, Department of Software Development). They have achieved promising results in the field of internal metrics based on source code analysis, and therefore we intend to co-operate with them in further methodology research.

The projects' IT security lab and IT quality lab have been categorised into different project groups in the organisational structure of the Knowledge Centre; formerly two separate departments did research into these fields. However, the two approaches are similar in a number of ways. The similarities in the method of assessment and certification, as well as in the requirements of documentation and document managing justify the need for a single laboratory at the Knowledge Centre for the two activities. Our preparatory study sums up the conditions of forming a joint security and quality lab and also shows possible connection points between the two fields. Research tasks to be solved include harmonisation of attestation systems (such as CC and CMMI) and the drafting of proposals for the mutual recognition of certain proofs.

4. HUMAN-MACHINE INTERFACE

Head of programme: Dr. László Szirmay-Kalos, professor at BME IIT

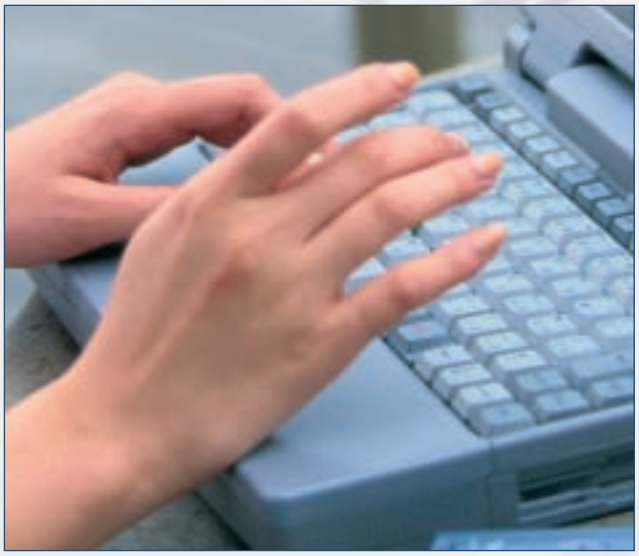
Objective

This research programme deals with the general questions of interaction between human users and computer systems, visual and sound interfaces and the ergonomy of instantly comprehensible ways of conveying information. However, it focuses on real-time three dimensional (3D) imaging. The practical implementation of real-time 3D systems poses problems both in the field of storage capacity and in computing speed. However, realistic imaging and 'telepresence' could have breakthrough results in various fields, such as detecting and manipulating dangerous situations. An equally important domain of exploitation is the realistic representation of models and plans, and the blending of real and imaginary worlds (e.g. cinematographic applications, virtual pursuance of architectural desgns, and realistic animation of medical imaging). This research programme aims at developing new algorithms and methods of realisation.

Activities

The main activities of the programme in the accounting period focused on the research tasks of the Real-time rendering methods project. To describe three-dimensional objects, realistic real-time imaging uses models with storage requirements of several terabytes while procession times are limited to only few nanoseconds per pixel. This task requires scalable distributed hardware infrastructure and parallel algorithms.

One of the options for distributing the tasks is assigning parts of the pixel space to processors. In this case, each processor renders a subset of all the visible pixels (generally a rectangular shaped part of the whole image). Using this method makes the assembly of the whole image relatively simple. The other option is distributing the tasks among the processors in a way that each processor renders one (or a few) objects of the model, and calculates all the pixels of the object(s) in question. In this case, the assembly of the image is done by a final compositing. The advantages of this method lie in the fact that simply by changing the parameters of composition we can influence the visibility of each object and thus we can see behind the objects in the foreground or make them transparent if we wish.



Our research aimed at examining parallel algorithms of compositing and experimental comparison of implementations. Based on the theoretical achievements we have created the prototype of several methods of compositing using the devices of our industrial partner (scalable distributed hardware and visualisation framework), as well as the development of a benchmarking system used to measure efficiency.

The experience gained managing huge sets of data and the achievements of algorithm development (combined with the datamining results of the first research programme) proved to be of use for the identification of signature samples for the project Authenticity and quality of e-Document project group.

APPLICATION-DEVELOPMENT DIRECTIONS
1. e-DOCUMENT DIRECTION

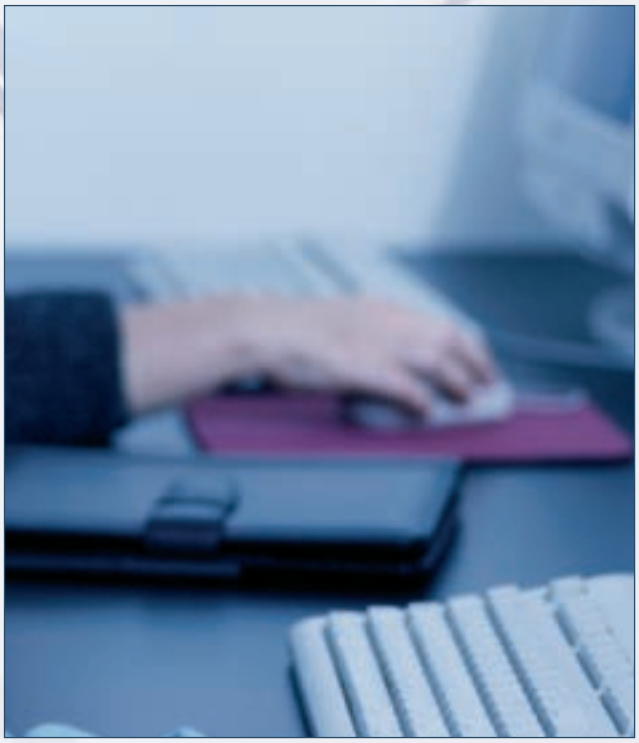
Project Director: Dr. Charaf Hassan, Ph.D., associate professor, BME AAIT
Professional field: Software and systems development
Publications: book chapters: 2, periodical: 25, conference: 130.
Memberships: John von Neumann Computer Society, IEEE, Hungarian Academy of Sciences Information Technology Committee.
Major industrial commissions over the past 3 years: Nokia Research Centre, Microsoft Research, Vultron, ModEduNet EU Project
Professional awards, acknowledgments: János Bolyai research scholarship, 1998-2000; Microsoft development relations regional director, 1998-2006; „For Work at the Student's Scientific Society" Budapest University of Technology and Economics Dean's Commemorative Plaque, 1999; Pannon GSM Professor's scholarship, 2000-2002; Master Teacher's Award, 2001; IT Trainer of the Year, 2003; 2 IBM Faculty Awards, 2004; IBM 48-hour Programming Competition teacher 2004 and 2005.

Scientifically grounded methodological research efforts supporting the development of complex information technology systems were articulated as a stand-alone competence in the strategy of the Budapest University of Technology and Economics' (BME) $(IT)^2$. Development work completed in the first year confirms the necessity of methodological research, as well as its important role in the creation of development frameworks that directly support practical applications, because the richness of application projects' content cannot be set in schemes, yet at the same time this cannot be covered with combinations of unique and independent development work in an efficient manner - and it is the time-to-market of products that needs to be kept in mind first and foremost in this respect.

Deployment of the Model Driven Architecture (MDA) software technique constitutes the most modern means of creating framework systems nowadays, and it is a technique that allows visualised transparency and maintenance, and serves application projects by means of ensuring a standard software development technique at the conceptual level. Accordingly, we build around MDA's methodological basis in e-Document application projects, and utilise the theoretic findings accomplished in the field of multi-dimensional, multi-layer modelling.

The framework system provides standard support for shared software development activity in varying application fields from both the methodology, as well as the technology aspects. The objective of formulating different developers' framework systems is to enhance the competitiveness of products containing software development, as well as to create a combination of pooled assets which directly and efficiently activate the code libraries that significantly reduce product times-to-market, along with their elements.

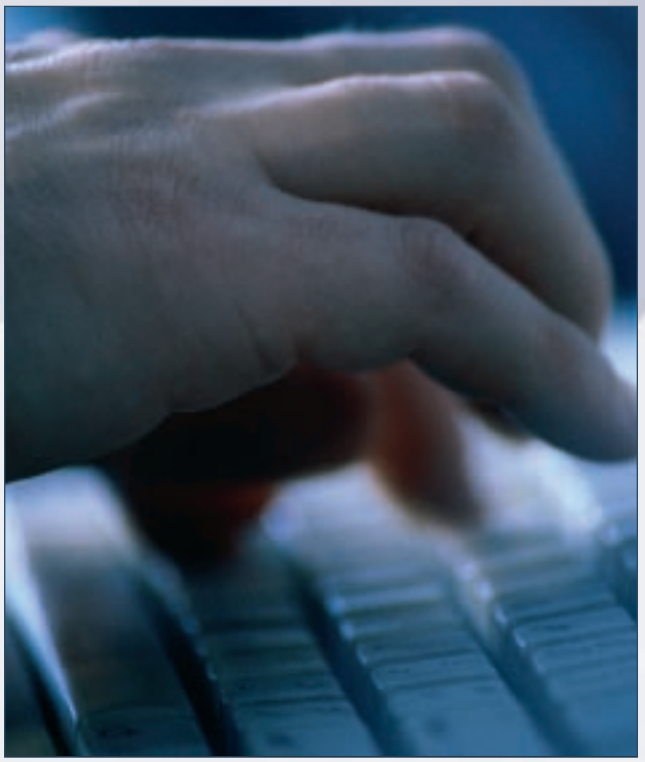
Developer framework system services can be supplemented using application specific plug-in modules. Document management tasks, for example, are implemented with a plug-in module that over and above storing the documents and archiving them directly or as meta data, manages access rights, automatically forwards documents and reply documents to the appropriate recipients, allows for prescribing and tracing the information-flow that documents realise, as well as by means of elaborating the option of mobile document management. Our task is to develop software compo-



nents that provide services for these products, and moreover to formulate additional editing possibilities for generated electronic documents, along with the possibility to file them in the standard document management chain. With services elaborated for organisation/corporate governance systems, we ensure the possibility to process electronic documents generated during the activation of form completion options in a standard manner, along with the co-ordinated management and system level verification of different documents created as part of the company processes. We formulate an application interface that allows for the articulation of requirements at the user level, and co-ordinates the system of corporate processes and documents accompanying production in a flexible manner which adapts to any possible change.

Within the e-Document Project Group, we use the framework system for development efforts in progress in various professional fields. For users, the convenient and efficient development environment means that they can use high level models, as well as descriptive modes which fit the professional field's concept system during development. Professional, field specific languages have to be formulated for this. Exploring the essential, as well as content related correlations of the applications constitutes the preparations for this phase. This is the work we completed in the first year of the project, among other things, supplemented with performing specific developments which in part accelerate the market entry of planned products and in part ensure that the previously acquired market positions of industry partners can be retained. Wherever possible, we implemented the developments in forms of service in order to be able to recycle the codes.

University-industry professionals in the e-Document project group supplemented the list of BME $(IT)^2$ achievements with the following accomplishments:



I. The enhancement of the Dragon MT workflow system which performs the automated processing of medical test findings
   a. Software development in the current issued version
   b. Formulation of the thick-client prototype
   c. Carrying out performance analysis and optimisation, along with the summarising of results in a study, and publications; documenting development efforts
   d. Investigating Java and .NET platform integration with the help of web services. Study, document
   e. The design of various client framework system functions, documents

II. Off-line signature identification and examination of origin
   a. Collection of specimen signatures, creation of signature database
   b. Implementation of test system
   c. Specification and implementation of signature preparation algorithms
   d. Formulation of unique point-pairing algorithm
   e. Formulation of operational test prototype

III. Document management
   a. The formulation of the SDX (Signed Document eXpert) server component's special WebService (SOAP) interface
   b. The formulation of data link interfaces (SOAP, file-based protocols, SMTP) for associated, as well as other background systems
   c. The formulation of the architecturally scalable SOA-system
   d. Performance testing of the formulated system

1.1 Content, document conversions /subtask 1.1/

e-document direction

Project manager: Tibor Fóris, M.Sc., IT engineer, BME CIT.
Professional field: Software design and development
Publications: periodical: 4, conference: 7.
Professional experience: designing and developing administrative IT-systems, developing process control systems, developing enterprise systems, and developing web-based applications.
Major industrial commissions: designing and developing the Standard Administrative System, developing process control systems for Hungarian State Railways, participation in the development of various enterprise, as well as web-based applications.

Our consortium partner, the Nuance Dictaphone corporation's Healthcare Solutions business unit is the world's leading supplier of voice recognition, dictation, and transcription systems (creating electronic documents from voice recordings), as well as services. Its products simplify electronic data management and processing connected to patients, and enhance their quality. Today there are more than 400,000 physicians in close to 4,000 hospitals, clinics, and other practices who use Dictaphone solutions that contain the Dragon Naturally Speaking voice recognition engine. With its help, the costly activity of writing test findings is replaced by dictation, followed by a quality controlled process of automated voice recognition and transcription with a transcriptor, which makes better and cheaper care possible by means of more direct, as well as immediate accessing of electronically stored findings and patient information. According to the development plans of our industrial partner for co-operation in BME (IT)^2 which were formulated with respect to Dictaphone products in April 2006, they gradually intend to replace their currently used systems, built on (thick) client-server foundations with a web-based family of products that better meet market demands. The client applications of this new product family, code-named „FX", are built around a shared client application framework system. One of the key objectives of our project is to create the research and development grounds of this framework system, and to perform its technological implementation.
Tibor Sás serves is the subject expert on behalf of our partner. He is a certified electrical engineer with more than 15 years' experience in software design and development topics such as embedded systems, real-time video streaming applications, controlled and configurable automatic document-content conversion, copy protection for software, as well as J2EE and .NET based business applications.

Objectives

The management and processing of electronic documents is one of the critically important areas of information systems which includes the entire document lifecycle, starting from creation, through various document transformations, and the processing of the document workflow, and ending with archiving. Focus is directed on a special area of document processing, that specifically of medical reports, where Nuance is the market leader in several fields. Simultaneously, the obvious objective is to allow for the application of generated research and development results on a broader scale, as well as to embody them in stand-alone products which can also be utilised in other document processing applications.
As a result of its previous activity as well as acquisitions, our industry partner has two similar families of applications that perform medical report processing - and both of them bear a significant market share. Because the application fields are identical and the nature of tasks to be solved is similar, the

structure of the systems is also alike, although the solutions do differ in many details and/or their implementation technology. Application-clients exist on a number of platforms and configurations in systems with a client-server structure: for example as thin as well as thick-clients which run on personal computers, clients running on PDAs, and on web-based application interfaces. The server-side, which embodies the business logic, performs the substantive part of document processing: voice recognition based document conversions, the processing of electronic documents, providing support for group activities, the performing of quality control tasks, the performing of workflow-type management tasks, as well as the archiving and delivery of documents.

Over recent years, significant know-how has been accumulated in the field of complex information system research and development at the University of Technology and Economics. In part, this is manifested in research topics and results (development methodologies, framework systems, performance analysis, etc.), and in part in new topics for research (distributed systems, software development using the J2EE platform and .NET platform), as well as in the form of independent laboratory and diploma subjects, and last but not least through participation in management, expert, and developer roles in industrial projects. Intensive research efforts connected to software development at the university - which are carried out in the field of model based development, and performance analysis - are directly applied during the formulation of the project's development methodology.

The co-operation of university and industry partners is realised in several aspects within document management. The most important ones are: the modernisation and creation of a new foundation for business logic and workflow management, the standardisation and modernisation of the client-side through the use of new technologies, as well as various other applied research tasks connected to system development, such as the modernising of the development methodology, automated testing and verification, and the optimisation of application server performance.

We are going to set the development of components and tools allowing the formulation of scalable workflow system as the objective, and the integration of such systems, which additionally make the automated tuning of applications possible, along with the addition of declarative consistence checking to the development process.

Co-operation in developing the Dragon MT Workflow System, along with the clients of the new FX system, which is being realised within BME (IT)², is creating a reusable component library and framework system through which document processing client applications can be generated using declarative tools, with formal specifications as the starting point.

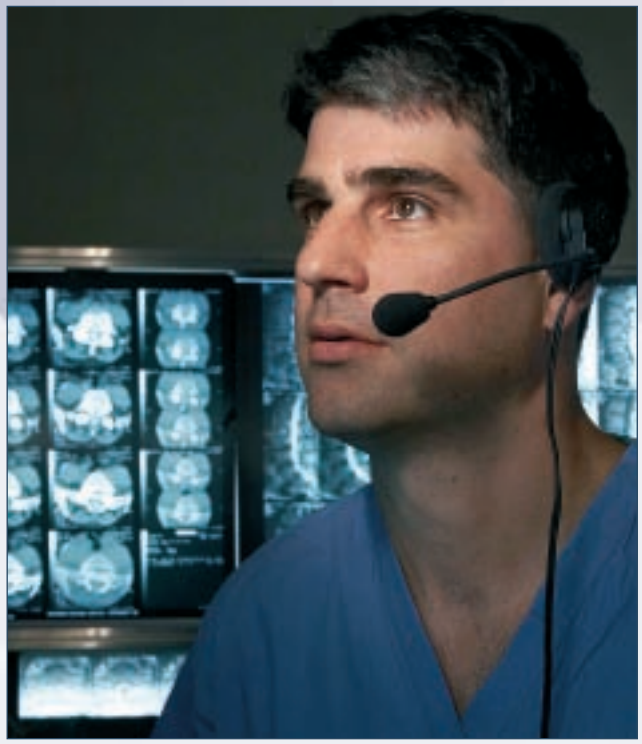
The most important advantage of the new client system is that it generates standardised user operation and appearance, as well as customisable applications, simplifies the integration of differently developed components, in addition to ensuring consistency for the server-client link, and automatic release tracking.

Activities

Apart from acquiring competence in the applications field, the objective of the first work stage is the investigation of formulating the framework system that allows the development of systems' client-sides, the drafting of specifications and the development of prototypes, as well as co-operation in server-side development efforts that are in progress, thereby creating the foundations for subsequent co-operation.

The first step saw project kick-off with project managers from Nuance Hungary and Nuance USA becoming acquainted with the products and technology, and setting up the group inter-operability environment. We have set up an automated test environment for the current project.

In alignment with the industry partner's product development strategy and scheduling, we completed the server-side development for the next in line Dragon MT Workflow System release as the first step of the project, in addition to taking part in the development of the corresponding thick client pro-



totype. The product has been released and put into operation, the thick client prototype completed and has served as the starting basis for drafting the specifications for clients to be created using the new technology client generator, as well as for creating their prototype.

As mentioned previously, Nuance has two products offering similar services, and both of them have a significant share in the US market for the processing of medical findings: the Dragon MT Workflow System, and the EXT (Enterprise Express Text) System. It might seem natural for the company to partially combine the products - standardising them, placing them on a shared developmental, methodological, as well as technological base while retaining and enhancing promising elements and solutions. Aside from those products the company is introducing new, innovative solutions. Several studies and application prototypes were produced in this reporting period in the interest of planning, as well as for the substantiation of decision-making: we investigated the possibilities for interconnecting different platforms based on services, conducted performance analyses and optimisation tasks for the system's server-side components, and examined different methods for data persistence. The studies offer recommendations on directions for development and potential new applied research opportunities began to evolve.

Selecting the tuneable parameter values of the applications server turned out to be one of the key issues in the course of performance analysis. Setting up a performance model that is capable of predicting performance in a suitably accurate way demands thorough research whose results to date have also been published as symposium papers.

The main emphasis was directed at the design and development of the system's various clients in the second half of the period. We produced a client prototype which includes certain parts of the clients' planned functionality and serves as a starting basis for designing and developing the client generator framework system to be developed.

The clients' specification has been completed and it specifies the direction for subsequent development efforts, in part with respect to the specific clients to be implemented and in part concerning the development of the framework system.

Technologies used for the client framework system were selected on the basis of the specifications, and a prototype was also developed for the sake of verifying the correctness of this selection. The client is currently being implemented on the .NET platform, since this provides good support for the reusing of various off-the-shelf applications (MS Word, Wordpad, Internet Explorer), and at the same time the framework system can also be used for providing support to other platforms. As the next step, the development of the framework system and clients will be continued: a general purpose document management component library will be created along with the client-generator framework system that is based on these components. We also take part in the development of the business logic, in line with the requirements of the industry partner.

The results and products of the first work stage

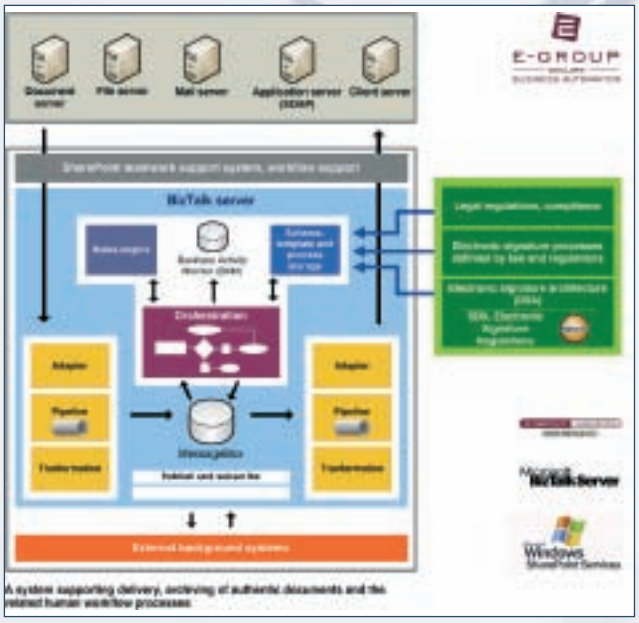
- Dragon MT workflow system release specifications, document
- Dragon MT workflow system release 8, server release, software
- Dragon MT workflow system release 8, thick-client prototype, software
- Performance analysis, optimisation; study, publications, document
- Investigating Java and .NET platform integration with the help of web services; study, document
- The design of various client framework system functions, document
- FX Client functional prototype, software
- FX client specifications, document
- Publications

1.2 Document management /subtask 1.1/

e-document direction

Project manager: Tibor Erdélyi, certified IT engineer, BME AAIT
Professional field: Software development, .NET Framework and associated technologies, Service Oriented Architecture, Biztalk Server based system integration
Publications: book chapters: 1, periodicals: 2, conferences: 3
Training: Participation in the elaboration of, as well as teaching of subjects on Software Development for the .NET Platform, and Games Development for the .NET Platform. Directing independent laboratory work and thesis planning as a specialist consultant
Participation in major projects over the past 3 years: T-COM, Global Knowledge, T-Mobile + Pannon, T-Systems, Monicomp, ProvidentCredentials, professional acknowledgements: Microsoft Certified Professional (2005), Microsoft Most Valuable Professional (2006), regular invitations to speak at professional events organised by Microsoft Hungary.

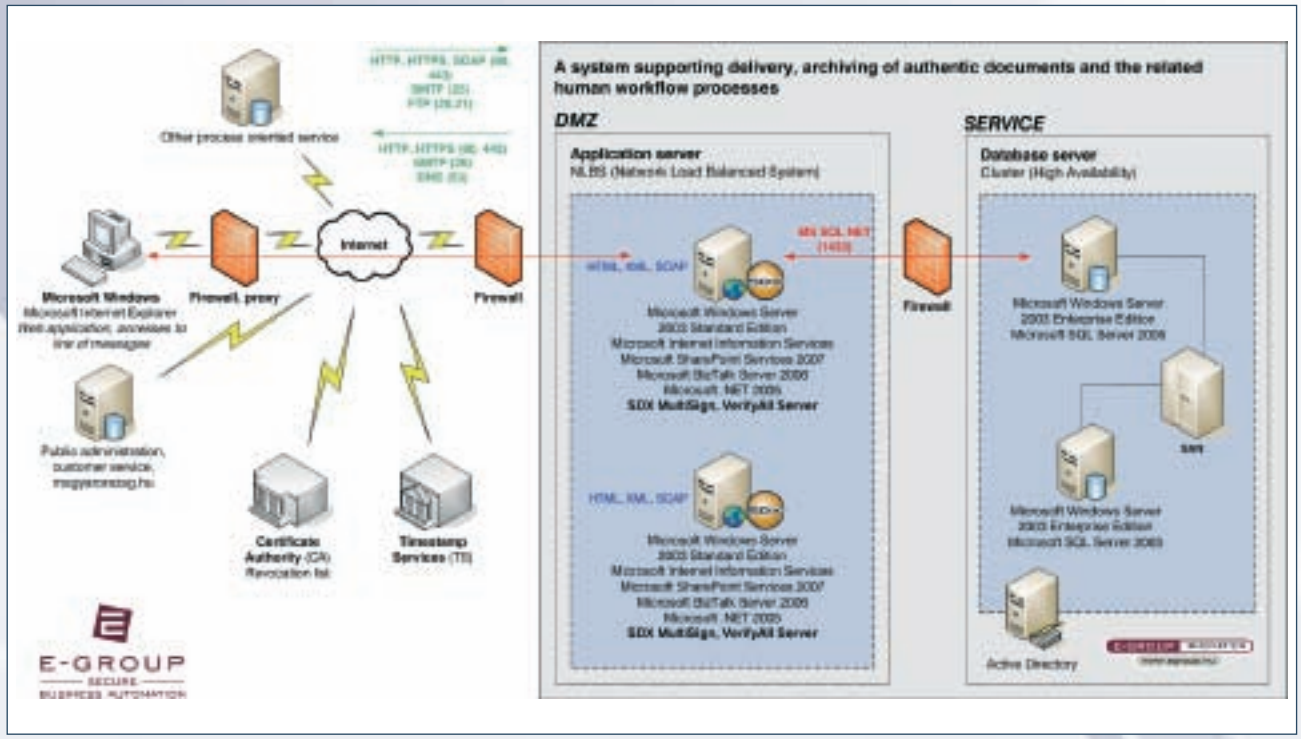
Our consortium partner, E-Group, launched the development of a pension fund system some six years ago, in which documents are authenticated in the form of digital signatures. The launching of this project came before the significant, nationwide-scale information technology decisions that provide an important role for electronic signatures associated with organisations, over and above the electronic files which users sign, and their related basic processes. Up to now, regulation by law has also been brought up to par for the dissemination as well as the facilitation of processes that are accompanied by electronic signatures. While in the initial period electronic signature formats were handled differently by different systems, nowadays standardisation appears to have been resolved in this respect. The creation of recommendations and the legal regulatory background associated with electronic signatures and their formats in Hungary, for which the EU played a substantial role in its progress, was accompanied by E-Group which played a significant role in the formulation of this background. The SDX (Signed Document eXpert) digital signature architecture that E-Group formulated is completely compliant with contemporary demands, and at the same time its roll-out to the Service Oriented Architecture (SOA) platform brought to light numerous development applications, scaling, as well as product development tasks.



30 year old Gábor Garami serves as the subject expert on behalf of our partner. He is the IT Director of E-Group, and heads development. He graduated from the Faculty of Electrical Engineering and Informatics of the Budapest University of Technology and Economics as an IT engineer in 2000. He holds numerous specialist credentials in fields associated with Microsoft technology: MCP, MCSD, MCSA, MSDBA, MCSE. Transaction and document management are key areas of his interest along with the formulation and supporting of such systems in the Microsoft SOA, and Microsoft .NET developer environments. He was one of the initiators of the SDX (Signed Document eXpert) classified digital signature application and architecture (DSA) product and continues to participate in its development. In this project, he plays a crucial role in the formulation and design of the SDX Microsoft BizTalk 2006 service oriented platform, as well as in the integration of the Microsoft SharePoint 2007 group work system with the SOA and SDX platform.

Objectives

Digital signatures - as a consequence of their intactness, the integrity they provide and fact that they can't be denied - are going to become a key tool in the future practice of authenti-



cating documents. The formulation of systems that comply with EU expectations as prescribed by the statutory, as well as the legal regulatory environment is becoming obligatory for an ever increasing number of institutions. The associated IT-systems will trigger a great number of additional document management processes that are associated with digital signatures, and with the documents that are signed with them.

For managing these complex and composite processes, a robust technological platform is necessary which simultaneously ensures simple and effective service provision as well as high reliability. An additional requirement is the capability to display elementary processes connected to signatures (signature, authenticity check, archive time stamping) at a high level of abstraction, thus facilitating attention to the associated work processes.

The fact that authentication rules and the standard management methodology for business processes need to be implemented in a shared IT model poses a methodological challenge and determines the research tasks for the elaboration of the document management system. Handling these two areas harmonically is by no means a simple task, since for example any signed document can only be authentic in an unaltered form, while business processes frequently build up document data separately in the system memory, repeatedly saving, or retransforming them. This problem appears in a similar manner when formulating communication, as well as integration - therefore the task on the whole can be solved by means of expanding upon the different methods needed to formulate a shared methodology.

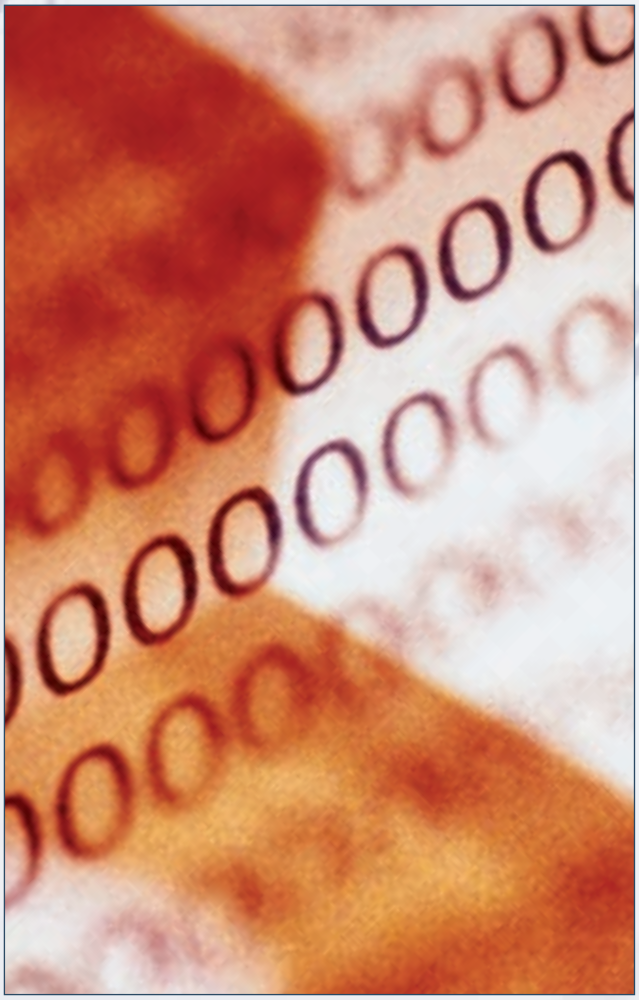
Leading IT firms have come up with the Service Oriented Architecture (SOA) concept - and made it accepted on a broad basis - for ensuring the uniform, as well as standardised integration of different corporate systems. BizTalk Server (Integration Software) - with the help of its adapters - makes communication with external systems possible in the most varied manner, supports message processing and transformation (pipelines, transformations), as well as controlling the business processes of interoperating external systems. The product to be created in the course of the project is to provide a number of supplementary services and capabilities apart from basic functionality. These include enhanced level reliability, safety, and scalability as well as the possibility to formulate business rules which make processes that are available to begin with even more functionally flexible. Monitoring the processes can be listed as being part of the scope of supplementary processes, and this allows the extraction of useful business information from processes, along with the building of data warehouses on the basis of extracted information. Needless to say, the users are also frequently impacted in the business processes, therefore the solutions that are employed usually must also be linked to a document management as well as a portal system.

We intend to implement the management of the many different kinds of processes in the SOA architecture, with support from the BizTalk Server. In the course of the project, BizTalk Server adapters are going to be used for the purpose of taking over documents to be signed, or already signed in different ways (electronic mail, file server, web service), and in turn to deliver them to the appropriate place. Unique information channels (what we call pipelines) were set up for the preliminary processing of messages (for example the extracting of a document from a mail corpus). Any specific application system will be implemented by means of building and integrating components into a whole. Integration processes which are obviously implementation dependant constitute the core of the integration solution. For this reason, the first stage of

the project saw the creation of sub-processes and components adapted from selected specimen processes that elevate building from components to a higher level of logic. A number of adapted specimen processes were generated as examples to demonstrate the use of components, which at the same time also illustrate the monitoring of business rules and processes. Because in its current stage - without the integration of external systems - the project would only allow users to communicate with processes using e-mails, the system's SharePoint document repository, as well as interface, was also integrated with the project. As a result, documents may be sent and received from the company's own document management system, its own group work portal, and the displaying of other solution-specific meta data associated with them also becomes possible. Needless to say the appropriate SharePoint components also needed to be produced in the first stage of the project in order to achieve this.

Activities

We formulated the frames for group work that satisfy research and development tasks in the first work stage and co-ordinated development methodologies among university, and industry partners. We systemically sorted the knowledge associated with the SDX digital signature architecture, and identified the atomic components linked to signatures. The requirements and recommendation articulated in electronic procedures, legal regulations, and laws were reviewed and acquired as well as processed the following know-how:



- Familiarisation with the guidelines as set forth in Minister in Charge of the Prime Minister's Office Decree No. 2/2002 (IV. 26.) MeHVM, whose guidelines pertain to the security requirements for services associated with classified electronic signatures and to service providers providing such
- Familiarisation with the archiving processes (SDXM, Tax Authority format) set forth in the Act on the General rules of public administration authority procedure and services (PAPSA)
- Familiarisation with the decree on the general requirements for document management at organizations that conduct public tasks
- Familiarisation with Minister of Finance Decree no. 20/2004 (IV. 21.) PM on electronic invoices
- Familiarisation with the Ministry of Informatics and Communications' conversion recommendation pertaining to the technical specifications of the metadata of electronic duplicates.

We conducted the requirements analysis of SDX's SOA service and specified the fundamental principles pertaining to design efforts. The SDX SOA system specification was formulated and its system design completed. We conducted scalability and performance analysis for the formulated architecture. A fault-tolerant, as well as high reliability architecture was formulated within a virtual environment. We analysed the developer methodology and group work support system in the Microsoft Solution Framework (MSF), and investigated whether this technique can be used in accordance with the project's requirements.

The results and products resulting from the first work stage

- Development of elementary software components associated with digital signatures (Receipt logging and receiving over different protocols, Electronic signature, Time stamping, Notification, Archiving, Authenticity check, Delivery, Presentation, Ciphering and encryption)
- Methodology to support the creation of archiving processes that are natural in the scope of PAPSA (public administration authority procedure) procedures
- SDX (Signed Document eXpert) server component, WebService (SOAP - Simple Object Access Protocol) interface
- Data link interface and architecturally scalable SOA system concept
- SDX SOA-based system specification, logical and physical system design
- System pilot for the implementation of basic functionality
- Electronic invoice format, SDX MELASZ electronic signature format schema and concept repository

1.3 Authenticity and quality audit /subtask 2.1/

e-document direction

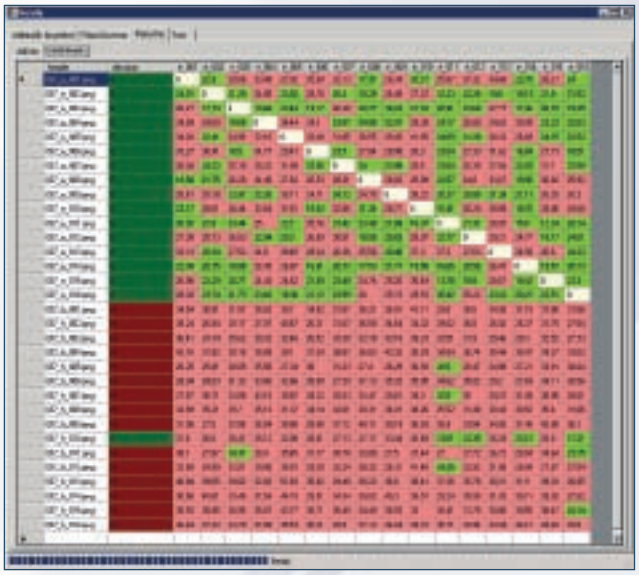
Project manager: István Albert, certified IT engineer, BME AAIT
Professional field: Informatics, software architectures, application optimisation
Publications: books: 1, conferences: 5
Major industrial commissions over the past 3 years: Hungarian Financial Supervisory Authority (PSZÁF), OTP Bank, Hungarian National Bank, T-Systems, Deutsche Telekom

The task of signature verification has been preoccupying researchers for some time. Several publications have appeared on this subject but with the appropriate technology lacking, the accuracy demanded by business applications is yet to be achieved. It is our conviction, however, that this level can be accomplished using the newest image processing methods and data mining techniques.

Signature verification can be broken down into three areas. The first one is on-line identification, the essence of which is that one intends to identify the person writing the signature while signing takes place. Because the signer writes his/her signature on a digital tablet, using a special pen, the complete signature process can be examined thoroughly, along with the dynamic movement of the pen. AutoGraph, developed by DSS Consulting Ltd., performs on-line identification tasks and is the first commercially marketed signature identification product developed in Hungary. Its effectiveness was comparable to the best solutions in the world according to the year 2004 SVC (signature verification competition) database. The special time sequence analysis and data mining techniques that are used in this product made it possible to perform identification more efficiently than with previously known solutions. Additional signature verification areas include off-line identification (examining signatures scanned from hardcopies), and origin checking (examining whether the signature was put to paper with a pen, or by printing, perhaps through photocopying). Our research and development co-operation intends the achievment of significant efficiency improvement in these areas as well. Dr. András Cifra, certified electrical engineer and MBA, is the subject expert on behalf of our partner. He is a professional with more than 15 years' experience, accumulated in several fields of information technology that are relevant for our purposes. His publications include one book and 32 symposium papers. He is a member of the John von Neumann Computer Society, a standing member of the organising committee of the Telecommunications and Management Forum, as well as the EU FP Committee of the Information Technology Enterpreneurs' Association. He is the manager of numerous industry projects, and tenders in Hungary and the EU.

Objectives

The objective of the project is to create algorithms to perform off-line signature identification as well as origin checking tasks which reach the level of efficiency demanded by business users. For this purpose, a software product that can be marketed due to its quality is going to be formulated in the course of the project using the verification methodology.



Our experiences show that one of the major problems in off-line signature identification algorithms is caused by difficulties in extracting semantic information. When graphologists compare two signatures they use features such as "small hook, large pressure", or "slowly sharpening end". These strokes are natural to the human eye, while at the same time they frequently appear impossible to extract from binary image displays. This seems to be backed-up by the fact that only a few publications concentrating on graphology features were created in this subject over the past decade. One of the project objectives is to recognise these features, and in turn to describe them using exact mathematical methods. The extraction of individual features, however, is insufficient in itself. We need efficient and deterministic algorithms which are capable of comparing features and selecting features that correspond by pairs of examined signatures. Once we have this information, we will only need a function describing the differences between signatures, on the basis of which we will be able to specify the borderline between original and counterfeit signatures.

The research tasks outlined above require special technical and image processing competences which BME (IT)^2 staff members provide for the project. Furthermore, what is especially advantageous is that several of these staff members have already dealt with the resolution of the off-line partial task previously, for example as part of their thesis.

We plan to resolve the task of off-line identification during 2006, and develop the solution into a product before the end of the year. We will seek a solution for performing origin checking during year 2007 and supplement the product developed in 2006 with this functionality.

Our results will be published following the formulation of the algorithm that performs off-line identification. No algorithm capable of extracting signature reference points automatically and performing identification based on them has ever been published, so the successful solution of the problem may generate serious international interest within the scientific community.

Activities

The objective of the first stage of the project was to establish the scientific criteria as well as the technical background for research to examine known signature identification methods, as well as to formulate a proprietary solution.

We reviewed previous research findings and set up a development and teamwork environment. We have begun a literature review phase and as part of this we have determined the definitive research policies and elaborated the schedule in light of those. A project portal was created to simplify teamwork and co-ordination. We have conducted a counterfeiting experiment in order to measure the level of efficiency with which an average individual can fake as well as identify fake signatures. The collection forms were drafted on the basis of experience from which the database is continuously being expanded. For the pre-processing phase a framework system was created which is capable of processing A4-size scanned forms automatically, can identify the signatures on these, and place them in the database.

Processing is broken down into three major areas:

- the extraction of features
- research and development of comparison algorithms
- research and development of classification algorithms.

In the course of our efforts, we managed to extract features that are valuable from the semantic perspective as well, instead of abstract solutions that tend to stray from graphology characteristics. End-points, crossings, and curves were highlighted. We have formulated an algorithm that is capable of identifying as well as characterising the corresponding features per pairs of two signatures on the basis of the global relations of these features. This allowed the efficient separation of original signatures from counterfeit ones. The current phase involves the testing of the system's prototype, and we have also completed the system design for the forthcoming business applications.

The results and products from the first work stage

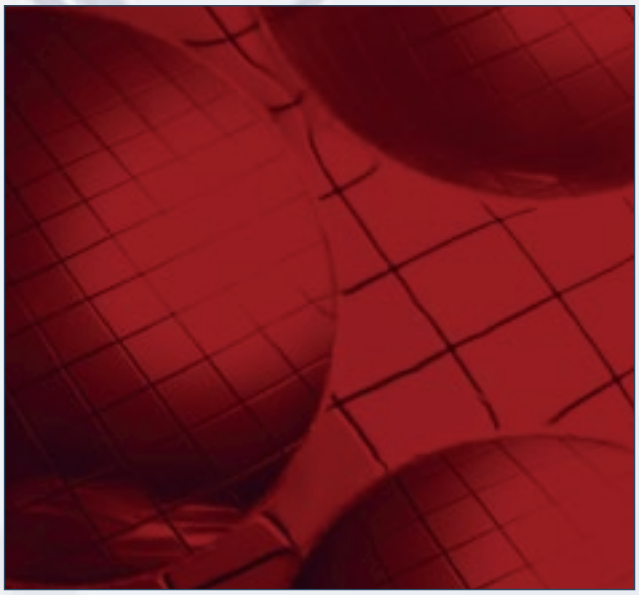
- Creation of the project portal, and developer environment
- Specification of the signature collection methodology, as well as storage
- Collection of signatures, and creation of signature database
- Literature review and formulation of detailed research plan based on consultation with experts and on our own experiments
- Implementation of test system
- Specification and implementation of signature preparation algorithms
- Examination of DPM and HMM-based comparison algorithms.
- Formulation of unique point-pairing algorithm
- Creation of operational test prototype
- Completion of AutoGraph 2.0 application specification and system design

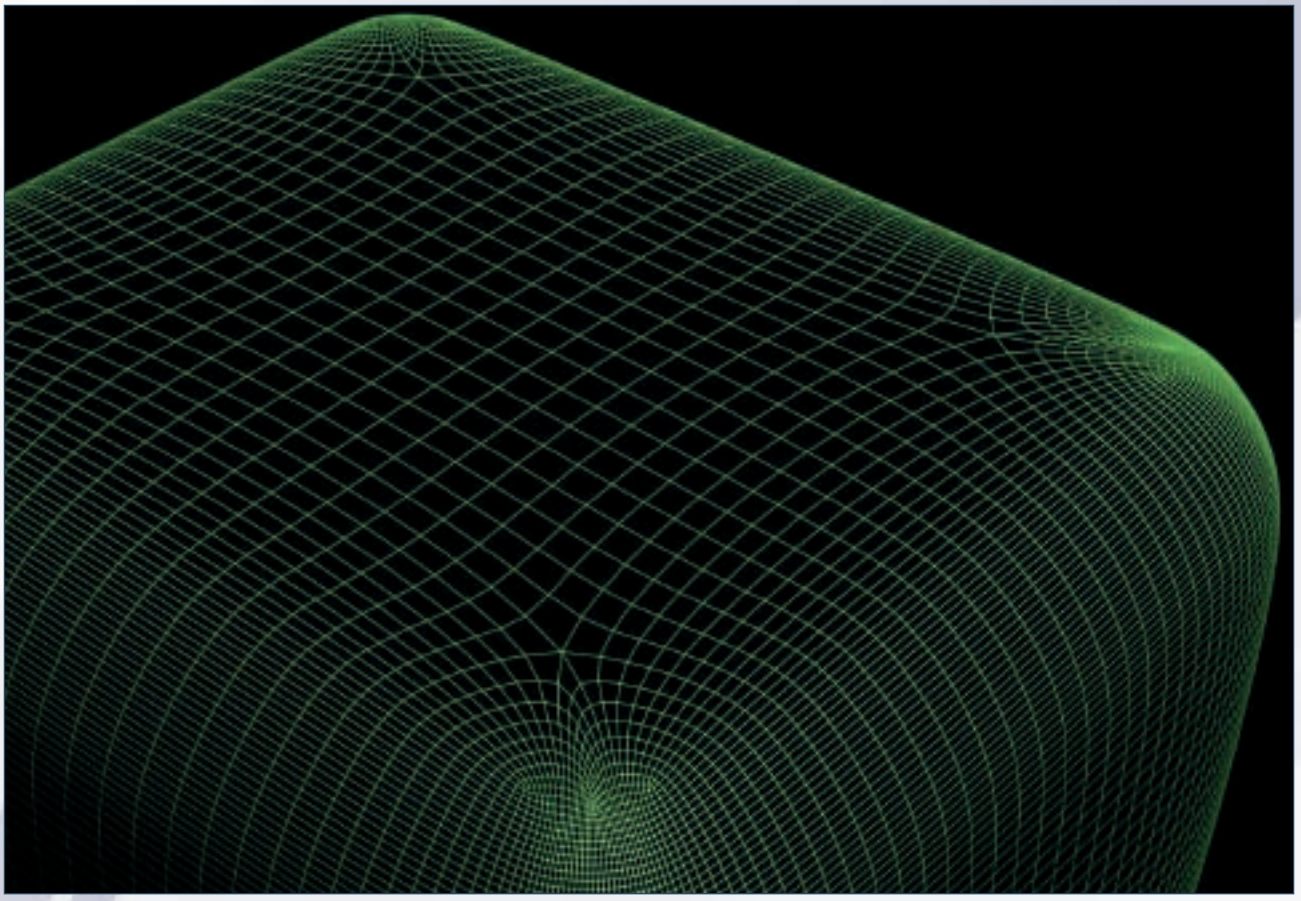
2.MIDDLEWARE, KNOWLEDGE-BASE AND GRAPHICAL APPLICATION DIRECTION

Project director: István Jankovits, director of development and services at BME (IT)², director of R&D at BME CIT, graduated electrical engineer.
Specialty: high-level logical synthesis, information system design, e-government
Publications: books: 2, book chapters: 1, journals: 3, conferences: 22.
Relevant industrial and research projects in the last 3 years: Designing the Information Strategy of the National Communications Authority, designing the IT system integration of National Communications Authority, evaluation of assets of National Communications Authority, installation of Standardised Allocation System at the University of Pannonia (Veszprém), installation of quality management of SzÜR 21 at National Communications Authority, implementation of the first phase of National Audiovisual Archive (NAVA), analysis of connection rules of integrated databases
Professional honours: OTDK 2nd place (supervisor)

The elements of the business world (trade, transport, public utilities, public services such as e-government, e-administration) that are specialised according to different kinds of services are being challenged by higher and higher market requirements, rivalry and necessary cost-efficiency, and responding to these questions with a traditional approach is getting even harder. A knowledge-based society expects complex services that can be implemented in most cases through the cooperation of several services, and the problems of interoperability requirements and shared accounting must be solved by these service providers. The existence of segmented services and the convergence of services provides a new challenge for the IT world. The procedures of process integration, orchestration, cooperation optimisation and installation of the IT background have also begun at organisations. Services cross over between services providers, and processes can not always be assigned to only one service provider.

Complex services need complex background information systems that can be reached by users via a single entry point, and they should not have to be concerned with the details of these operations (such as process mapping, accounting, clearing). Implementation of such systems is not a simple process; it needs experience in connection with methodology, technology, and needs wide range interoperability and an interdisciplinary approach. To reach this goal a more effective and regulated cooperation between market, government, administrative organisations and systems is necessary, and an effective and secure access for the civil sphere must be provided. One program of the new National Development Plan (NFT) also addresses the modernisation of public administration, i.e. the implementation of electronic administration. This service-development also requires experience in designing and implementing complex information systems. To reach the development goal it is necessary to precisely define the requirements and standards, ensuring interoperability and security requirements. Cost-effective design of such a system can be achieved by using professional methodologies and high-level design in the context of technology and system planning. During implementation it is required that several parts of the system are functioning correctly as stand-alone subsystems. Therefore standardised services and IT systems will be





based on the integration and definition of the interoperability requirements of existing subsystems. Applied methodologies must take into account the standardisation requirements and interoperability possibilities as well as the commitments of European Union regulations. The goal is to install systems that are adaptable to changing environments. System components must be prepared for interoperability and IT security evaluation, and quality and conformance (3-tier architecture, SOA etc.) analysis must be based on modern technologies. Not only regulation, but also conformance analysis and measurement (based on these rules) are also important, which compose the main tasks of the IT security and quality project group of the Knowledge Centre.

The goal of this project group is to participate in several industrial and public administration projects to synthesize and document experiences, and based on the accumulated experiences and results to employ new R&D results in projects, and to make recommendations for standardisation, regulation and methodologies. The strategic goal of the Knowledge Centre is the transfer and utilisation of amassed experiences and participation in the implementation of service-based electronic government and public administration. A project has been started to construct a knowledge base based on amassed experiences, and to develop a monitoring system that uses AI-technology for business and service processes. The project group's other project area is the research and development of a special but relevant domain for the market: computer graphics applications that use multiple processors and computers.

2.1 Geographic information system databases /2.1. subtask/

Middleware, Knowledgebase and Graphical application direction

Project leader: István Jankovits

Our consortium partner, ESRI Hungary Ltd. (originally Geocomp) was founded in 1989 as a joint venture (American-Hungarian). Its main mission was to be the local dealer for ESRI (Environmental Systems Research Institute), the market leader in the field of GIS (Geographic Information System).
ESRI Hungary Ltd. covers the field of geoinformatics (GIS) through providing services and participating in system integration projects. Basically it deals with the development and integration of IT systems that manage large, spatial and geographical data. Business processes also cover trading, systems analysis, systems design, and database management activities. The research of data-interoperability as a main R&D activity is one of the basic tasks of the company.
The objective of ESRI Hungary Ltd. is to create and use GIS software systems and management models at a high level to make user's activities easier in the field of technology, environmental protection, health care, marketing, investment, risk analysis, and financial analysis.

J. András Németh is the subject expert on behalf of our partner. A civil engineer graduate at the Budapest University of Technology and Economics, he has also completed Business Management and MBA courses. He has been the Managing Director of ESRI Hungary Ltd., and also earned a wealth of experience in project management. He has published more than 30 essays and articles, and over the last 15 years has participated in projects in connection with system design and installation. He is a member of the advisory board of OpenGIS Foundation, and a member of the management board of the National Conference of Geoinformatics.

Objectives

Linking different databases is always a difficult task. This is especially true when existing databases must be connected to each other and to new developments such as in public administration. As an electronic government solution comes into sight the need for the ability to process multiply kind of data, to connect heterogeneous systems, and to provide interoperability gets even greater.
ESRI has accumulated experience in the field of connecting geoinformatical and other databases and has had to ensure interoperability.

There are efforts to provide simple, graphical interfaces that ensure interoperability among numerous applications. Conversion of data between different structures and databases is a labour-intensive task, because data integrity must also be ensured. The software to be developed would guide the user through the steps of conversion, which are based on a methodologically correct design and can execute a validation and verification process.
The result of this project would be a solution that can provide a middleware with input parameters. This solution will be based on ESRI ArcGIS Data Interoperability technology and also addresses a potential application.

Application-development activities include:

- Selection of test location and environment: an appropriate institution is necessary for the validation of the pilot system where inner functions and data sets are suited for testing middleware.

- Designing a pilot solution based on the chosen data-interoperability case:
    - terminology (Word document)
    - test environment of pilot project (Word document, logical design)
- Implemention and testing of pilot application at the chosen institute.

In the subsequent steps we will analyse project results, evaluate the technology and tools used by ESRI and analyse the development methodology.

Activities

In the first phase a software pilot that is able to provide a graphical interface for users to easily connect different IT systems has been implemented and tested.

The goal of this solution is that it would be a modern data-conversion system and additionally to be able to provide interoperable, connected processes by using middleware.

The version 1.0 can handle approximately 20 different kinds of file types that are used in the world of geoinformatics, and is able to manage user-defined formats by using FME (Feature Manipulation Engine) technology. The design phase of the software pilot is based on structured systems analysis and design methodology (SSADM), and project management is based on PRINCE project management methodology. This adaptation is explained by the:

- type of pilot,
- budget limitations,
- type of R&D.

The first step in connecting information systems was the analysis of relevant data structures and function lists. We have compiled a terminology dictionary by collecting the most important expressions in the field of geoinformatics. The graphical interface supports the description of systems, topological mapping of data and function structures and the input of any kind of data. If the data format is known, selection of the simple format is a step of this phase. It was necessary to modify IT systems to be able to transport information between systems, which was solved by the module defined by the requirement set of the solution pilot.
Through use of a graphical interface it is easy to view, create mappings and graphical links between database tables and fields.

The process of connecting databases is depicted on the graphical interface as a flow diagram. After the developer's testing of the pilot application, further testing will be applied in the next phase in a governmental, public administrative environment in the city of Szeged, or at BGTV for a standardised register of public utility and at Földhivatal (land administration) for the register of title deeds.

The results and products from the first work stage

- Project deed of foundation
- Terminology dictionary
- Test environment and logical design of pilot project
- MidGispro (software) status: 70%

2.2 Transport logistics /3.1. subtask/

Middleware, Knowledgebase and Graphical application direction

Project leader: István Jankovits

Our consortium partner, T-Systems Hungary Ltd. is skilled in the field of implementing and maintaining complex IT systems where services must be provided with the required service level set down in agreements. T-Systems Hungary has developed and provides IT system support for the traffic activities of BKV Ltd. and VOLÁNBUSZ Ltd. and has also installed SAP modules at these companies.

Tamás Wippelhauser is the subject expert on behalf of our partner. An electrical engineer graduate at the Budapest University of Technology and Economics, he has finished Sybase, Uniface developer and SAP BW courses and has multi-year experience in software design, and project development management. Recently, he was the director of software development at T-Systems Hungary. His specialty is transport, software development and installment that supports transport logistics. References: from 1996 to the present, the BKV-TransIT project for which he has been participating in project management, scoping, design and quality management; VOLÁNBUSZ Ltd. - VBIIR project, TRAFFIC system (2004 -).

Objectives

The foundation of the Budapest Transportation Alliance (in Hungarian Budapesti Közlekedési Szövetség or BKSz) generated the need for the three companies (BKV, MÁV, VOLÁNBUSZ) to accept common requirements for their networks, timetables and accounting. The standardised season-ticket is one of the reasons for common requirements in shared accounting. To facilitate travel transfer between BKV, MÁV and VOLÁNBUSZ, time tables must be standardised and should be supported by an extended IT system.

Up to now, the IT system that supports traffic management, technical and business activities has not been standardized; there are separate services for business processes, and consequently they must be standardised to achieve successful operation. The partners in the consortium bear the necessary knowledge.
Further developments such as transport logistics challenges at BKSz will provide the mandate to continue standardisation. The analysis of common traffic and accounting processes must be made at all three service providers.

The industrial partner as shown above owns the required knowledge in connection with the IT systems of these service providers.

BME (IT)^2 experts have accumulated many experiences in recent years in the field of interoperability matters, analysis, and defining interoperability requirements of IT systems, and also have references in the governmental, public administration sector (IHM, NHH, BM), so both the technological and regulatory knowledge is available.
The goal of the project is to connect the separate IT systems of these three companies. A middleware and service-set are needed to execute common tasks that support the operation of service providers based on the requirements laid down in agreements, and a standardised communication interface is also required. BME (IT)^2 experts participate in the design and implementation phase, and based on the results new recommendations and standards will be written.

The heterogeneous IT systems of service providers must be analysed to show that the data need of the central module which is under development can be satisfied from the viewpoint of time and content, and further steps of process and systems development must be declared. The other side must be also checked - the service provider must be

able to accept and process data from the central module. Data export and import functions between the central module and service providers must be determined.

Activities

In the first phase, BME (IT)^2 experts and industrial partners began an R&D pilot project based on the needs of BKV Ltd. to provide a separate solution for traffic management and accounting processes. For accounting processes it was mandatory for predefined requirements of quantity and quality parameters to be taken into account. One of the main goals of this project is to collect reusable know-how in the field of transport systems, and to construct a base for the overall creation of BKSz's transport logistics system. In the interests of this, transport logistics expressions have been determined and formal descriptions have been made.

In the first phase the following traffic management and accounting matters were focused on:

- The requirements of central systems needed for the execution of common tasks must be determined.

- Analysis of service providers' heterogeneous systems to determine whether the data requirements of the central module can be satisfied from content and time perspectives.

- Analysis of service providers' IT systems to determine whether they can accept data from the central module.

As the first step, the coverage of the IT system has been defined, processes have been analyzed, expressions have been detemined, and assets stored in the IT system have been assessed. One of the critical problems of achieving interoperability is the handling of redundant data. We have proposed to clear the database of redundant data and to solve the possibility of synchronization. We have worked out the system design of the central data model, and subsystems, and after the acceptance of this document we have implemented the new and modified functions. Development was based on 4GL (4th generation) technology, within which we have used the UNIFACE development environment and ORACLE database motor. The three tier architecture was worked out with UNIFACE 8.
The benefit of the results and experiences of this pilot project will be apparent in subsequent stages of the project. The industrial partner has been making significant effort to involve other service providers to extend the coverage of the interoperability middleware.

The analysis of the transport domain was a great challenge during the R&D project. Based on the expression model we could specify, develop and install reusable components. In the subsequent stages a domain-specific component

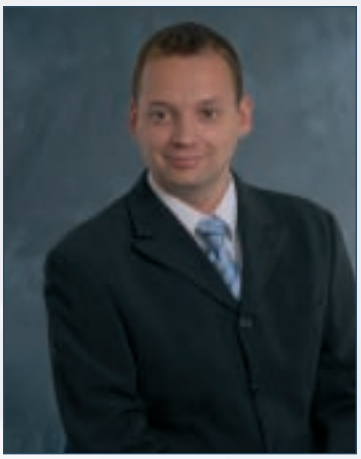
library will be created, and the developing framework of BME (IT)^2 will be extended with plug-ins. This means that the development of the middleware will accommodate standardised methodology and technology; execution is possible through domain specific models and descriptions. The developers of the framework are working in cooperation with the researchers of the e-Dokumentum project group.

The results and products of the first work stage

- Project deed of foundation
- Description of requirements
- Data model changes
- Description of new and modified functions
- FORTE-Integrity implementation (Database, Software)
- Functional and integration test documentation
- User manual

2.3 Internal security algorithms /3.1. subtask/

Middleware, Knowledgebase and Graphical application direction



Project manager: Csaba Krasznay, electrical engineer, M.Sc., CISA, CISM, CISSP, electrical engineer, BME CIT

Area of specialty: IT security, electronic signature, e-government and e-commerce security, IT security evaluations and certifications

Symposium publications: 8

Memberships: member of the board of the Hungarian Association for Electronic Signatures since 2006, member of the Hungarian faculty of ISACA since 2006.

Projects: Development of application methodology for electronic signatures, analysis of antivirus systems according to Common Criteria, IT security guide for local governments

Our consortium partner, Megatrend IT Ltd., aims to improve of the ISeeSec software product which the company trades and is developing. The ISeeSec is a complex IT safeguard solution, which is dedicated to prevent internal information leaking. During the collaboration, Megatrend Ltd. will take on software engineering tasks with the support of experts from the BME (IT)^2 organization. The theoretical background will be developed with the active support of the industrial partner. Additionally the test environment will be established and installed with the help of the partner, so that the completed product and other products with similar profiles can be tested.

Dezső Nagy is the subject expert on behalf of our partner. A security consultant, he graduated at BME as an electrical engineer, M.Sc., faculty of Data and Telecommunication. Among other qualifications he has an upper level security manager degree and BS 7799 security auditor qualifications. In addition to educational, developer and manager working roles he is the security consultant of Megatrend Ltd. His area of specialty is internal threat assessment, focusing on human resources as the main source of vulnerability and weaknesses as well as the development of the protection philosophy of ISeeSec, and definition and realisation of the development standards. He is a member of the Communication Engineering Science Association.

Objectives

The collaboration aims to develop a product which is able to detect accidental or purposely committed information leaking from the information system based on behavioural pattern. The previously mentioned product, the ISeeSec, sold by the industry partner, has been available on the market for five years. The software possesses a significant knowledge base, but the attack pattern trees of its current schema identify only pre-defined cases. The product has two main components. The first one identifies the internal workflow entities and classifies the system's objects and sub-objects into different security classes, while the other one protects them against attacks. The designed software seems like an IPS (Intrusion Prevention System), but with the difference that it protects against internal information leakers, not external attackers. The available protection techniques display much similarity in both cases. It is important to exactly define the data accesses in the new software. A user action is identified as an attack depending on the objects' and sub-objects' security classes. The software on its own is implemented as a framework. This means that the software is able to integrate other IT services which are developed independently by third parties. The result is a complete service package which can satisfy customers' demands concerning internal security. The security group operating within the BME (IT)^2 organisation has significant theoretical knowledge in the field of IT security. In developing and improving new algorithms usable in the new product, we have processed a bibliography referring to the field and have utilize this knowledge.. During modelling we apply traditionally known methods (artificial intelligence, attack trees).

Our objective is to ensure that the new ISeeSec product will be able to identify and neutralise general attacks and its framework will provide complete protection service for customers. To achieve this, we require new descriptions of IT attacks which can identify the aggregation of states judged

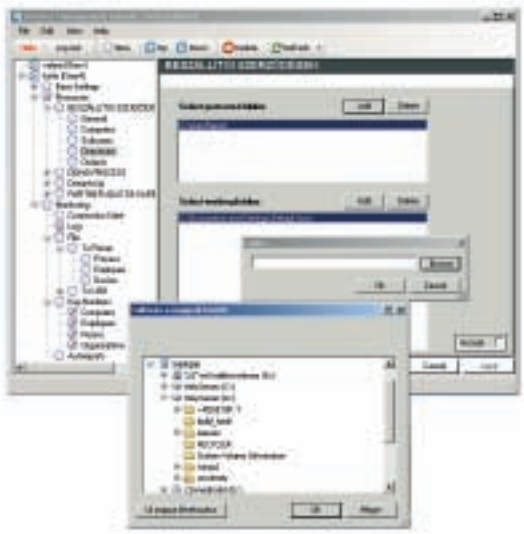
dangerous and avoid them. The neutralisation of such attacks is a crucial research result, and it is also very valuable from both science and market aspects. The industry partner wishes to come out with new software based on this research in 2007, version 4.0. In order to achieve this aim, the pace of collaboration has increased in 2006. This year's objective is to survey the market, define the essential concepts and create the sample attack profiles. According to these results we have to create the appropriate mathematical model which will able to recognise the attack patterns. The technology of the protection profiles will be developed by the end of the first year. The first joint product will come out in 2006, based on the research to be implemented in 2007.

Activities

Currently the development of the available product, version 3.5, which came out in May, 2006, is on the way. This is mainly an improve version of the previous system in which the first results of the Megatrend and BME (IT)^2 collaboration appear. The product is used mainly at domestic state firms, but this year will be distributed internationally. In the first quarter of the year the partners in the project have been cooperating continuously. During technical consultations, the staff of the (IT)^2 organisation received information on the ISeeSec product's current version. A market analysis and the creation of a conceptual system have been completed. Over the course of this period we have determined what types of features the new product must have in order to be able to provide unique solutions to customers. These are vital towards defining the course of the product's development. Based on this we have created the conceptual system which will be used in the development of the new internal security algorithms. The result of the documentation is a study containing the data of both the market analysis and conceptual system.

The result of the research shows that the market demands a framework which can integrate IT security solutions that not only anticipate information leaking with preventive control, but with the usage of detective controls help the audit and verification processes later. First of all, this objective can be achieved with different products using a uniform interface. In the interests of this a survey of other BME (IT)^2 partners to join the framework has been initiated.

In the second quarter of the year a test environment has been established for the testing of ISeeSec and similar software competitors. The staff of the industry partner has installed the latest version of ISeeSec on which tests can be carried out. According to their current market position, some of the competitor software products have been fully tested for comparison with ISeeSec.



While these competing products provide various services, all of them have a flaw - in our opinion none of them can be considered complete. Their effective features are mainly technical (e.g. usage of cryptography), which can be relatively easily integrated into our software. However we can declare that none of the competitor software product has such a comprehensive knowledge base that we intend the ISeeSec to have in 2007. A framework approach is also missing from them, although the IT trends indicate this feature is a must.

In the second half of the year the design of the new version will have started in which all of the new functions will be deployed which are indicated by the market survey. The data security classification will be calculated with the help of the newly created mathematical model which provides the opportunity to use various independent factors for the calculation. In the complete product we can scale the levels of the security solutions using this model.

The results and products of the first work stage

- Our survey of the market outlines the features of the software on the domestic market and of the most significant foreign competitors.
- We have developed a conceptual system which can identify the entities and parameters of a business process.
- We have established a test environment where ISeeSec and similar software can be tested.
- We have analysed the competing products in the test-bed and have created a new feature list.
- We have created a new mathematical model which in the final version can serve as a basis to identify and aggregate the elements of a process measured by several independent parameters from a security perspective.
- We have developed the new software version 3.5.

2.4 Research of real-time rendering methods /4.4. subtask/

Middleware, Knowledgebase and Graphical application direction

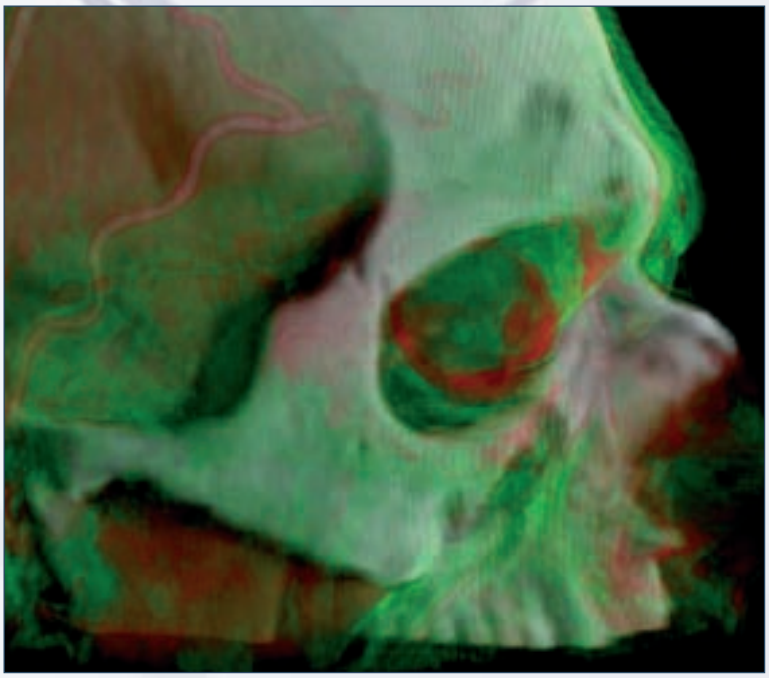
Project manager: Dr. László Szirmay-Kalos, Doctor of the Academy professor, Ph.D., MSc in electrical engineering, BME IIT,
Speciality: Computer graphics
Publications: 17 books, 10 book chapters, 34 journal papers, 74 conference papers.
Membership: „John von Neumann Computing Society" computer graphics group presidency member: 1999- Eurographics executive committee member: 2001- 2004
Notable industry assignments in the last 3 years: Intel Co., Graphisoft Ltd., Institute of Radiology, GameTools FP6 projectNumber of PhD Students: 8,
Awards: Bólyai scholarship, Széchenyi scholarship, Charles Simonyi award, Bólyai award

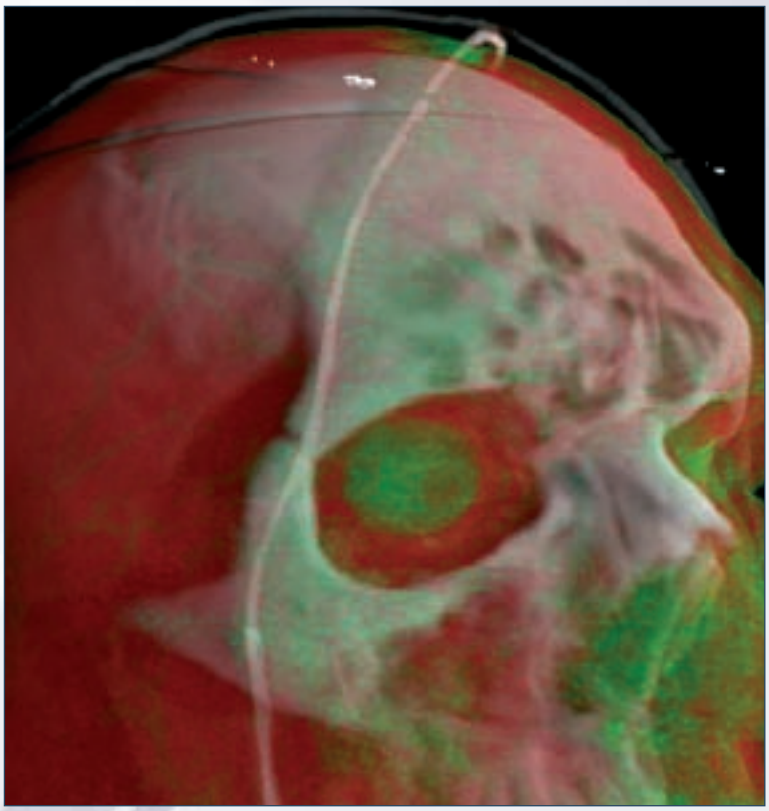
The R&D group in the High-Performance Computing division at Hewlett Packard (HP) designs and develops cluster hardware and software technology supporting integrated computation, storage, and visualisation. A primary focus of the visualization effort is to support scalable visualization to meet the need to visualise very large data sets. Just as computational tasks can be divided among many processors, visualisation tasks can also be partitioned among cluster nodes. The nodes render the part assigned to them according to the chosen strategy and these are combined into the final image of the aggregate dataset. Combining partial images is called image compositing, which is one of our project's main targets. There are no standard software libraries for image compositing. To facilitate the development of scalable applications for visualisation clusters, HP is developing a specification for an image compositing library and developing an implementation. Hewlett Packard plans to include a tuned version of the library in its visualisation product, HP SVA. The main goal of the HP-BUTE cooperation within the BME (IT)^2 is the development of the compositing software, development of standard benchmarks demonstrating the efficiency of the solutions and research of algorithms capable of visualising large datasets in real-time. Research results will be incorporated in applications for large dataset visualisation.

Glenn Lupton is the subject expert on behalf of our partner. The Technical Director for High-Performance Computing Visualization R&D group at Hewlett Packard, he has over 30 years' experience with R&D projects including graphics clusters, image compositing, programming environments, compilers, and software tools and has held senior technical positions with Digital, Compaq, and HP.

Objectives

The project spans several research areas of the knowledge centre. The primary goal is the research of algorithms and rendering methods for visualising large datasets and development of applications based on these results. We employ clusters to solve complex visualisation problems; task partitioning and compositing of the results is a special domain of distributed systems.





Scalable supercomputing systems allow researchers and engineers to solve increasingly complex and computationally intensive problems. However, intuitive, real-time visualisation of the resulting huge datasets remains unsolved. The main problem is that the visualisation of large (gigabyte) datasets is far beyond the storage, processing and display capabilities of graphics devices.

These challenges are addressed by Hewlett-Packard's Scalable Visualisation Array (SVA) product. An SVA is a cluster consisting of graphical and general purpose workstations. Architecture is based on Linux, freely available programs and standard software and hardware components. To operate the SVA, such software tools are required which make accessible the computing and graphics resources of the whole network to visualisation applications. Visualisation applications can be organised in three different ways. The simplest method is the classical, one-host mode. Secondly, when so called screen-space compositing is used, each node renders a rectangular part of the full frame, which is typically a high resolution image. On the other hand, when using object space composition the rendered model is shared among the nodes, each of which renders an image representing part of the virtual world. Images rendered by the nodes are composited in screen-space so that the user sees the complete image of the virtual world. Currently two kinds of compositing operators are implemented on the CPU: depth compositing and alpha compositing. In the following, rendering algorithms have to be developed which can take advantage of these technologies, to demonstrate the efficiency of the hardware and software environment, and to prove its advantages in real-world scenarios. The algorithms render polygon models and volumetric models obtained from scientific simulations or medical data. On the other hand, a compositing component has to be developed which not only implements trivial operators but it is customisable to be able to fit the specific demands of an application. Moreover, a faster but obviously more difficult GPU-based implementation should be preferred instead of the current CPU-based one.

The BME IIT computer graphics group, one of the BME (IT)² founders, is internationally recognised for its research accomplishments in the domains of global illumination and volume rendering methods for a decade. For four years, the group has also gained significant expertise in the domain of GPU programming. R&D results are incorporated in medical, architectural, and entertainment applications. Therefore the BME (IT)² has a thorough theoretical and experimental background for developing methods for realistic visualisation of high resolution models, and the necessary expertise for building GPU-based applications.

The goal of this project is to develop surface and volumetric visualisation applications based on the SVA technology. We are to create distributed systems to visualise large models using rendering algorithms based on physically plausible global illumination models. Developing these applications provide feedback for the developers of the SVA technology and make suggestions for further improvements and development directions. A certain, predictable improvement could be the development of a flexible, GPU-based compositing subsystem.

Activities

The goal of the current phase is the investigation of the efficiency of the distributed compositing framework, the specification of a benchmark framework, and the study of parallel implementations for classic rendering algorithms. To analyse the efficiency of the distributed compositing system, we selected algorithms and rendering methods which can be used for realistic tests and used later on in distributed rendering applications. Beyond the immediate goals, the selected algorithms and rendering methods generate further research and development tasks.

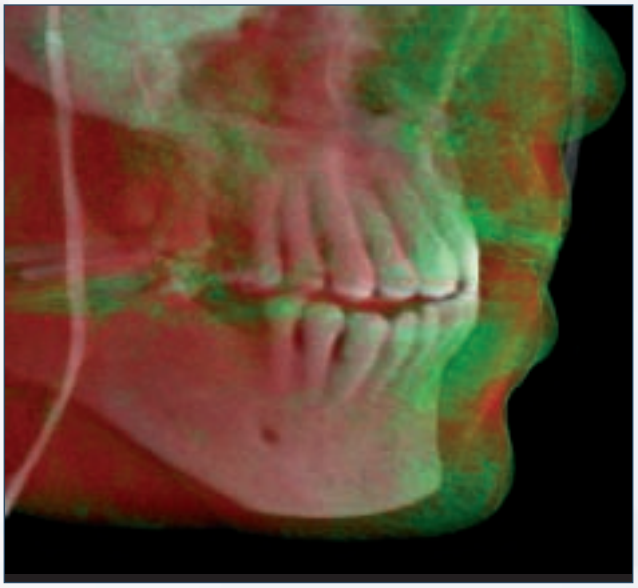
For the first year of the co-operation between HP and BME (IT)², a schedule was elaborated setting short-term and long-term goals and tasks, research directions, and defining collaboration areas. Beyond that, the hardware and software environment was set up.

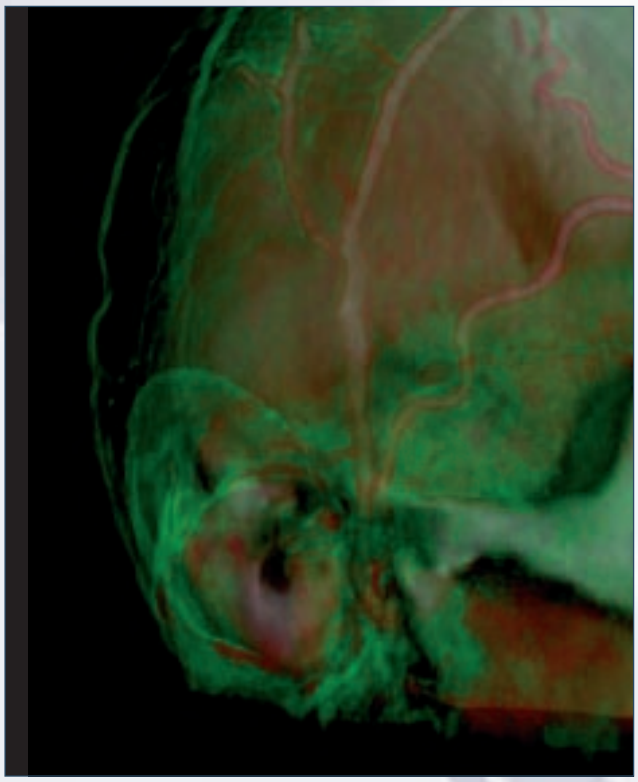
First of all we elaborated the specification of a benchmarking software allowing performance measurements of the compositing framework. While specifying and designing

the benchmark we aimed at creating a tool for analysing the framework and various compositing procedures in a distributed environment, examination of the parallel version of algorithms, effectuate verifications and validations.
Research tasks are oriented to the theoretical and practical examination of compositing instruments (existing instruments/implementations), and on the other hand to the development of applications based on the compositing framework. We examined and chose such relatively new procedures for the development of these applications, which enable real-time visualisation of small and medium sized data sets, while a the same time can serve as a basis for researching yet unsolved, general volume rendering problems.

The goals of research and development are the examination of rendering methods for visualisation of large data sets and the development of applications based on these. Such data sets are typically represented by volumetric models, visualised with the aid of volume rendering methods. Therefore the examination of the framework is made with visualization methods which cannot be used on single workstations for real-time rendering of high resolution models. The two chosen methods are the isosurface ray-casting and the translucent volume rendering methods. In both cases, the goal is not only the development of their parallel implementations and benchmarking, but the research extends to areas like sampling, stereo rendering, efficiency, development of new algorithms, etc.

Along with the setup of the specific hardware and software environment for the project, the platform independent implementation of the benchmark framework and the parallel volume rendering implementations have been developed. As HP continuously develops the compositing system while the development of the framework is ongoing, we have taken part in the testing of various versions. The specified benchmark system has been implemented, and its testing and development continues.





We have summarized research results in technical reports and publications, and presented them on international conferences. The complete benchmark system and the sample applications are built into the applications which demonstrate the usage and efficiency of the compositing system. They will be presented at several conferences, like the Supercomputing Conference in November 2006.
In the future BME (IT)^2 will continue the development of the benchmark system and of applications relying on the compositing system, and participate in the development of the compositing system. The research on algorithms and procedures continues, and new results are expected. We integrate the developed procedures and algorithms into software components which will serve as the basis for new, distributed rendering systems.

The results and products of the first work stage

- Specification of benchmark system, study, document
- Specification of a distributed ray-casting based volume renderer, study, document
- Specification of a distributed translucent volume renderer, study, document
- Prototype of a distributed ray-casting volume renderer, software
- Prototype of a distributed translucent volume renderer, software
- Stereo volume renderer based on ray-casting, software
- Benchmark system - application, software

3. e-SECURITY DEVELOPMENT DIRECTION

Project director: Dr. Zoltán László assistant professor,
MSc in electrical engineering, BME IIT
Research area: software engineering, metaprogramming, development of distributed object oriented systems, software engineering education
Publications: books: 1, lecture notes: 6, journal papers: 7, conference papers: 48
Important research and industrial projects: GVOP, IKTA, TÉT, ITEM, IST, TEMPUS projects
Awards: Award for Outstanding Innovation, KPMG professorial scholarship, HP professorial scholarship.

As one of the most rapidly developing disciplines these days, information technology plays a significant role in both the operations of society and the economy, and in managing their operating efficiencies. The continuous, exponential growth of computing/storage capacity of hardware, and the drastic increase in network bandwidth enable the solving problems that once seemed to be insurmountable, due to technical limitations. However, it can be inferred that there is more to information technology on its current technical, technological level than what is exploited by creating and operating complex, highly complicated systems affecting society and economics (e.g. e-government, distribution, intelligent transport and logistics, meteorology, simulation and animation, process-, organization and decision support systems, just to name a few). This situation has been confirmed outside Hungary as well. International studies show that only a small percentage of complex IT projects can be considered successful, and the exaggerated expectations towards the sector have decreased over the last decade. This is mostly due to the fact that the security and quality of an IT system is often insufficient, and protection tools and techniques are cumbersome and difficult to manage. System downtimes result in a lack of essential functionalities and data loss, while security holes make users vulnerable. There is not sufficient support available for secure operation, connection points linking different systems are missing, and simple modifications in the application field can only be realised through complex development in the implementation field.

The more IT systems dominate every aspect of life, the more IT security comes to the forefront. International standards and regulations are created to classify systems and to certify compliance with requirements (e.g. Common Criteria), with Hungary acknowledging the efforts and aiming to employ these initiatives (e.g. MIBÉTS). Alongside the technical level approaches, organisational level approaches are becoming increasingly (COBIT, BS7799) accepted. A similar tendency can be experienced in terms of quality and quality assurance, where alongside the ISO there is an increasing demand for CMM based certifications.

The ultimate goal of the program is for BME $(IT)^2$ create a laboratory where IT security & quality auditing and authentication activities can be performed, evolving - by the end of the project - into a certification laboratory. Being a supplier-independent university organisational unit, BME $(IT)^2$ provides an ideal framework for such a laboratory. The numerous research topics include: analysis of new threats, verification and validation techniques, secure payment protocols, audit methodologies and computer based support thereof, determining quality attributes of (software) products, processes, and resources, and the related metrics and measurement techniques.

The laboratory must support the dissemination of Hungarian IT security audits. Thus the laboratory can significantly contribute to the evolution of a Hungarian evaluation schema, and also prepare Hungarian IT products to meet internationally accepted certified auditing. This activity, on the other hand, reduces the costs of Hungarian enterprises aiming to get a certificate valid only in Hungary, since it will be available for a favourable price; moreover, the thorough preparation involved can save significant costs when acquiring international certifications.Software quality has both a product and a process view. The aim of creating and operating such a laboratory is to provide a realisable tool and service in both product and process-based quality control and quality assurance.

In all four programs, research and development is supporting technology and application developments providing specific products and services promising economic benefits. Developments are implemented within the scopes of application projects initiated based on the innovation requirements of consortium partners and other users of the IT market.

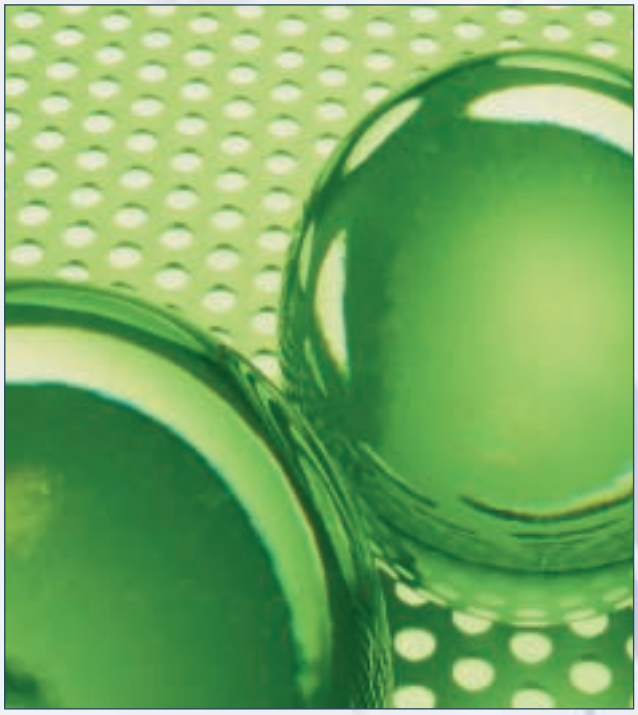
3.1 Quality Laboratory /3.2 subtask/

e-Security development direction

Project leader: Dr. Zoltán László

Objectives

The measuring of software quality can be done by analysing the product and/or verifying the process. The first attempts adopted the product-based approach. The difficulty of these measurements caused this approach to be shifted into the background for a while - at least in business activities - but it is has been making a come back to the forefront of this technical field ever since the ISO 9126 standard was introduced at the end of 1990's. In Hungary, software development processes are certified according to ISO 9001:2000, CMM, SPICE, CMMI or other security standards. Acquiring the authorisations for granting the increasingly widespread CMMI certification, and for the preparation and trainings of these, is a lengthy and costly process even for those having the necessary field experience and routine. Within the scope of the current project, BME (IT)² is aiming to provide a realisable tool and service in both product and process-based quality control and quality assurance.



Certification of a software product. Software vendors have communicated the need for measuring certain „characteristics", and for the validation of a specific software product. Within the scope of the project, an ISO 9126 standard application - a standard based quality certification - methodology will be developed. The methodology supports the understanding of measured metrics, creating quality profiles, selecting the relevant metrics and evaluating the results. Application of the methodology will be supported with software as well. The aim of the present project is to have BME (IT)² and its employees cooperate with software vendors while providing consulting services and assistance in creating the quality profile of the company. In case there is a demand from the software developer company side, software metrics are to be analysed and examined based on the standard. The project also includes investigating the conditions of accrediting the methodology at the Hungarian Accreditation Board (Nemzeti Akkreditáló Testület - NAT), and attempting accreditation if found to be feasible.

Accredited CMMI instructor training and CMMI audit. BME (IT)² aims to enter the market of process-based quality control by offering CMMI instructor and SCAMPI (Standard CMMI Appraisal Method for Process Improvement) auditing services. Unfortunately, attaining this goal is a lengthy and costly process, since CMMI auditing and CMMI instructor training can only be provided by companies obtaining partner status or by individuals earning the certificate, meaning they attend and complete fee-based courses controlled by the developers of the methodology. Thus, a strategic partner is needed. This is facilitated by the fact that the BME Department of Control Engineering and Information Technology (IIT) and its employees - founding members of the BME inner consortium - have already made some efforts towards reaching this goal. Software for supporting CMMI audit. A SCAMPI auditing process can not be performed without information system support. Due to its seemingly impossible application in Hungary, and insufficient functionalities, similar purpose software it is recommended to develop a proprietary framework to support the SCAMPI auditing processes. Principally, the software records CMMI model requirements in a structured fashion, both in English and Hungarian. Navigation within the model and a status check of each requirement are to be supported.

Activities

After obtaining a copy and starting the processing of the ISO 9126 standard, a thorough literature review has been per-

formed in the field of quality profiles. As a definition for the certification process the Goal/Question/Metric (GQM) methodology was adopted. The connection with industry practice and applicability was established by the industry demand of conducting the quality review of a statistical process control and quality control program (SPC). The analysis of this software enables and necessitates the creation of a general control engineering software related quality profile, and application of this profile in the auditing process. The work performed included the assessment of standard metrics based on the industrial software, the specification of the quality profile creation process, and the creation of two versions of the SPC program profile. A separate measurement process was developed to define the explicit parameters implied by the industry demand. The profile-plan related to the software of Secbox unit of subtask number 3.3, „Virtually closed networks", was prepared. All the instructions, standards, and guidelines related to the NAT accreditation were gathered, and a first version of the accreditation scenario was created.

Broadening the original scope, software quality can be interpreted from a technology perspective as well. Considering this aspect, the creation of formal models and model-based software development are paramount. It has been found that certain ISO 9126 quality metrics and the results of formal model-based program analysis show a correlation which could contribute towards the scientific foundations of quality reviews. Within this context:

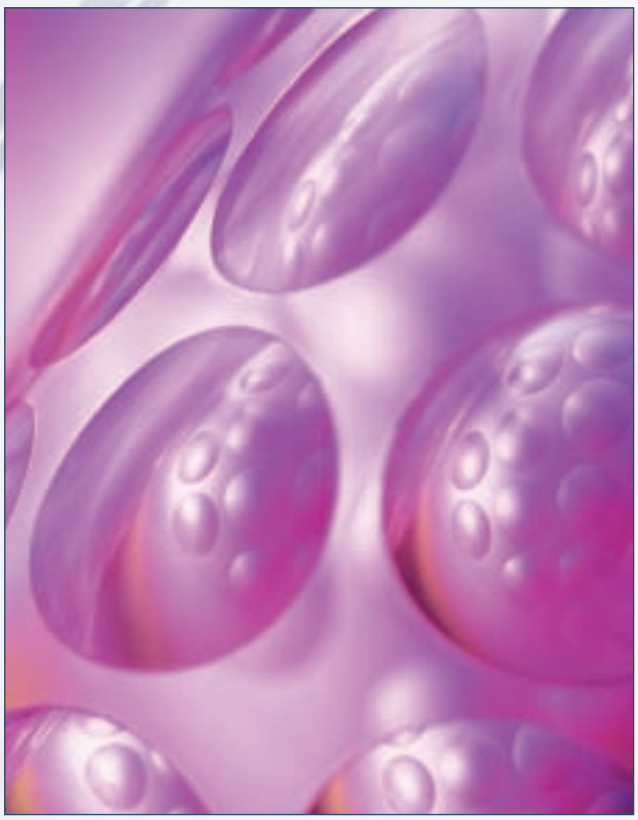
- significant results - supported by several publications - were achieved in the field of model-based and aspect-oriented software development and code generation; and
- cooperation started with the Department of Software Engineering at the University of Szeged in the field of model-based source code analysis and linking quality parameters, with the cooperation extended to other regions in Hungary.

Based on actual market conditions, and analysing the quality trends of the near future, it was inferred that the mutual interest of BME (IT)^2 and its employees in terms of process-based quality control and training would be most sufficiently served by a jointly founded spin-off company. The interested parties recorded their mutual goals in a letter of interest. Since the foundation of spin-off companies where a budgetary institution is also a proprietor has not yet matured in Hungary, the preparations took more time than expected, thus shifting the foundation of the company into the second phase of work.
The company to be founded will have a significant role in auditing products according to the ISO 9126 standard. However, the point 4.2.0.1 of the MSZ EN 45011 standard relevant to the certification organisation prohibits the certification organization from planning and delivering the kind of products it is authorised to certify. Therefore, since BME (IT)^2 can not discontinue software planning and development, certification services will be provided by the spin-off company.
The system specification and the prototype of the CMMI audit supporting software (CMMI Assistant) were completed by the deadline. Main features include:

- Registering existing evidence of the audited organisation
- Assigning evidence to the CMMI model, and eventually evaluating the projects of the given organisational unit according to SCAMPI based on the evidence revealed by the audit
- Generating reports for the projects based on evidence and actual results
- User and system administration, CMMI browser.

The results and products from the first work stage

- Summary of the Goal/ Question/Metric Method - study
- Description of the external, internal and in-use metrics of the ISO 9126 - specification
- Quality profile pattern for an industrial software - specification
- Quality handbook - preliminary version
- Software (CMMI Assistant), supporting CMMI auditing - system definition, design and implementation plan, user documentation, software (prototype)
- Model based aspect oriented code generator (technology)
- Publications: 4 international conference papers, 1 student's scientific conference paper



3.2 Log-gathering and analysis /3.1 subtask/

e-Security development direction

Project leader: Szabolcs Szigeti, MSc in Electrical Engineering, MBA
Job: BME Centre of Information Technology, research associate
Research area: Information technology, computer networks, IT security, next generation protocols
Teaching area: programming, computer networks, software engineering
Professional qualifications: CISA
Publications: book chapters: 3, conference papers: 15, other: 10

Balabit Ltd. has been developing perimeter security and network management tools and providing services in these areas since 1996. Its product portfolio includes the syslog-ng tool and the Zorp firewall suite, which not only shows a considerable market presence in Hungary but is also well known on other markets. Zorp's popularity is attributed to its capabilities and graphical management interface.

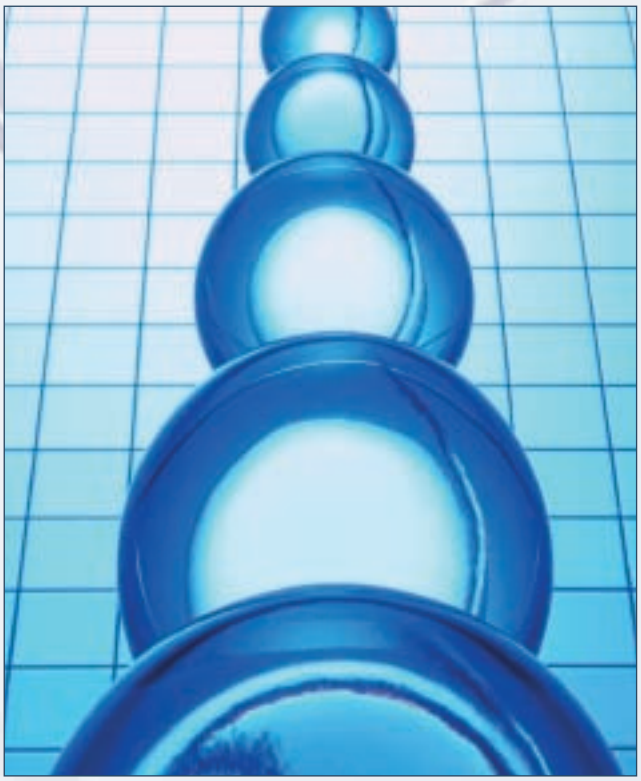
The syslog-ng tool was initially conceived to replace the original syslog tool, and has become vastly popular amongst the open-source solutions. The purpose of this project is to create a complete log-gathering hardware-software infrastructure, based on syslog-ng.

The subject expert on behalf of the industrial partner is Csaba Major. He graduated from computer science in 2000 at University of Miskolc. Since then, he has been working at Balabit Ltd., initially as systems engineer, lead systems engineer and currently IT security consultant. He is specialised in Linux operating system, firewalls and Zorp Modular Firewall. He is a certified Zorp engineer. In this project, his role is the coordination of activities on Balabit's side.

Objectives

The open source syslog-ng tool from Balabit Ltd. is a popular tool, which is widely acclaimed in the open source community. It is part of several high-profile Linux distributions, such as Suse or Debian, where it has completely replaced the original logging tools. There is market demand for a complete logging infrastructure and Syslog-ng provides a sound base for constructing one. Current log tools provide services for centralised or remote logging, but they lack central management. Since all log source and log-gatherers are manually configured, these solutions suffer from scalability problems.

Several products are available for total management solutions (Tivoli, Unicenter etc.) for large IT systems. In practice, however, such a management system is unnecessary, while there is still need for a scalable, centrally managed, flexible log solution. Reliable logging is not only required for reliable operation, but there are legal requirements,



such as the Sarbanes Oxley Act, that demand auditable operations. There are numerous log-analyzers on the market, but no tool exists to solve the problem of gathering logs from large IT systems. Because the number of sources can be over 10 thousand, not only the performance has to be adequate, but the solutions for efficient management and operation must be identified.

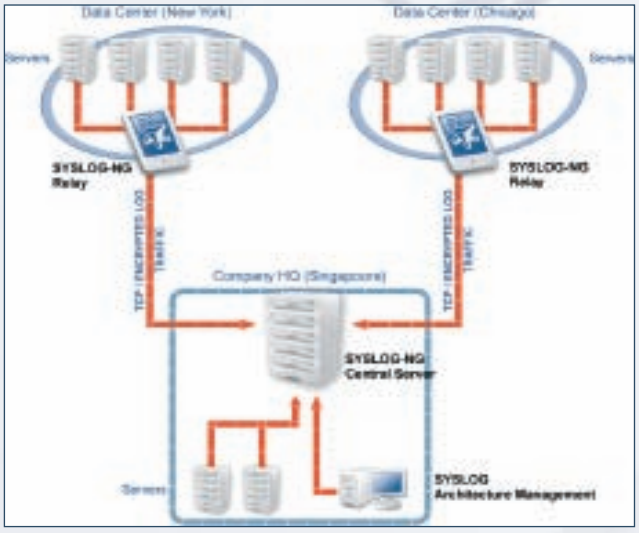
Syslog-ng is an ideal foundation to develop such a system. The goal of the project is to create a centrally manageable, scalable, flexible and high performance system to gather logs from a variety of IT equipment and applications. The hierarchical logging framework will transfer the various log entries to a central repository.

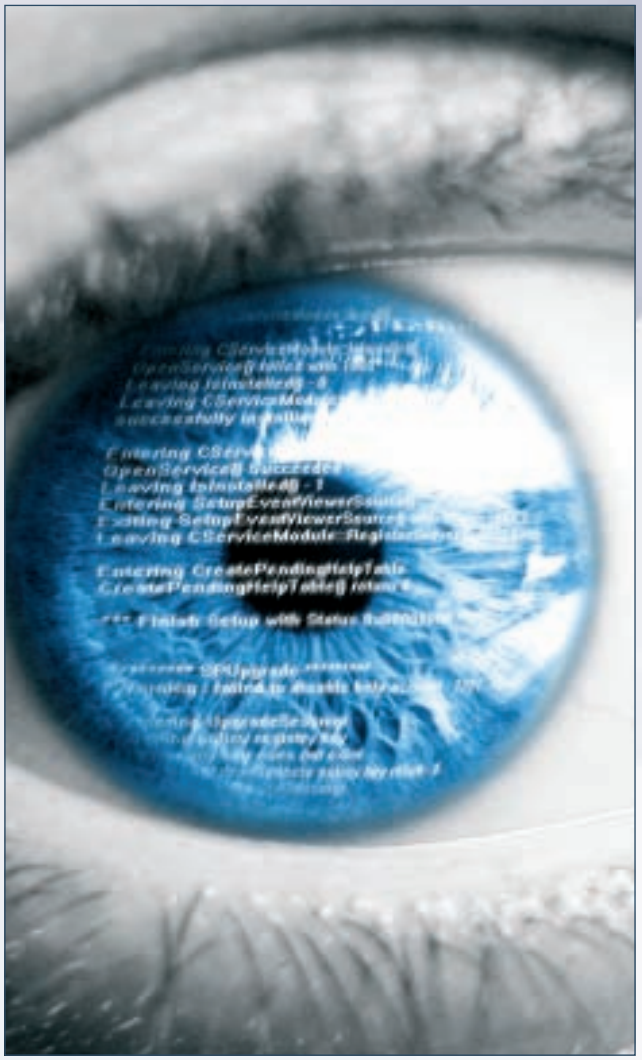
The project will create a logging infrastructure based on open industry standards to enable users to customise the system to their needs.
The log entries can be searched, filtered, analysed and archived. By combining elementary log entries, higher level logs can be created for alerting, browsing, etc. Development will utilise the knowledge of this field to solve the structuring and analysing logs. A high performance pattern processing language will be created for implementing alerts.

The project consists of two independent, but connected phases:

- In phase one the log gathering infrastructure will be designed and implemented. It consists of the log-relay hardware-software components, the management framework, the log database and its management interface. The end result will be a commercially available product.

- In phase two, the products functions will be enhanced with a log analyser module to enable higher level analysis which can uncover otherwise hidden events. An example is to combine firewall logs with application logs to explore covert channels. A report generating module will help in creating various reports.





The project will result in a product that can be presented on the market on its own, or as a part of a larger solution.

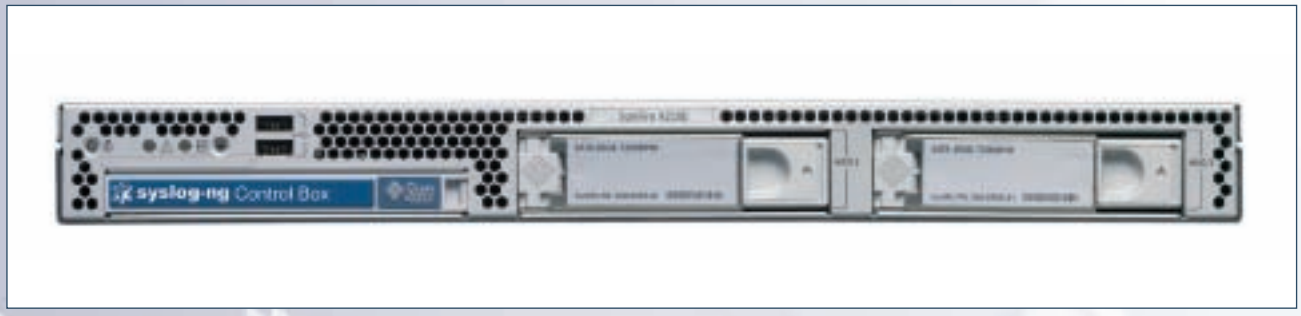
Activities

The first main task was to develop the detailed project plan, and create specification requirements and a detailed system design. The project organisation and its supporting IT infrastructure (mailing list, wiki, document repository, source code repository, etc.) were implemented.

Next, the detailed project timetable was set for the first phase, which will result in V1.0 of the product. A preliminary plan was set for the second phase.
The requirement specification was drafted by the project team.

From there on, work was split into independent packages, so smaller teams could work individually on each module. (IT)^2 employed a programmer who also took part in the planning.
Equipment was procured and developer workplaces were set up.

During detailed planning, the system design, database schema, XML schema and other documents were created.



Technology trials were conducted to try the viability of the most modern techniques, such as AJAX.

For V1.0 of the product, three main components had to be developed:

- The system software (firmware) for the log gathering device (relay). The relay firmware is based on Linux, using a web interface to communicate with the management framework. Main development tasks were the system configuration upload and refresh mechanism, and the individual configuration of the system components. The XML schema was developed to facilitate configuration data exchange between the management and the relays.

- The relay configuration database and logic. The high number of relays required careful planning to reach scalability goals. The configuration database is structured upon the relay hierarchy. The database (and its handler module) stores, manages and uploads configuration data and its access rights.

- The user interface of the central management station. The configuration database is accessed through a web based graphical user interface. The main design goals were scalability to several thousand relays, while maintaining usability; web browser based solutions; and conformance to the look-and-feel of other Balabit products. The ideas from Balabit's Shell Control Box were taken and implemented using AJAX technology to create a smooth user experience.

At the end of phase one, the project goals set at the start of the project were met, allowing for start of the second phase.

Obviously, besides setting technology goals, the project also has commercial goals, which include the marketing of the product and related services. $(IT)^2$ and the industry partner will agree on the exploitation of the product after initial market reactions.

The results and products of the first work stage

- Project organisation and support infrastructure
- Requirement specification
- System plan
- Central management station (software/hardware component)
- Log gathering system (software/hardware component)

3.3 Virtually closed networks /subtask 3.3/

e-Security development direction

Project leader: László Bacsa, BSc in economics and graduating in Master of Business Administration (specialized in fiscal economics and info-communications) this year. Director of innovation and marketing at BME (IT)², project manager at BME CIT.
Field of interest: innovation management; preparation, planning, coordination and control of projects, proposals; international relations and management of communications, marketing and innovation.
Publications: 1 book-chapter and 4 conferences

Our consortium partner Secfone Ltd. started its research into Manageable Virtual Closed Network (MVCN) protocol in 2004, and soon after the development and hardware implementations of MVCN also began. The MVCN protocol has been patented, and the network access hardware by the name Secbox was also developed. Secfone's mission is to enhance the functionality and usability of Secbox as well as to develop more MVCN equipments. Hence Secfone does research and development in specific target areas (mobile communication, video transfer, IP based voice transfer) to integrate the MVCN protocol.
The industrial partner's supervisor is Mr. János Zelenák IT expert; process developer, informatics teacher. He pursued his studies at the University of Szeged, he has been working in IT for 18 years; through his companies he has been working on several development projects initiated by IBM since 1997. His speciality is IP security technology IP.

Objectives

The extent and scale of information streaming on electronic networks is increasing almost day after day. The freedom of the Internet arises some critical security questions, furthermore the control and the administration of communication over the Internet not resolved in terms of security. The solutions of secure communication for the "security-sensitive" industries (e.g. automotive, chemical, and pharmaceutical), for governmental bodies and for other organizations are expensive and special. The results of Secfone's developments based on the patented technology, as a cheap and more effective alternative, renders secure communication possible for small and medium sized enterprises, as well as for households and individuals.

It is unimaginable to enter to the global market without having the IT products audited by an independent organization. Obtaining the independent certification of Common Criteria (CC) - worldwide accepted ISO/IEC 15408 standard - referring to security and dependability is a basic requirement. It must be demonstrated during the project that the patented protocol corresponds to the specific security provisions. This way we reconsider the earlier developments, as well as the products under development (MVCN, Secbox) with respect to quality and security. During the methodologically grounded interoperability analysis, the MVCN protocol and the Secbox product must be tested to meet the set up interoperability conditions.
Throughout the past few years the growth rate of changes from switched telephone networks to IP based networks in the communications infrastructure has been increasing rapidly. It is an actual market demand to produce a VoIP gateway capable of cooperating with Secboxes, as well as managing and connecting a VoIP telephone network to ISDN/PSTN/VoIP/MVCN networks.
Our additional aim is to create a secure, broadband virtually closed network capable of transmitting a great deal of data, with the development of a new hardware-software tool based on the patented technology.
The performance of new generations of mobile devices makes them able to transmit voice and video data on mobile-network over MVCN. Since the secure data transmission in the mobile networks is unresolved or the existing solutions are expensive and complicated, the utilization of the patented technology would be unique in this market as well. Our medium-term aim is to apply the technology in the new generation mobile environment.

Activities

The workgroup for the preparation of the Common Criteria (CC) methodology has been formed. The task of this group is to analyse the security demands and the vulnerability of the products in security aspects. Firstly they had to write down the Security Target (ST) documentation pursuant to the AEL 2+ security level. The document has been finished. The German IABG (Industrieanlagen-Betriebsgesellschaft GmbH) firm was requested to prepare the product for CC certification.

In the R&D and Innovation Centre of BME (IT)^2 we set up an Asterisk - software based telephone sub exchange - test system. By analysing the MVCN protocol and with the use of available modules of the earlier Secbox platform (ARM9) we could successfully integrate the protocol under an i386 system. As the result of the research we developed a system where the transmission between the Asterisk and the devices, and amongst the devices themselves, data streaming is encrypted using the MVCN protocol.
We have developed an environment for examination and development to analyse the broadband operation and where the code optimizing could be performed. The development was in three parallel ways: the first one aimed to optimize the MVCN protocol, the second one to optimize the fingerprint recognition system of the Secboxes and in the third one to examine the system's functions.
After several sorts of measurements and examinations (profiling, broadband measuring, etc.), it become clear that the device could have a much higher capacity than the original throughput (1.2Mbit/sec), there is more potential to this piece of hardware. Based on the analyses we determined the bottleneck of the implementation and after fixing it the throughout become almost three times higher (3Mbit/sec). It was proven that using the current encryption (Blowfish) the hardware could not have higher throughput, therefore more optimization is not needed.

An essential condition of the MVCN network's security is the reliable identification of the users. Instead of the conventional, username/password based identification, the Secbox device is promoting fingerprint recognition. As the software packages of the device used hitherto were not able to perform this task with the appropriate speed and reliability, re-examination and improvement was required. In the course of that we developed and tested several new solutions.

„Functional testing" is checking the aggregation of Secbox's services and functions, based partly on the protocol specification and partly on the requirements originally set up. In the first step the total functionality of the Secbox was mapped, followed by planning the test events. During planning, beyond the functional examination, the robustness of the system was also taken into account. An automatic test system has been set up, which is able to examine the operations characterized by defined test events.

The preparation and porting of the MVCN technology to the new generation mobile applications was started with summing up the possibilities of solutions. An overview has been completed analysing the operation systems of the present mobile devices in the terms of optimal usability. On the basis of that, we have chosen the Linux operating system, because it seems to be the most effective platform on which to create the prototype. An appropriate device has been chosen. We have successfully integrated the MVCN layer on the test devices, so it is possible now to send encrypted data from one device to the others.

The results and products of the first work stage

- Preparation for the CC qualification and certification (55%)
- Integrated MVCN - Asterisk systems in basic functions
- MVCN broadband optimization (3Mbit/sec)
- MVCN system operating in new generation mobile environment

4. GRID AND IT SECURITY LABORATORY DIRECTION

Project director: Dr. Imre Szeberényi Ph.D., Associate Professor, electrical engineer, BME CIT
Speciality: parallel and distributed systems, grid systems, operating systems, embedded systems, interprocess communications, protocols, information security
Publications: Books: 2, reviewed articles: 14, Scientific presentations: 39
Memberships: John von Neumann Computer Society
Major industrial and research projects: Hungarian Utility Grid Environment (NKFP), enabling grids for E-scinecE project (EU FP6), the user-oriented unification of the Hungarian SuperGrid and ClusterGrid systems (IKTA), development of services based on the ENUM procedure (GVOP), preparation of professional IT security documents, opinion about the MIBÉTS documents (IHM, NT

The evolution of global distributed IT systems is due to the rapid development of data transmission alternatives. Within these systems the on-demand usage of IT resources (like processing and storage capacity) and services (like searching and computing services) can be realised, and this can lead to a much more efficient resource management. In the first place, the demands for sharing and efficiently utilising resources has emerged primarily for scientific research tasks. The main reason for this is the massive scale of collaboration of many researchers and institutes when engaging in high volume projects. Contributing and the sharing of resources has become natural and logical during cooperation. The demand for wide range resource sharing and connection started so called Grid research and the worldwide experiments surrounding it.

Nowadays the requirement for using shared, dynamic, on-demand IT resources has become a standard in most aspects of life. This is due to the simple recognition that IT application services are manifest for the mass of end-users just as other services like the power grid, the sewage system, or laundry services. As the palette of IT service users widens, the specific details of technical solutions become uninteresting for more and more users.

The reorientation of distributed IT systems towards becoming user and service oriented is presently a challenge. This task brings on a great deal of unresolved technical and technological problems, such as load balancing, security and authentication problems, reliability and quality of service questions, etc.

The experimental results strengthen the prognosis that the Grid research supported significantly worldwide cannot be separated from Web-technology, moreover according to the results so far, the Grid may be Web-technology's new generation. However, the possibilities of Web-technology enhance the creation of easy-to-use user interfaces, which greatly contribute to the industrial usage and spread of the results.
The subtasks to be realised by the project team are to bolster the industrial usage and spread of Grid technology. The subtask connected to the distributed, extended file systems, consists of examining the usage possibilities and requirements in the Grid environment of the scalable storage devices made by our industrial partners. The goal of this subtask is to achieve the appropriate modifications and settings in order to create a product which becomes a stable basic of the Grid infrastructure.

The subtask connected to resolve the planning tasks with high computing needs consists of developing a specific industrial application. The final achievement is a service based on the Grid infrastructure, and is able to contribute to executing the daily planning tasks of the industrial partner. Usage of this application would make the planning and construction of pre-stressed, reinforced concrete bridge beams much faster and effective.

The industrial widespread use of Grid systems has been greatly reduced by the absence of trust in the built-in security systems. But security is a very important question in examining every IT system. The objective measurement of security is a great challenge for the developers and also for the procurer. By completing the third subtask, a security laboratory will be deployed. This laboratory will contribute to solving the security problems of the BME $(IT)^2$ projects.

4.1 Distributed, extended file systems /4.1 subtask/

Grid and IT security laboratory direction

Project leader: Dr. Imre Szeberényi

HP is a leading developer and supplier of various IT products, technologies, solutions and services. On a company level, HP worldwide's research and development group of the High-performance Computing Division pays great attention to developing high capacity scalable storage devices. The main goal of developing the Lustre technology based, scalable storage system, the SFS (Scalable File Share), is to serve massive sized and high capacity cluster and Grid systems with reliability and easily improvable storage.

One of the important characteristics of the HP SFS system is that it can be easily integrated with the latest network technologies, so the data transmission throughput can reach 770MB/s.

Dr. Gavin Brebner (M.A., MSc., PhD.), the subject expert on behalf of our partner, works in the Advanced Development & Strategic Customer Management team of Hewlett-Packard's High Performance Computing Division where he is a senior technical contributor. He was previously a member of the engineering team that developed the Lustre based Scalable File Share product, and retains strong ties with this group, maintaining a strong interest in file systems and storage. He works with HP customers in areas such as Grid computing, and distributed file systems. Previously he spent some years working in Hewlett-Packard's Central Research Laboratories, and prior to that spent many years in industry and academia, researching and developing application specific integrated circuits.

Objectives

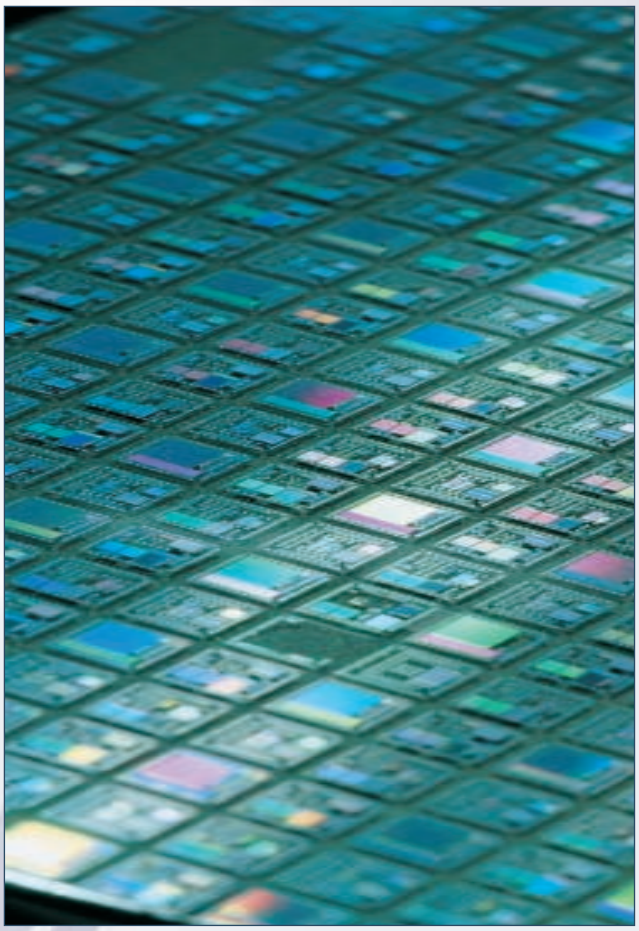
Hewlett-Packard developed the SFS (Scalable File Share) product based on Lustre technology. This product gives high reliability and data transmission throughput for a relatively low price, in a cluster environment in a specified hardware configuration.

With the rapid development of network technologies, the demand and opportunity arose to utilise such high capacity storages as Grid resource. But the remote network connections, due to the low bandwidth, cause heavy lagging, and this makes planning distributed file systems more difficult.

The primary scope of the research task is the discovery and elimination of the problems caused by the limited bandwidth, lagging and network errors.
The National Information Infrastructure Development Program (NIIFI) joined the project as an external partner through its recognized experience in the planning and creation of distributed file systems.
As no competence exists regarding the usage and configuration of the HP SFS in Hungary, the project began with a learning phase, the major benefit being that a current knowledge base has been formed, which is unique in Hungary.

The concrete objectives of the project in brief:

- Gain access to a brand new technology and competency, which provide current knowledge and feasibility to the region
- A sample HP laboratory is to be established, which may later operate as an HP test laboratory
- To support the usage of HP SFS in other industrial and/or scientific projects
- The long term goal is to provide great storage capacity for data-intensive research.



Activities

Through the cooperation of leading professionals from HP, the precise task plan and timing have been completed. Installation of an SFS system became necessary at the BME (IT)^2 site. The device was constructed for a separate order, and was dispatched on 26 May 2006. The configuration contains all the parts necessary for making the system expandable and foolproof. Currently the system provides a storage capacity of 3 Terabytes in redundant mode, and the client machines can access this storage by connecting to an object-oriented file system based on Lustre technology.

The most important task of the first session was to prepare and analyse an environment needed for further sessions.

This task bears further significance because this is the first HP SFS system in Hungary, as well as in the Central-European region.

After analysis of the system, test cases were defined to examine the performance and dependability of the system according to the quality of the network connection.

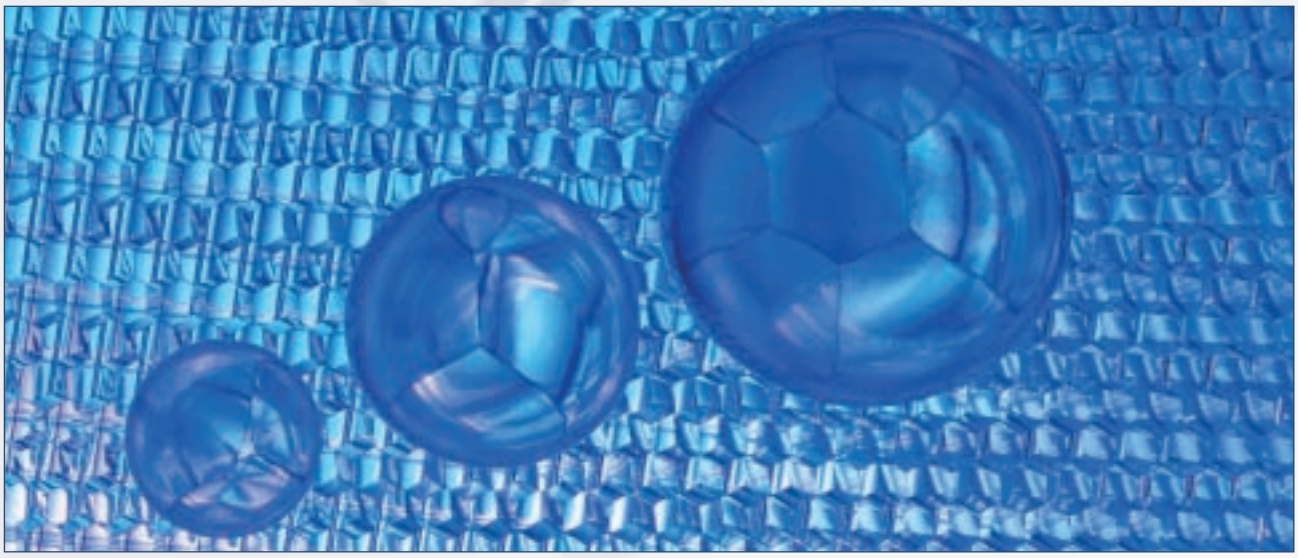
During the course of this, a survey was initiated to figure out how the HP SFS system be connected to the biggest Hungarian academic Grid system, the ClusterGrid, operated by the NIIFI.

Another survey was conducted regarding how HP SFS storage capacity can be utilized in a high profile EU project, the Enabling Grids for E-sciencE (EGEE), with 91 participating institutions.

Knowing the characteristics of the system, it became evident to apply the SFS system in the implementation of the industrial application during the 4.1 subtask. According to this a cluster environment was planned and implemented that could become a basic part of a scalable Grid system.

The results and products of the first work stage

- making of a more accurate task specification
- installation of the hardware system
- examination of the dispatched system, development of the test system
- execution of measurement analysis, evaluation of the results
- connecting the SFS system into the EGEE infrastructure
- connecting the SFS system into the ClusterGrid system
- development of SFS client patches for newer Linux versions



4.2 Industrial application of GRID systems /4.1 subtask/

Grid and IT security laboratory direction

Project leader: Dr. Gábor Domokos Professor and Chair, member of HAS, MSc. architectural engineer, BME SZT

Field of interest: Large deflections of elastic structures, structural stability and global research of equilibrium, non-linear computation of cyclic symmetric structures, chaotic phenomena in time and space, especially the chaotic states of elastic structures, digital modelling of chaotic motion, connections between discrete and continuous systems, mechanical applications of group theory, parallel algorithms for engineering structures

Publications: 1 book, 4 book chapters, 50 research papers, 236 presentations

Fellowships: Member of several doctoral committees, Chairman of the Doctoral Committee of the Faculty of Architecture, BME (2000-), leader of the Pál Csonka Doctoral School, Secretary of the Mechanical Committee of the HAS (1996-1998).

Although the BVM Épelem Ltd. is not a member of the BME (IT)^2 consortium, it is expected to be one of the industrial beneficiaries of the research results. BVM Épelem Ltd. is one of the main companies in Hungarian precast reinforced concrete industry. It produces vast quantities of prestressed beams for building and infrastructural construction. The initial spatial deformations (lateral displacement and torsion) of prestressed bridge beams with a span over than 30m renders them unusable. Up to now there has been no reliable method to predict such unfavourable deformations. The proposed algorithm enables users to calculate spatial deformations in the design phase. As an external contributor BVM Épelem Ltd., takes part in the research through professional consulting, sharing its experiences and carrying out comparison experiments on beams.

Antal Tápai, subject expert on behalf of our partner, graduated as a civil engineer at the Technical University of Budapest in 1964. He is an expert engineer of structural engineering (1979). He started his career at a company which was the legal predecessor of BVM Épelem Ltd. Earlier he was a technical manager, and since the company's privatisation has been the technical head manager. Antal has taken part in important developments including the design of the reconstruction of the factory of the BVM Épelem Ltd. He has also worked on product development for the wall elements for the Budapest, Praque and Calcutta metros, work which achieved international renown. He has also taken part in the development of the structure for numerous investments (Budapest Sport Hall, schools) and has played an important role in the establishing the production of precast tramline elements and bridge beams. He taught at the Ybl Miklós College for 20 years. Since 1993 Antal has been the Leader of the precast group of ÉTE (Association on Building Science), and is a member of the Hungarian Group of fib. He is the chairman of the Hungarian Concrete Association.

Objectives

Through the development of networking technologies, algorithms and technologies can be applied now which had appeared to be unusable earlier or were expected to run in super computers. One such algorithm is the Parallel Hybrid Algorithm (PHA) developed at BME. It solves boundary value problems in a different way than traditional solutions. Boundary value problems appear in:

- civil engineering mechanics (e.g. deflections of prestressed beams and columns),
- calculation of the shape of fibres
- calculation of the shape of trailers and mushroom-cords in biology, and
- the control tasks of robotics.

The developed PHA algorithm has been applied successfully in several engineering research tasks. Based on the experiences of these studies our goal is to develop an easily configurable facility to calculate the spatial deformations of prestressed bridge beams.

The project covers the whole spectrum, from fundamental research to the implementation of the pilot application. The steps for project completion are the following:

1. Development of an algorithm to calculate the spatial deformations of prestressed reinforced concrete bridge beams. The calculation of asymmetric cracking must be modelled in a physically and numerically reliable way.

2. The embedding of the previous algorithm into the Parallel Hybrid Algorithm earlier developed by the Department of Mechanics, Materials and Structures, and adaptation into the Grid environment.
3. Development of a portal surface to input data and a graphical tool to display the computational results.
4. Further investigation on the acceleration of the algorithm and the implementation of the possible solutions.

Activities

In 2006 the project progressed at an accelerated pace than the previous schedule approximated

The problem associated with the basic research (Task 1: numerically reliable calculation of an asymmetrical, cracked reinforced concrete cross section) has been solved completely. This achievement plays an important role in the PhD thesis of András Sipos. The principal theoretical results are all connected to this topic. Compared to the previous solutions, our method exhibits a very fast, global convergence. This is not only a numerical experience, but for special cases we also provided an analytical proof. This robust stability is not for the sake of comfort: without robustness it would be impossible to develop a reliable parallel algorithm.

The 2nd aimed task - namely the embedding of the algorithm into the existing PHA code - has been finished successfully. Although this is the first application containing an inner iteration, the embedded algorithm works well. Due to the inner iteration we expected significant deceleration; therefore we carried out benchmark searching tests. These tests were conducted on problems which could be easily compared to earlier solutions without inner iteration, i.e. the industrial problems were not included in this phase. The comparison of the results of the industrial problems with experimental data is now in preparation. During this work we will test the deformation and the failure of beams manufactured by BVM Épelem Ltd.

The results of the benchmark test exceeded our expectations. It came to light that the stability of the inner iteration is extremely strong, and in most of the cases in 3-4 steps provides a solution inside the margin of error. Due to this fact the

entire method has not decelerated significantly. During the test we modelled fascinating engineering problems, an activity which was not included in the original objectives. Without the developed method these problems were impossible to calculate. We are publicising these results which are under review.

We have begun the adaptation of the algorithm to the Grid environment. Now we are carrying out test-runs in the academic CLUSTER-GRID environment.

The user interface, which enables users to input data interactively via a web browser, is ready.

We have developed a principle scheme to reduce the exponential computational need of the PHA algorithm to a polynomial. This result has been published.

The results and products of the first work stage

In the first phase we have completed the following tasks according to schedule:

- The algorithm for calculating the spatial deformations of prestressed reinforced concrete bridge beam has been developed. The calculation of the asymmetric cracking has been modelled in a both physically and numerically reliable way;
- the developed algorithm was embedded into the Parallel Hybrid Algorithm;
- the embedded algorithm was tested as a benchmark;
- the embedded algorithm has been adapted into the academic CLUSTER-GRID environment;
- the development of the data input portal structure of the portal;
- the development of the interactive interface to the portal;
- the development of a principal scheme to reduce the exponential computational need of the PHA algorithm to a polynomial.

4.3 IT security laboratory /3.2 subtask/

Grid and IT security laboratory direction

Project leader: Csaba Krasznay, M.Sc., CISA, CISM, CISSP, electrical engineer, BME CIT
Area of specialty: IT security, electronic signatures, e-government and e-commerce security, IT security evaluations and certifications
Publications: 8 conference
Memberships: member of the board of the Hungarian Association for Electronic Signatures since 2006, member of the Hungarian faculty of ISACA since 2006
Projects: Development of application methodology for electronic signature, analysis of antivirus system according to Common Criteria, IT security guide for local governments

Objectives

Finding an objective measurement of the security of IT products and systems is a big challenge for developers and customers. The ISO 15408 standard, better known as Common Criteria, helps in these kinds of measurements and laboratory tests. Hungary has joined with those countries who accept the Common Criteria but we don't have such an accredited laboratory that would be able to perform these kinds of tests, or perform the analysis and later the certification. The primary objective of this project is to set up and accredit such an institute.

The establishment of an IT security laboratory began in 2003 within the structure of the BME Centre of Information Technology. Therefore the body of knowledge and skill which enables the fast development of the laboratory was available during the establishment of the Knowledge Centre. As the founding member of BME (IT)^2 consortium, BME CIT has already been in possession of ISO 9001 quality management and BS7799 information security certifications which ensure the policy based, well-ordered and secure operation, and also serve as a model for the whole BME (IT)^2 operation.

It is important to note the Common Criteria based analysis of antivirus applications from the previous major tests of BME Centre of Information Technology, where we examined 7 AV products from the Common Criteria point of view. The interoperability test of the Hungarian Association for Electronic Signatures has the same significance as when we studied the interoperability questions of signature creation applications.

The objective in the first year of BME (IT)^2's operation was the infrastructural development of the laboratory. It's also important to emphasise the national and international networking. Members of the IT security laboratory monitor and take an active part in other research and BME (IT)^2 development projects to guarantee the consideration of IT security aspects in the planning phase of these projects.

Our short term objective is that the preparation of Common Criteria of the products developed in BME (IT)^2 projects should take place in the security laboratory. After gaining accreditation, the laboratory will become an independent evaluation laboratory.

Activities

As the first step towards developing the laboratory we outlined a precise work plan and the laboratory's system design. The system design deals with physical security, network and IT infrastructure. In the first half-year term the devices necessary to begin our undertaking were purchased and installed. The laboratory was developed on the facilities of BME (IT)^2 in a standalone, separate room. Those colleagues who participate directly in the security examinations also work in this room. For the development of human resources - and creating several new workplaces - among other tasks, we employed some recently graduated professionals who have previously worked together with BME (IT)^2's consortia partners.

The development of the laboratory's operational policy was an important step. This was based on the ISO 9001 and BS7799 policies of BME CIT, one of the internal founding

partners of RET. In the development of these policies we stressed consideration of the foreign Common Criteria schemes which declare the conditions of an accredited laboratory. This operational policy would be completed later in compliance with arising demands and specifications.

The professional support of other BME (IT)² projects is one of our more emphasised objectives. In the first year, employees of the laboratory have participated in four projects:

- In the design and documentation of Secfone Ltd. SecBox, to foster its Common Criteria certification;
- IT security testing in Megatrend Informatikai Co's project that deals with the development of inner security algorithms. We performed penetration and bypass tests to analyse the vulnerabilities of these algorithms;
- In Balabit Ltd's Syslog project - we provide support for IT security compliance in the design and implementation of the Syslog log analyser application;

- The main objective of Balabit Ltd's Zorp firewall project is to prepare the product for Common Criteria certification. The required documentation and the preparation of the Protection Profile have begun this year.

The Certified Information Systems Security Professional (CISSP) training week and exam were organised for the first time in Hungary with the support of the IT security laboratory. One of the best known worldwide, this professional exam tests IT security knowledge. The organisation of this exam is a supplementary step that serves and ensures the international acceptance of the Hungarian profession.

In 2006 the employees of BME (IT)²'s laboratory appeared as presenters and exhibitors at many noteworthy conferences. The greatest success was Hungarian IT Security Day, where nearly 1000 professionals could get familiar with the products and services of BME (IT)². In future, this can result in significant professional collaboration that helps the long term success of BME (IT)².

The results and products of the first work stage

- Development of the laboratory's own physical security system: a closed-circuit TV system was installed at the BME (IT)² facilities. A proper access policy is place in the laboratory which complies with regulations. This physical security fulfils the organisation's information security policy;
- Development of the laboratory's infrastructure: the necessary IT, network and human resources have been ensured for ongoing operations;
- Development of the operations policy: documentation has been made and is working in conformity with the organisation's quality management and information security policies and other requirements originating from various standards;
- Services: the laboratory has initiated two new services, one of which is the CISSP training and exam, while the other is the interoperability examination of electronic signature creation applications;
- Preparation for CC certification of Secfone Ltd's Secbox is 50% complete;
- Development of inner security algorithms for Megatrend Informatikai Co is approximately 30% complete;
- The lab task in Balabit Ltd's Syslog project is 10% complete and the associated Zorp has begun.

PUBLICATIONS

The research publications put out by the BME (IT)² Knowledge Centre over the past few years have been compiled. Actual activities were performed within four R&D programmes and their results were made use of in four main fields of exploration. The list of publications is given here categorised within the four research and development programmes:

1st programme
Development methodology and framework

Gábor Imre, Zsolt Berényi: Modelling the Effect of Application Server Settings on the Performance of J2EE Web Applications

Gábor Imre, Hassan Charaf: Analysing and Modelling the Effect of Application Server Settings on Web Application Performance, the 7th International Conference on Technical Informatics, 8 - 9 June 2006, Timisoara, Romania

Balázs Simon, Zoltán László: A Framework for Traversing Models Using Loops, submitted to IASTED International Conference on Software Engineering ~SE 2007~ 13-15 February, 2007, Innsbruck, Austria

Zoltán László, Tibor Sulyán: Compiler generator for creating MOF-compliant source code models in Proceedings of the 2006 International Conference on Programming Languages and Compilers (PLC'06) ed. H.R. Arabnia, June 26-29, 2006, Las Vegas, USA, in SERP'06 Vol II, pp. 851-857.

Simon Balázs: Modell alapú kódgenerátor keretrendszer (Model-based Code Generating Framework), paper submitted to the scientific students' associations of BME VIK, 2006.

L. Lengyel, T. Levendovszky, G. Mezei, H. Charaf, Model-Based Development with Strictly Controlled Model Transformation, the 2nd International Workshop on Model-Driven Enterprise Information Systems, MDEIS 2006, May 23-24, 2006, Paphos, Cyprus, pp 39-48.

Tihamer Levendovszky, Ulrike Prange and Hartmut Ehrig. Termination Criteria for DPO Transformations with Injective Matches, Graph Transformation for Verification and Concurrency 2006 (GT-VC 2006), Bonn, Germany, Electronic Notes in Theoretical Computer Science (forthcoming).

László Lengyel, Tihamér Levendovszky, Gergely Mezei, Hassan Charaf, Separating Constraints in Validated Model Transformations, 3rd European Workshop on Aspects in Software (EWAS'06), Technical Report, Enschede, the Nederlands, University of Bonn, ISSN 0944-8535.

G. Mezei, T. Levendovsky, H. Charaf: A Model Transformation for Automated Concrete Syntax Definitions of Metamodeled Visual Languages, 2. International Workshop on Graph and Model Transformation (GraMoT), Brighton, United Kingdom, September 8, 2006, Electronic Communications of the EASST (forthcoming).

L. Lengyel, T. Levendovszky, H. Charaf: Realizing QVT with Graph Rewriting-Based Model Transformation, 2. International Workshop on Graph and Model Transformation (GraMoT)
Brighton, United Kingdom, September 8, 2006, Electronic Communications of the EASST (forthcoming).

Gergely Mezei, Tihamér Levendovszky, Hassan Charaf: Restrictions for OCL constraint optimisation algorithms, OCL for (Meta-)Models in Multiple Application Domains (OCLApps 2006), Genova, Italy.

Related: Zoltán László, Steinar Glamseter:
Metaprogramming framework for generating persistent Java applications, in Proceedings of the IASTED International Conference on Software Engineering and Applications ~SEA 2006~, Dallas, USA, November 13 - 15, 2006.

2nd programme
Distributed and embedded systems

Daniel Pasztuhov, Andras Arpad Sipos, Imre Szeberényi: Calculating Spatial Deformations of Reinforced Concrete Bars Using Grid, HPDC 2006.

Szeberényi Imre: A Grid technológia és kutatás hazai és nemzetközi eredményei; IX. Országos Neumann Kongresszus, Győr, 27-29 June, 2006.

Szeberényi Imre: A Grid technológia és kutatás eredményei; eVilág , V.évf. 8., 24-28, 2006.

Pasztuhov Dániel, Szeberényi Imre: Konfigurálható portlet (conflet) alkalmazása clustergrid környezetben, Networkshop, Miskolc, April, 2006.

Sipos András Árpád, Várkonyi Péter, Domokos Gábor: Szerkezet-tervezés az interneten: egy gépi algoritmus gyorsítási lehetőségei. Építés- Építészettudomány, in press.

Sipos András Árpád, Domokos Gábor: Postcritical behaviour of asymmetrically loaded rods without tensile strength, European Solid Mechanics Conference 2006, Budapest, 29 August 2006.

Sipos András Árpád, Domokos Gábor: An efficient algorithm to determine spatial deformations of RC bars, International Conference of the International Association for Bridge and Structural Engineering 2006, Budapest,13 September 2006.

Dóbé Péter, Szeberényi Imre: Állományok hatékony szinkronizálása webszolgáltatáson keresztül, Networkshop, Miskolc, 2006.

P. Dóbé, D. Németh, I. Szeberényi: Building gLite Based Scalable Grid Environment with HP SFS, EGEE'06, Geneva, 2006.

Somogyi Csomgor, Szmrecsányi Márton, László Zoltán: Erőforrásfelhasználás-nyilvántartó és elszámoló rendszer Grid környezetben, Networkshop, Miskolc, 2006.

Related: Galvács László: Elosztott és összefogott erőforrások - Szeberényi Imrével a Grid technológiáról, Business online, 2006/8-9., 30-35.

Katie Yurkewicz: Building Better Bridges, Science Grid This Week, Fermilab, Batavia, IL, 18 October 2006.

3rd programme
IT security and quality

Kollár Balázs, Krasznay Csaba: Elektronikus archiválórendszer fejlesztése PKI alapokon, Networkshop, Miskolc, 2006.

Szabó Áron, Szigeti Szabolcs: Digitális aláírás: együttműködésre képes és biztonságos alkalmazások, Networkshop, Miskolc, 2006.

Krasznay Csaba: Common Criteria szerinti értékelések lehetőségei Magyarországon, IT Biztonsági Nap, Budapest, 2006.

Related: Csaba Krasznay, Áron Szabó: Developing interoperable e-government solutions in Hungary, E-Gov Interop'06 Conference, Bordeaux, 2006.

Szabó Áron, Szigeti Szabolcs: Digitális aláírás: együttműködésre képes és biztonságos alkalmazások, Országos Neumann Kongresszus, Győr, 2006.

Krasznay Csaba, Szigeti Szabolcs: A magyar elektronikus közigazgatási rendszer biztonsági analízise, Networkshop, Miskolc, 2006.

Gábor Bóka, Dr. Katalin Balla, Prof.dr. Rob J. Kusters, Dr.ir. Jos J.M. Trienekens:
Towards Tool Support for Situation-Dependent Software Process Improvement; EuroSPI 2003.

4th programme
Human-machine interface

Balázs Domonkos, Attila Egri: Volume Rendering in an Optical Tracking based Virtual Environment, CESCG 2006

Tamás Umenhoffer, László Szirmay-Kalos, Gábor Szijártó: Spherical Billboards and their Application to Rendering Explosions, Graphics Interface, pp 57-66, 2006.

József Koloszár, László Szirmay-Kalos, Zsolt Tarján, Dávid Jocha: Shape Based Computer Aided Diagnosis and Automated Navigation in Virtual Colonoscopy, Spring Conference on Computer Graphics, pp 113-120, 2006.

Mátyás Premecz: Iterative Parallax Mapping with Slope Information, CESCG 2006.

Balázs Domonkos: Parallel Implementation of Volume Rendering Algorithms, SC06 BOF on Linux Visualization.

ABBREVIATIONS

BME	Budapest University of Technology and Economics
$(IT)^2$	Information Technology Centre for Innovation and Knowledge
AAIT	Department of Automation and Applied Informatics
AJAX	Asynchronous JavaScript and XML
BKSz	Budapest Transport Association
CC	Common Criteria
CISA	Certified Information Systems Auditor
CISSP	Certified Information Systems Security Professional
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
COBIT	Control Objectives for Information and related Technology
DPM	Dynamic Programming Method
EGEE	Enabling Grids for E-scienc
E EXT	Enterprise Express Text
FIB	Federation Internationale du Beton
FME	Feature Manipulation Engine
GIS	Geographic Information System
GQM	Goal-Question-Metric
ECOP	Economic Competitiveness Operational Programme
HMM	Hidden Markov Model
IIT	Department of Control Engineering and Information Technology
IK	Centre of Information Technology
IPS	Intrusion Prevention System
ISO	International Organisation for Standardisation
IST	Information Society Technologies
M(LD)M	MultiLayered and -Dimensional Metamodel
MDA	Model Driven Architecture
MIBÉTS	Hungarian Scheme of Information Security Assessment
MOF	Meta Object Facility
MVCN	Manageable Virtual Closed Network
NAT	National Board of Accreditation
NAVA	National Audiovisual Archive
NIIFI	National Institute of Information Infrastructure Development
PHA	Parallel Hybrid Algorithm
PRINCE	Project Run in Controlled Environment
SCAMPI	Standard CMMI Assessment Method for Process Improvement
SDX	Signed Document eXpert
SFS	Scalable File Share
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
SPC	Statistical process control
SPICE	Software Process Improvement and Capability dEtermination
SSADM	Structured Systems Analysis and Design Methodology
ST	Security Target
SVA	Scalable Visualisation Array
SVC	Signature Verification Competition
SzT	Department of Mechanics, Materials and Structures
TÉT	Scientific and Technological Co-operation
VoIP	Voice over Internet Protokoll
XML	eXtensibel Markup Language

MARKETING COMMUNICATION OF THE KNOWLEDGE CENTRE

As a centre for innovation, BME (IT)² aims at the establishment of novel and effective cooperation between university research laboratories and representatives from the industry. The goal of the Knowledge Centre is the creation of new marketable products and their economic utilisation. In addition, our goal is also to enrich the innovation methods, automatisms, and current practices of this cooperation between the university and the industry, and to present our results to a wide range of third parties by means of communication. Communication primarily supports the successful operation of the institution, both at an internal and external level. By presenting this competence and results to the professional target group of the project, the institution aims to achieve that in the long run the market participants turn to the Knowledge Centre with their demands in innovation and R&D. Throughout the past year, the members of the Knowledge Centre have informed both the professional and the broader public about its goals and specific professional activities and results in the framework of domestic and international conferences, exhibitions and workshops.

Major events organised by the Knowledge Centre:

1. Workshop on Methodologies and Frameworks. The research goals and tasks of BME (IT)² in the fields of methodology and frameworks. (3 March 2006)

2. Professional introduction representing the R&D and innovation cooperation between the IT industry and BME. Those interested could view an on-line broadcast of the event on the Internet. (29 March, 2006)

3. Grid afternoon at BME. The Grid laboratory of BME (IT)² presented Grid technology along with its possible applications towards the resolution of research tasks involving large compuational or storage capacities. Speeches were followed by demonstrations, during which the audience was given the opportunity to solve simple tasks using an environment which already enables the utilisation of resources of over 1100 machines in the academic network. (30 March 2006)

4. Ceremonial opening of the Single-Space R&D and Innovation Workshop of BME (IT)². Boda Miklós, President of NKTH, Széles Gábor, IT chairman of the Pázmány Péter Programme and Dr. Sallai Gyula, Vice Rector of BME, inaugurated the Single-Space R&D&I Workshop with a ribbon cutting of a. (9 May, 2006)

5. European Research and Innovation Exposition - Paris. At the Hungarian research, innovation and technology stand, six Hungarian research institutes of represented through the organisational and financial support of NKTH, , among them BME (IT)² . (8-11 July 2006)

6. New Technologies Workshop. The goal of the event was to present the most recent research results in connection with ENUM, EUROLAB, IPv6 protocol, VoIP solutions using an Asterisk server, and Grid technologies. (18 July 2006)

7. IT Security Day. The largest event dealing with IT security in Hungary, organised by ITBN. The most significant developer, consulting and commercial companies of Hungary participated in the event. BME (IT)² was the professional patron of the event, and also participated as an exhibitor. (26 September 2006)

8. Professional symposium on the modernisation of public services and e-administration. BME (IT)², in cooperation with the National Administration of Development as well as MeH Electronic Governmental Centre, informed the professional audience about the preparation of developments, current tasks to accomplish, and also the utilisation of the professional competence of the Knowledge Centre in the realisation of the operative programmes of the National Development Plan. The Knowledge Centre provides continuous updates on its programmes, as well as the institution itself, at http://it2.bme.hu

The Knowledge Centre has created a unified image, and all of its appearances at various programmes have been accompanied by publications complying with this image (brochures, posters, etc.).

One of the chapters of the international publication entitled

"New Strategies in Innovation Support", which was published by the University of Salamanca with the support of the EU, deals specifically with the possibilities for innovation in university knowledge centres, and gives a detailed presentation of the goals of BME (IT)², its methodologies of operation, as well as its activities. A 10-minute-long promotional video focusing on the activities and operation of BME (IT)² was also prepared for the Paris exposition. The video can be found in English and Hungarian on the home page of the Knowledge Centre.

MAJOR MEDIA EXPOSURE:

MEDIUM	DATE	TITLE	GENRE
MŰHELY	27 March 2006	Az ötödik tudásközpont a BME-n	Article
IT-BUSNESS TODAY	28 March 2006	Holnap Történik	Article
HWSW	30 March 2006	Innovációs és tudásközpont..	Article
IT-BUSINESS TODAY	31 March 2006	Hazai Hírek	Article
IT.news	31 March 2006	IT-tudásközpontot avattak a Műegyetemen	Article
Index	31 March 2006	Tudásközpont nyílt meg a BME-n	Article
Élet és Tudomány	13 April 2006	Átadták az IT Innovációs és Tudásközpontot	Article
NKTH honlap	May 2006	Meghívó az Egyterű K+F+I Műhely ünnepélyes megnyitására	Invitation
MŰHELY	8 May 2006	Új tudásközpont indul a Műegyetemen	Article
Világgazdaság	9 May 2006	Egyterű k+f+i műhely megnyitása	Article
ECHO TV	9 May 2006	Tabuk nélkül	Interview
Echotv.hu	10 May 2006	Innovációs műhely a BMGE-n	Article
Prím Online	10 May 2006	Újabb tudásközpont a Műegyetemen	Article
IT-news	10 May 2006	Start a műegyetemi tudásközpontban	Article
Educatio Press	10 May 2006	Megnyílt Magyarország első IT kutató, fejlesztő, innovációs műhelye	Article
Magyar Hírlap	10 May 2006	Innovációs műhely a BMGE-n	Article
Metro	11 May 2006	Közös ipari-egyetemi fejlesztési műhely	Article
MTI	15 May 2006	Átadták a műegyetem K+F és innovációs műhelyét	Article
Világgazdaság	19 May 2006	K+F+I: egy ernyő alá terelik az innovációt	Article
Horizont	June 2006	Minden sikeres férfi mögött áll valaki?	Article
Klick	June 2006	K+F+I egy térben	Article
Klick.hu	6 July 2006.	K+F a tudásközpontokban	Article
DUNA-TV	10 July 2006	HEURÉKA megtaláltam	Interview
MISKOLCI TV	September 2006	Klick, innovációs magazin	Interview

INDICATORS

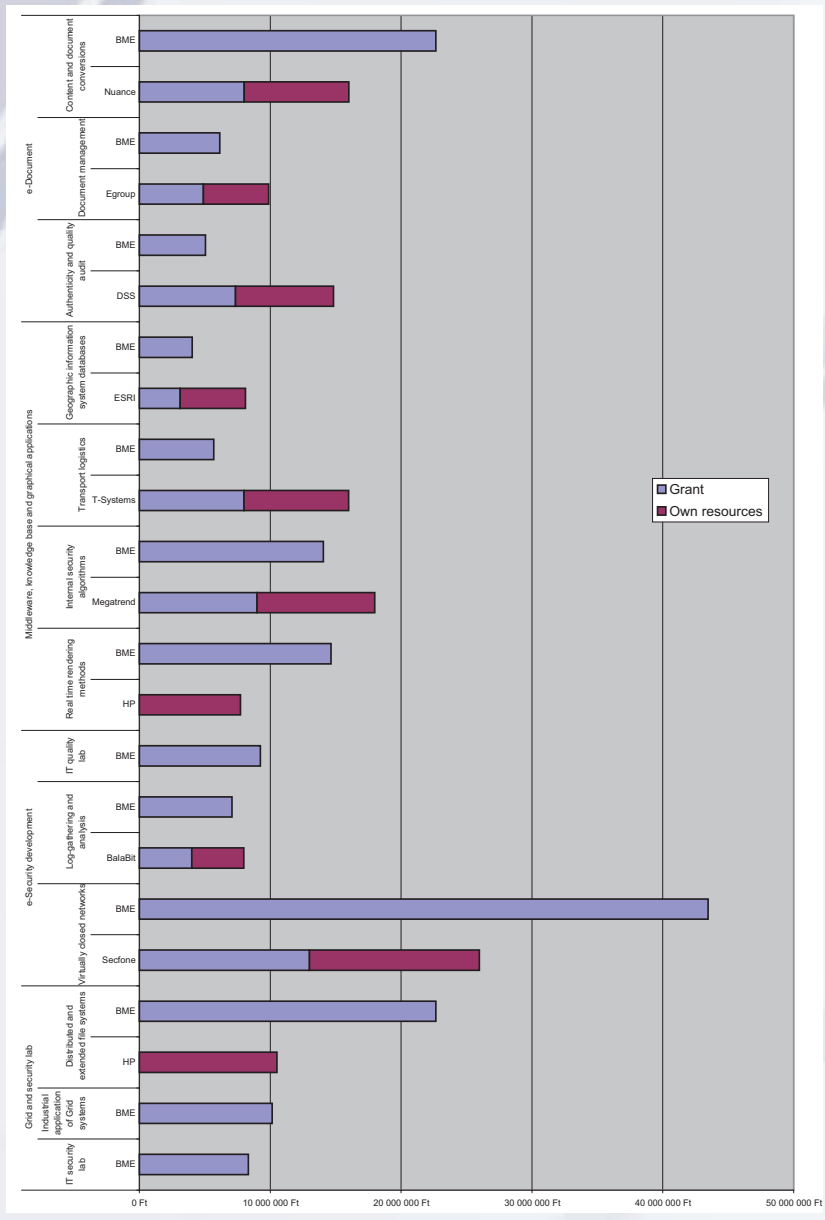
INDICATORS OF ACCOMPLISHMENTS		
1. Exploitable achievements of the project		**Year 2006**
Developed	product	4
	service	6
	technology	5
	application	4
	prototype	6
Number of patents submitted		0[1]
2. Scientific results		**Year 2006**
Publications (conferences included)	domestic	12
	international	17
Have they resulted in new international projects? (Y/N)		Yes
3. Human resources		**Year 2006**
Are project results used in education? (Y/N), and if so in what form?		Yes
Involved in the project	number of university students	18
	number of PhD students	12
	number of young researchers	7
Number of people employed as a result of the project	at enterprises	11
	at research institutes	31
	total number of researchers	22
4. Economic use		**Year 2006**
Institutions taking part in the activities of the Knowledge Centre	number of research institutes	3
	number of enterprises	9
Number of new enterprises founded as a result of the project		1[2]
Have the project results been put to economic use? (Y/N)		Yes
Number of enterprises utilising research results from the project		6
Income arriving from the project	surplus receipts (eFt)	42890
	Income from export (from the above	16990
5. Other, special monitoring indicators derived from this project		**Year 2006**
Number of courses enhanced with research results from the project		7
Number of students involved		610
Number of diploma theses prepared from topics in the project		4
Number of training courses initiated as a result of the project		2

1 - BME (IT)² did not wish to fulfil the indicator in 2006.

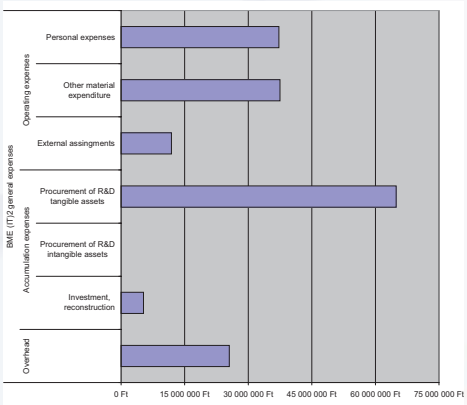
2 - Establishment of the new enterprise is underway.

FINANCING

The management policies of BME (IT)² Knowledge Centre were established in compliance with the public finance law, higher education law, and the management regulations of NKTH and BME. Specific financial, documenting and accounting processes are carried out with the support of the unified management system (EGR) of BME, under complete transparency and documentation. The Knowledge Centre accepts its income under its own central project code. The financing of all subprojects (in this case 14 professional and 1 management subproject) will be done from this central project code. Several units of the institution can participate in the realisation of each of the 14 subprojects. Therefore, within the management regulations of the project, the leader of each institutional unit has the disposal of the source under the subcode corresponding to the subproject, according to the agreement with the Knowledge Centre. Based on the progression of the project and the accomplishment of tasks, the Knowledge Centre allows the use of resources under the subproject code in quarterly intervals. The projects carry out wages management under each subproject code (only private expenditures are allowed). Procurements, investments, extermal commisions, management, innovation, PR and communications, along with personal and material expenses linked with other relevant activities (conferences, organised programmes, membership fees, overhead, etc.) are provided from the central project code. With the help of the established method, the Knowledge Centre management processes can run together and in a clear, auditable way even at the level of projects. The member institutions of the industrial consortium cooperating in the Knowledge Centre also conduct their management processes in compliance with legal and application constraints. Their financial and accounting processes linked with the BME (IT)² - project will be viewed by professional auditors.



For the sake of clarity, the financial data of the Knowledge Centre in its first year of operation, can be summarised in the following diagram:



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