cospaces Newsletter

Editor's Corner

Here is the second issue of the **CoSpaces** Newsletter. We hope you have enjoyed reading the first CoSpaces newsletter issue. As well as browsing the content of our public project website (URL: www.cospaces.org)

Inside this second issue, there is the traditional coordinator's message by Scott Hansen, of The Open Group, discussing the necessary transformation of manufacturing organisations beyond the product life-cycle management toward plant life-cycle management. Then, there is a report of the first annual **CoSpaces** conference which has been held in Leiria, Portugal from 26 to 28 September 2007. You will find also three technical articles, the first one about the understanding of collaborative workspaces within an organisational perspective. The second one describes a structured approach to improve collaboration through capability assessment and CoScope instrument. The third one presents the **CoSpaces** Collaborative Software Framework. Then, you will also find the traditional latest news from CoSpaces partners and an enumeration of recent events where CoSpaces project has been participating as well as a list of up-coming events, which might be of interest to you. To be booked in your diary, CoSpaces, together with other CWE projects, is involved in the organisation of the CWE 3 day event, including papers presentations, workshops and demonstrations, which will be held during ICE'2008 in Lisbon from 23 to 25 June 2008. More information at the following URL: www.ice-conference.org

This CWE event constitutes a unique opportunity to learn more about the progress made within the different CWE projects.

Marc Pallot, CoSpaces Newsletter Editor

November 2007 Newsletter n°2 Inside this issue

Coordinator's Message

Manufacturing organisations are undergoing a transformation to address new and dynamic markets and to fend off competition as effects of globalisation are being felt in local markets. Manufacturing processes are getting leaner, more agile, and manufacturers are investing in production equipment with increased intelligence. Designing products or components has become increasingly multi-disciplinary where design decisions must reflect not only user needs, brand identity, and attributes such as quality and reliability, but also how a product will be produced and increasingly how it will be tailored during production for specific markets or individual customers.

Product lifecycle management in today's companies is a collaborative process that requires teams of people to work together to achieve a diverse set of goals. The effectiveness of that collaboration has a substantial impact on not only product innovation and marketability, but also on the costs of manufacturing and the operational efficiency of the company. Many leading organisations are beginning to invest in more advanced collaboration methods and technologies as a way of being more competitive – with products and financially.

Looking forward we see the focus of managing manufacturing expanding beyond product lifecycle management to encompass a new and more agile approach to plant lifecycle management. It's clear that the time between substantial re-engineering and reconfiguring of production facilities will continue to shorten. This will impact the information we must store concerning products and associated design and production decisions as production facilities may be reconfigured more than once during the life of a product.

The CoSpaces collaboration software framework will support the interdisciplinary teams involved in both product and plant lifecycle management and will enable every member of the team to participate in the planning for products and production facilities. Product and production planners will be able to access the information they need when they need it and be able to retrieve information when production lines changes. The CoSpaces research teams have today developed the first prototypes of these new collaboration systems and over the next months will be working with industrial partners to fine tune these new technologies to meet the challenges product and production managers are facing today.

We encourage all those involved in engineering design and management of manufacturing facilities to regularly visit our website at www.cospaces.org where we will make our results available as the CoSpaces project progresses.

Scott Hansen
The Open Group
CoSpaces Project Coordinator

First Annual CoSpaces Conference

26-28th September 2007, Leiria, Portugal

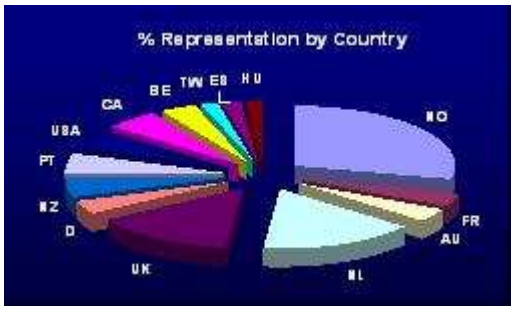
by Simon Hardiman, *CARSA – Business Innovation Office (BIO) Manager*

The CoSpaces 1st Annual Conference was held in Leiria, Portugal, 26-28 September 2007, in conjunction with the 3rd International Conference on Advanced Research in Virtual and Rapid Prototyping (VR@P 2007). The conference was held on the campus of the University of Leiria, and attracted a broad representation of academia and industry.

The driving force behind our first annual conference was to raise public awareness about collaborative working and the benefits it affords. Another motivation was to promote the CoSpaces IP Project, whose aim is to develop organisational models and distributed technologies to support collaborative working within innovative collaborative workspaces. CoSpaces is targeting both individuals and project teams within distributed virtual manufacturing enterprises to establish effective partnerships, enable dynamic collaboration and creativity, improve productivity, reduce the length of design cycles and take a holistic approach to implementing product phases.

Conference Attendance

This 1st instance of the CoSpaces Annual Conference attracted a broad range audience in terms of nations, sectors and disciplines. The European continent accounted for the majority of participants, with significant representations from Norway, the Netherlands and the UK, followed closely by Portugal, Belgium, Germany, France, Spain and Hungary. The Conference also attracted attendees from the USA, Canada, New Zealand and Australia.

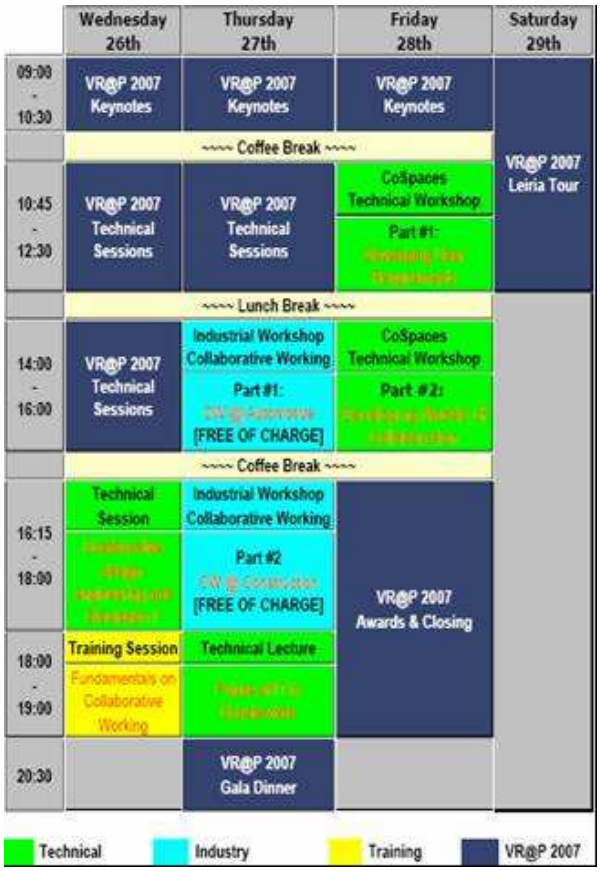


In terms of industrial sectors coverage, the construction industry was most heavily represented, followed by consulting companies, education bodies and universities.

There was also a quite large attendance represented by governmental and public organisations, standardisation bodies, systems and tool vendors, research institutes and centres. Key European industries such as aerospace,

automotive, defence and ICT were also represented though in smaller numbers.

Conference Programme & Proceedings



The **Collaborative Design, Engineering & Simulation Technical Session** was chaired by Prof. Terrence Fernando of the University of Salford and the CoSpaces Scientific Coordinator, and comprised 3 talks:

- *Collaborative workspace for aircraft maintenance* by Gilles Gautier of FWRC, University of Salford (UK), presented the CoSpaces technological approaches that will support future scenarios in which augmented reality is used to facilitate the diagnosis of in-flight faults involving remote experts, based on the current organisational processes and stakeholders active in aircraft maintenance;
- *Challenges & needs for creating collaborative workspaces for the AEC-FM industry* by Pedro Maló, FCT-UNL at UNINOVA (PT), explored the motivations, requirements and challenges for achieving significant and sustainable innovation in the AEC-FM domain, involving an analysis of specific AEC-FM collaboration issues at individual, team and enterprise levels; and presented the CoSpaces approaches that will support the realisation of next generation Virtual Building Environments, where both workers and businesses are capacitated with performance enhancing technologies;
- *Challenges & needs for creating collaborative workspaces for the automotive industry* by György Falk, VARINEX (HU), conveyed new support perspectives in relation to design and distribution in the automotive design phase; explained and discussed current support scenarios in the automotive industry; and presented the CoSpaces approaches and technologies that will support future scenarios for enhanced distributed design and engineering in the automotive industry.

The **Training Session** on the **Fundamentals of Collaborative Working** was delivered jointly by Joao Sarraipa & Pedro Maló of Uninova (PT) and Vasileios Kyratzopoulos, National Technical University of Athens (GR), and focused on imparting the basic aspects of collaboration and collaborative working, tailored to both industry and research communities interested in IT-supported collaborative working.

The **CW @ Automotive Industrial Workshop** was a 2 hour mixed industry/research event focused on team-centred approaches for supporting collaboration in the automotive domain, including 3 talks given by European automotive companies, followed by open and interactive discussions:

- *The importance of innovation for process engineering at Huf Portuguesa* by Jorge Silva, IT Director, Huf Portuguesa (PT), focused on the different application perspectives of a tier 1 automotive company;
- *Future collaborative workspaces* by György Falk, CEO, VARINEX (HU): conveyed the views of VARINEX and the Hungarian Automotive Cluster on collaboration, collaborative working (CW) and team-centred collaboration for design & engineering; and addressed how CW can facilitate and bring value to business interactions, collaborative/concurrent design & rapid prototyping, and engineering in the Automotive domain;
- *Collaborative environments in software development for production lines* by Rui Ferreira, Director, IASYS (PT), addressed technological integration and collaborative environments in production lines; and the challenges and limitations of an SME in the pursuit of innovation.

The **CW @ Construction Industrial Workshop** was a 3 hour mixed industry/research event focused on collaboration, collaborative technologies and interoperability in the engineering & construction sector, including three talks given by European construction companies, followed by open and interactive discussions:

- *Building Bridges* by Romeu Sanchez, Mota-Engil Engenharia (PT), addressed Mota-Engil's own pursuit of innovation through human-centric collaboration and IT;
- *Collaboration in large-scale construction projects: dreams and reality* by António Grilo, Partner, Neobiz Consulting (PT), presented an overview of the initial ambitions and current reality of collaborative practices in use in large-scale projects in Portugal;
- *Collaborative design and engineering* by Carlos Ferreira, CEO, CXSComputing (PT), conveyed the vision of a Portuguese software house that develops innovative IT solutions for design and engineering – a company that intends for collaboration to be a cornerstone of their business offerings and a key mechanism for achieving market penetration.

The **Technical Lecture** entitled **"The Future of IT in Construction"** centred on providing a view on trends and the way forward on use and research on IT in the Engineering and Construction domain. The targeted audience was constituted of both research community and industrial practitioners with interest on IT in the Engineering and Construction domain.

The **Technical Workshop** on **Developing User Requirements**, led by Ash Patel and Michael Pettitt, University of Nottingham (UK), focused on the processes for eliciting and structuring user requirements, and approaches for developing scenarios and use cases. Focal points were the difficulty of developing requirements for multiple user partners; managing conflicting needs; the difficulty of eliciting requirements for complex socio-technical systems; the wording and representation of user requirements; an introduction to the Living Labs concept; the advances being made in the CoSpaces Project; and discussions on the Living Labs concept versus requirements generation.

The **Technical Workshop** on **Developing Collaboration Models** was led by the University of Nottingham (UK), the University of Salford (UK) and UNINOVA (PT). The workshop reviewed some of the existing collaboration reference models, with 3 talks being given:

- *Modelling Collaboration* by Ash Patel and Michael Pettitt, University of Nottingham, delivered an introduction to the CoSpaces Project; discussed the purpose and importance of user requirements; explained user requirements elicitation work performed in

CoSpaces; presented user requirements gathered in the Athena Project; and introduced the Living Labs concept;

- *Dynamic Requirements Definition & Piloting in the Athena IP Project* by Ruben Costa of UNINOVA, introduced the Athena Project and presented the dynamic requirements definition and piloting approach and process followed;

- *Towards Model Driven Interfaces & Workspaces* by Gilles Gautier, University of Salford, proposed a classification of collaborator context elements, using a human-centric approach, to distinguish between the physical, organisational and digital contexts of the user; proposed a framework for modelling the user context in a collaborative environment; presented roles as links between the perspectives of the organisation and its employees; and showed how they are combined in a meta-model to better represent collaborator constraints, incorporating social and psychological aspects.

Open discussions were held after each talk to debate the difficulties of modelling collaboration, as well as the practical importance of collaboration models. Talks and discussions were followed by an interactive session with all participants to assign weightings of importance to factors which make up a collaboration reference model.

cospaces Newsletter

Understanding the Collaborative Workspaces

PART 1 – The organisation perspective

by G. Gautier, C. Piddington, T. Fernando and S. Mihindu
Future Workspaces Research Centre, University of Salford, UK

1. Introduction

This document is the first of two articles that will appear in the CoSpaces newsletters and aim at positioning collaborative workspaces relative to the processes, infrastructure and people within an organisation. A collaborative workspace is seen as the technological, social and organisational environment of a meeting between several collaborators.

Despite the concept of working collaboratively being very popular, its implications on the organisational structures and on the human requirements are not completely understood. As a consequence, it is often believed that new technologies will enhance collaboration by supporting the organisational processes (Prawel, 2007). But psycho-sociologists have demonstrated since the 19th century the importance of the social relationships between the workers (Reid, 1995). Indeed, it appears clearly in the literature that good social relationships between the collaborators are necessary to build trust and to generate a shared understanding of the project aims and processes, which are among the main features of collaboration (Schrage, 1990; Motiel-Overall, 2005).

Efficient technological workspaces for collaboration should therefore combine the support of the organisation processes and of the workers. So far, these two objectives are usually considered independently because of the difficulty to integrate both (Klüver et al., 2003). Consequently, the social and psychological features of the workers are not represented in enterprise models where the humans are only seen through their roles in supporting the processes. A quite similar approach will be followed in this article and the next one.. In particular this one avoids any human factors issues in order to focus on the enterprise view. In the following article the worker's perspective in his organisation will be discussed.

This document starts with a decomposition of an organisational structure in order to highlight the need to share viewpoints between collaborators. Then, the different types of collaborative meetings necessary through the project life are explained. Finally, the workspaces are positioned relative to the major applications (e.g. Catia, SAP, FEA), the standards (e.g. IFC), and the special case of virtual organisations.

2. The organisational layers

For a project, organisations adopt traditional pyramidal structures with managerial roles at the top and functional roles at the bottom. The top level roles mainly concentrate on the project objectives and processes, while the bottom ones are usually focussed on one skill or competence. Consequently, project organisational structures can be decomposed in three layers that are introduced here from top to bottom:

The *Project Manager* (PM) has a management and control function in the overall project. He is responsible for the achievements of the project, and he must make sure that the organisation's project objectives will be met. Therefore, he defines the processes that will be followed during

the project in order to meet a customer or product demand (time and cost) and he also defines the conditions that will allow to start or finalise each phase of the project. Finally, he is responsible for finding and managing the functional resources necessary to support the project processes (Figure 1).

Figure 1 – Simplistic view of the Project Manager' successive tasks

The *Management Team* (MT), led by the project manager, is in charge of the integration of several competencies/functions during a particular phase of the project. A *Competency Representative* is present in the team for each competence involved in this phase. The first task of the management team is to match the processes defined by the project manager with the corporate competencies. Consequently, the MT must build a common understanding between its members in order to allow them to take better decisions when a conflict has to be solved. If some competencies are missing in the organisation, then a virtual organisation is created by acquiring competencies through outsourcing or sub-contracting (Figure 2).

Figure 2 – Simplistic view of the Management Team' successive tasks

The *Skills Silos* are vertical structures responsible for the development of the competence. Thus, they contain the organisation knowledge for each competency involved in the project. The competency representative, who represents the silo in the management team, is at the top of the silo, possibly supported by other levels of managers. At the bottom of the silo, the employees with the functional competencies/skills act according to the decisions made by their managers.

The above components permit a simplistic representation of an organisation structure for one phase of a project. This simplistic view is nonetheless sufficient to highlight the need for collaboration in the management team in order for them to share a common understanding of the project and to assure that every view point concerned will be considered equally throughout the project. Indeed, late problem discovery has proved to be extremely costly in many industrial cases and they are regularly due to a limited understanding of the consequences of decisions made during previous management meetings. Similarly, collaboration at the silo level is essential to permit the workers to share cross project knowledge and experience in order to allow faster problem resolution or innovation (Lu and Sexton, 2006).

The organisation structure presented here corresponds to a snapshot in time. Throughout the project, management teams will change, as well as the skill silos involved.

3. The life cycles

The Product Life Cycle is the time line representation of a set of sequential phases from the birth to the death of a product or service. This addresses conceptualisation through design, to production, to deployment, and finally replacement (Figure 3). The Product Life Cycles are extended by the maintenance and recycling to face the increasing demand for 'through life services' (Gautier et al., 2007; Ward and Graves, 2005) as well as environmental issues. In this line, some advanced work in standards and PLCS (Product Life Cycle Support) has already been done in the USA Department of Defense and in the UK as traditional manufacturers change their business from product manufacture to through life service (Leasing). And the building sector is following a similar path with PPP (Private, Public Partnerships). Therefore, the outcome of a life cycle is often not only a product but also a service. This demands a far reaching collaborative way of working across organisations in order to consider the requirements at maintenance and recycling levels as early as at the design phase.

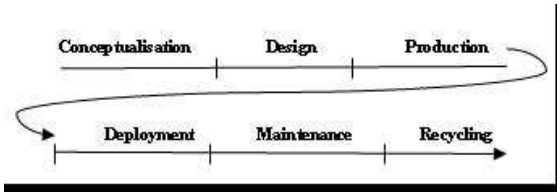


Figure 3 - Example of product life cycle

In order to save time, these phases are often parallelised which means that a phase can start before the previous one has been completed. This specific adaptation of the product life cycle is used by the project management processes. The

overlapping period between the start of a phase and the termination of the previous one is only possible after a *Maturity Gate* (Figure 4) meeting where the representatives of several competencies meet to assess the risk of change of starting a new phase of the project. Each overlapping phase corresponds to a high risk period where any changes in the previous phase can become extremely time consuming and costly to accommodate in later phases. The chairman of these meetings is the project managers, so that he can control the project from the clients' perspective.

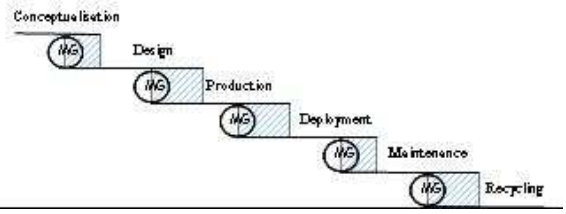


Figure 4 - Example of project management process

Decisional Gates occur within planned meetings and chaired by the project manager, and whose outcomes are critical for the project because they aim at solving or avoiding problems. As a consequence, they usually happen within a phase of the project, and even might involve representatives of later phases, such as maintenance managers. Decisional gate intent is to limit delays in the project progress by the identification of optimised ways to progress. Nevertheless, the participants of these meetings are the competency representatives and they usually need to consult with their skills silos in order to resolve specific difficulties or assemble additional data. Since these consultations cannot usually be made during the meetings, the decisional gates often consist of a series of meetings that result in action lists for the competency representatives and their skills silos. If the meeting workspace could be connected to the skills silos workspaces, then it would be possible to make decisions faster by discussing solutions with the relevant silos during the course of the meeting.

Two types of meetings can be differentiated - the planned meetings that are held throughout the project management process to assess progress and to mediate on problem resolution, and the reactionary ones that are needed to address urgent issues - they only influence the technology used and not the roles of the stakeholders, as the solution requires near real time performance. For reactionary meetings, mobile technologies might be useful to improve the reactivity of the organisation where meeting participants are not available or needed locally, even if these technologies could limit the level of interaction between the participants to the meeting.

Since the meetings aim at sharing information in order to improve the decisional quality, it is also essential to understand how the information flows between the actors and technologies constituting the project organisational structure.

4. Information flows and virtual organisations

Contractual terms surround most collaboration and describe the constraints to protect the organisation and its customers and to build trust. Indeed, from an organisation viewpoint, trust mainly refers to the respect of the contractual agreement because this data is quantifiable and therefore tangible (TrustCom, 2005)[1]. As part of the contract the organisation must define what can be shared, which is usually easier than to identify what needs to be protected (Intellectual Proprietary Rights). However, it limits collaboration because companies tend to share the minimum information, and it becomes difficult to build a common understanding of the project. Consequently, innovation is reduced and the decisions are easily made with an incomplete understanding of their consequences. This is particularly relevant in cross-organisations collaborations.

Virtual Organisations are necessary when an organisation doesn't have the full resources necessary to build a successful project. Two configurations[1] are presented in Figure 5 to illustrate some extremes of inter-silos relationships. In the first one, the Virtual Organisation is formed by the combination of skill silos that still work for their main organisations (Figure 5-a). As explained before, the information exchanges between the stakeholders are controlled and limited to the minimum. Innovation is also limited by the lack of understanding between silos,

[1] In order to keep the focus on the organisation viewpoint, the social aspect of trust will be discussed in the second article, as well as the influence of virtual organisations on the workers.

and it is usually derived from the collaboration objectives.

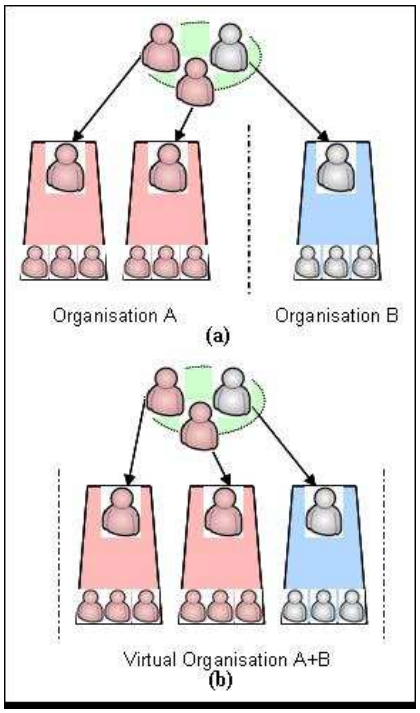


Figure 5 - Examples of Virtual Organisation

This is typical of supply chains and short term collaborations (partnering). In the second configuration, the virtual organisation tends to become autonomous from its parent organisations (Figure 5-b). It creates its own working culture and the communications between its skill silos are less constrained. As a consequence, innovation is facilitated by the shared understanding between the silos. Since the links with their original organisations are weaker and less controlled, the Virtual Organisation ultimately becomes independent and works as a new organisation (merger or new business).

Partnering intends to limit the possible drawbacks of collaborations due to the compartmentalisation of the knowledge and the development of a blame culture building a dependency of faith between organisations. This approach promotes similar values as inter-personal collaborations, such as equality, transparency and mutual benefits (Tennyson, 2004), and it also aims at generating win-win co-operations based on each organisation' strengths.

When considering the information flows, Virtual Organisations are where collaboration has the most impact because this is where the information shared is the most carefully selected. The competency representatives, due to their managerial roles, usually have the responsibility for defining what can be shared with other silos. Consequently, any sharing of new information must be validated by the relevant competency representative. However, as discussed before, the need for inter-silo collaboration often involves the participation of employees at bottom levels. Consequently, data is needed to be shared in the demilitarised zone of the parent organisation. They must keep control on it through their competency representatives, even in emergency situations.

The IT collaborative workspaces must allow communication across the organisation, but the IT tools developed on top of them often support competences. As a consequence, they store their data in a way adapted to these competences, taking into consideration the processes during which the data has to be accessed, or used, and manipulated by the corresponding disciplines. APIs are then used to extract the required view of the information and to translate the data stored into standardised information so that it can be shared with other silos (Figure 6). However, translations are often accompanied by loss of information and inter-silos interoperability is not yet fully achieved. Data incompatibility is still a major problem, even between silos sharing similar applications between silos because the versioning, the platform used or the configuration can be responsible for incompatibilities at data level (Prawel, 2007).

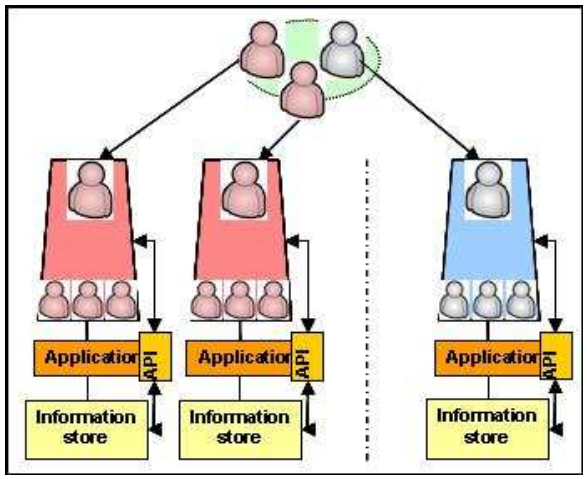


Figure 6 - Distribution of the product data between the skills silos

5. A possible it infrastructure

Since IT cannot assure complete interoperability between silos, it is essential that their collaboration is supported. Indeed, as seen above, due to IPRs the organisations are likely to share the minimum data required, which inevitably leads to a loss of information. By linking the silos through the people it becomes possible for the employees to share some knowledge about the data shared, their meaning and their context. On the opposite, an over-emphasis on IT processes restricts the silos' knowledge creation and innovation.

This approach supports collaboration by repositioning the workers at the centre of the cooperation, and by enhancing inter-silos communications, which would be necessary to validate the data translations and the integrity of the different parts of the project. Besides, the workers would need increased communications in order to better understand the data. As a consequence, the silos would share a common understanding of the project they are collaborating on. They would also learn about each other, which can make decisional processes faster by providing some knowledge about the sources of information.

Theoretically, there is no additional time loss with the above approach because it leads to a better understanding between the silos, which permits better decision making as well as leading to earlier problem discovery.

The CoSpaces project proposes the use of three data spaces per organisation in order to allow the setting up of the preceding approach (Figure 7): a private data space is only accessible within the firewalls of the organisation; a DMZ (demilitarised zone) space contains a subset of the private space's data for sharing outside of the main corporate firewalls in order to protect the organisation IT infrastructure resources from intrusion; and a collaborative space that contains the required data for the collaboration. The private and DMZ spaces are only accessible by the skills silos responsible for the data they contain, while the collaborative space stores information that may be shared between partners during the collaboration.

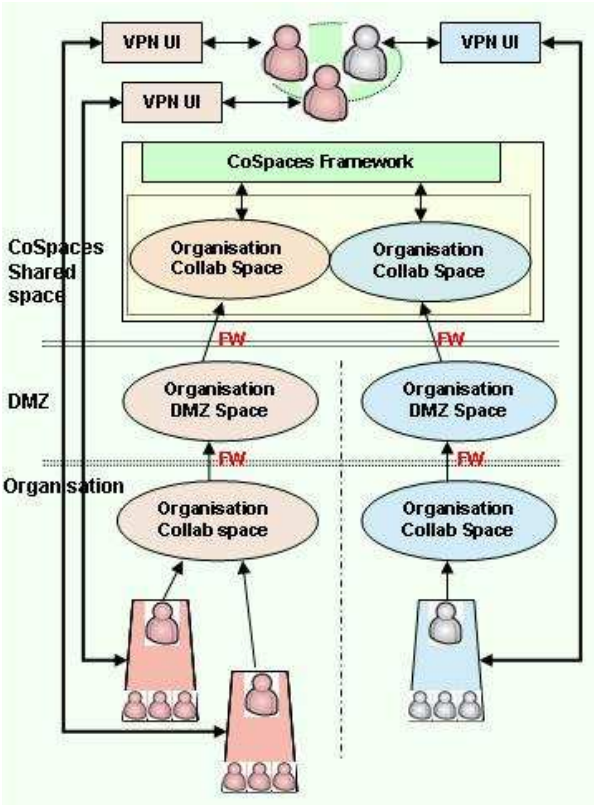


Figure 7 – CoSpaces Data Management architecture

This method allows the collaborative organisations to keep control on their data so that they can protect their IPRs. Simultaneously, it provides a way to make the information accessible anytime by the relevant silos, so that they can access any additional information during the meetings. Once the data is stored in the collaborative space, the CoSpaces framework controls data accesses and provides tools to work on it. Results of the meetings, such as minutes, can then be sent back to the DMZ and private spaces.

5. Conclusion

The above decomposition of the organisations' structures during projects permits the explanation of a few issues identified in the CoSpaces project through interviews with the end-user partners. This includes the consideration of every competency early in the project, the build of a shared understanding between the managers, knowledge sharing and interoperability issues. It shows that the technology alone is not likely to permit building collaborative organisations, but that it can facilitate it by supporting knowledge sharing and enhancing communications between skills silos. Thus, the data management architecture proposed by CoSpaces intends to

reposition the workers at the centre of the collaboration instead of providing them with the roles of processes enablers. This leads us to the importance of human factors, which will be presented in the next CoSpaces newsletter.

6. References

Gautier, G., Fernando, T., Piddington, C., Hinrichs, E., Buchholz, H., Cros, P.H., Milhac, S., and Vincent, D. (2007). *Collaborative Workspace For Aircraft Maintenance*, Proceedings of the 3rd International Conference on Advanced Research in Virtual and Rapid Prototyping (VRAP'07), Leiria, Portugal.

Klüver, J., Stoica, C., and Schimdt, J. (2003) *Formal Models, Social Theory and Computer Simulations: Some Methodical Reflections*. Journal of Artificial Societies and Social Simulation 6(2).

Lu, S. and Sexton, M. (2006). *Innovation in Small Construction Knowledge-Intensive Professional Service Firms: A Case Study of an Architectural Practice*. Construction Management and Economics, 24, pp. 1269-1282.

Montiel-Overall, P. (2005). *Toward a theory of collaboration for teachers and librarians*. School library media research, 8. Retrieved April 14, 2007, from http://www.ala.org/ala/aasl/aaslpubsandjournals/slmrb/slmrcontents/volume82005/theory.htm

Prawel, D. (2007). *Interoperability isn't (yet), and what's being done about it*. Proceedings of the 3rd International Conference on Advanced Research in Virtual and Rapid Prototyping (VRAP'07), Leiria, Portugal.

Reid, D. (1995) *Fayol: from experience to theory*, Journal of Management History, Vol.1, Iss.3, p.21.

Schrage, M. (1990). *Shared minds: The new technologies of collaboration*. New York: Random House.

Tennyson, R. (2004). *The Partnering toolbook*. International Business Leaders Forum and Global Alliance for Improved Nutrition.

TrustCom (2005). *D14 Report on Soci-Economic Issues*. TrustCom European project, FP6, IST-2002-2.3.1.9. http://212.0.127.139/trustcom/wp-content/uploads/2007/08/ d14+report.pdf

Ward, Y. and Graves, A. (2005) *Through-life management: the provision of integrated customer solutions by Aerospace Manufacturers*. Report available at: http://www.bath.ac.uk/management/research/pdf/2005-14.pdf

cospaces Newsletter

A Structured Approach to Improving Collaboration within Engineering Organisations

Pierre-Henri Cros, *CERFACS* & Scott Hansen, *The Open Group*

Introduction

Collaboration forms an integral part of almost every engineering organisation today. The amount of resources consumed both in money and effort for improving collaboration and the underlying technologies that support collaboration has steadily increased, and most projections indicate this trend will continue. Collaboration within an organisation depends on processes, technologies, and human behaviour. The way in which an organisation addresses each of these can fundamentally change the value obtained from collaboration within an organisation, or with other organisations. It also impacts the level of innovation an organisation is able to achieve. Collaborative processes and technologies can be used as a competitive advantage in business or for government organisation to deliver best-in-class service to citizens, or they can create unrecoverable costs and significant business or service disruptions. Helping engineering organisations introduce new processes and supporting technologies to improve collaboration is the focus of the Collaboration Change Management research work within the CoSpaces project.

On the one hand, collaboration can be seen as an organisational process just like production or selling. On the other hand, collaboration is based on social activities where new knowledge is supposed to be created depending on people behaviour, level of trust and conviviality among the various stakeholders. While any organisational process can be measured and improved, it is much more complex to measure a social environment or climate inside a group of people. Collaboration is practised by many thousands of organisations across Europe, yet very little is understood about how different organisations undertake the various tasks involved in collaboration.

The CoSpaces approach to understanding and improving collaboration is based on three important pillars:

1. A collaboration model that provides a structured approach or roadmap for identifying the key processes and technologies that enable successful collaboration. These become the focus for change when organisations seek to improve collaboration.
2. An ISO standard (ISO-15504) for modelling and describing processes. The principles within ISO-15504 are well accepted for software development, and have been applied in other process driven disciplines including procurement and innovation. The ISO-15504 standard provides a consistent and reliable framework that allows any activity to be assessed and measured.
3. A benchmark database of organisations from within the CoSpaces project and external, who have been assessed and whose data enables a benchmark for comparison and analysis of collaboration practices.

The CoSpaces strategy for Collaboration Change Management is to analyse in detail the current situation within an organisation or with other organisations, and to provide sound guidance to

organisations seeking to achieve higher performance through increased collaboration and introduction of supporting technologies such as the CoSpaces Software Framework.

The analytical methods and tools being developed in the project will enable CoSpaces partners to recommend changes tailored to an organisation's specific situation and goals, and to achieve the most effective balance between introducing technology, customising collaboration tools, worker adaptation and process re-engineering.

Collaboration assessment

The CoSpaces project is working to develop ***CoScope*** – the CoSpaces Collaboration Assessment Methodology, used to assess the collaboration processes and technology infrastructure of organisations. It will be an important tool to encourage improved collaboration and identify a realistic plan for introducing changes in collaboration and technologies that will benefit engineering organisations. The methodology utilises proven assessment techniques from Business Process Re-engineering and Process Improvement and provides an organisation with a profile of performance levels and attributes that indicate the maturity or sophistication of their current collaboration processes and enabling technologies.

The assessment profile is based on an underlying generic collaboration model consistent with emerging international standards that is broad enough to reflect the differing collaboration styles found in both commercial and public entities. By using a profile for assessment and reporting, CoSpaces accommodates the fact that:

- not all processes need be present in every collaborative organisation or between organisations, and
- organisations may have very different collaboration profiles depending on their industry, how they use ICT, the type of products or services they provide, and their specific business goals and objectives.

The important thing for an assessment method is to have a consistent benchmark that allows organisations to determine where they are today and to identify the new processes, behaviour and technologies that are important for meeting their business objectives. Once this is done, an organisation can establish goals and initiatives for collaboration improvement that specifically supports their business and use the *CoScope* assessment to periodically monitor their progress.

CoScope in action

The *CoScope* methodology will show where organisations perform well and identify where improvements could result in substantial benefits in terms of savings in resources expended, project team performance, and product innovation. The CoSpaces partners will use established collaboration best practice research to create and build a measurement approach to help organisations:

- measure current collaboration capability
- compare with peers and partners
- identify priorities for collaboration improvement
- establish prerequisite processes for advanced technologies
- drive and measure progress towards objectives

In other words, it will be possible to measure the level to which collaboration is encouraged and nurtured within an organisation and take appropriate actions for improvement. The *CoScope* approach is to employ the ISO-15504 reference for process assessment to analyse collaboration practices in key areas that affect team performance including:

- Cooperation
- Coordination
- Decision-making
- Initiation
- Evaluation
- Information production
- Knowledge management
- Resourcing
- Teambuilding
- Conflict management
- Technology infrastructure

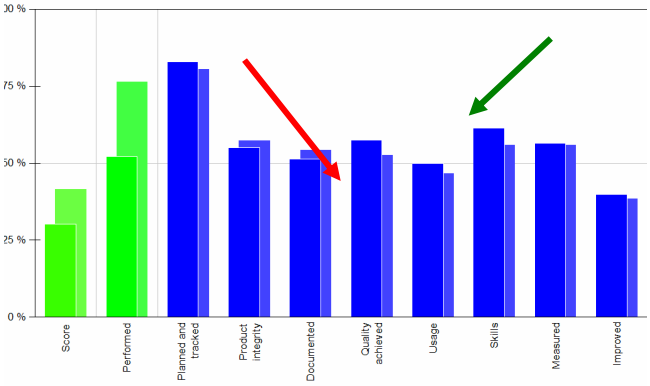
- Training

In each area organisation performance is compared and scored against statements describing different capability levels, from 'world-class' to non-existent. The ***CoScope Collaboration Assessment Tool*** is used to support assessment and capture the data from discussions amongst team members. It then computes average scores and variations, enabling teams to quickly home in on collaboration priorities and identify gaps against target collaboration profiles.

The *CoScope* methodology will enable project partners to not just analyse which collaboration processes and technologies are present within an organisation, but also how collaboration tasks are being performed by examining factors such as:

- level of formal documentation
- skills available to do collaborative tasks
- degree of planning and tracking
- level of quality achieved
- consistency throughout an organisation
- attention placed on improvement

This level of assessment will enable CoSpaces partners to provide clear and precise guidance that's tailored to the specific situation and collaboration goals of an organisation.



In the above example one can see from the collaboration profile extract that the organisation is well on its way to world-class capability in being able to plan and track team activities, but there are wide variations in how consistently planning and tracking tasks are actually performed leading to wide variations in project team collaboration and ultimately project team performance in delivering new and innovative products.

If an organisation knows where they stand between world-class collaboration capability and none at all, that knowledge can be used to focus on the biggest gaps, and design and carry through changes both in people and technology that will improve their business or services.

From measurement to management

Measuring how well an organisation encourages and supports collaboration is actually just the first step. In today's competitive environment the CoSpaces project also wants to be able to compare collaboration performance against others, or within different divisions of the same organisation and most importantly to identify a target profile and associated technologies that will provide substantial benefits. The goals of an organisation must ultimately drive the changes that are introduced and managed in support of increased collaboration. The approach to change management that will be deployed by CoSpaces avoids the 'one size fits all' guidance. The use of current and target profiles allow the project partners to recommend which CoSpaces technologies and new collaborative processes should be introduced to enable an organisation to achieve its specific objectives.

Although much of what one thinks of as collaboration is based on technology – it's people and the organisational environment that delivers the largest part of the benefits. Organisations prosper in the long run when they create an environment where people are encouraged to continually collaborate and introduce innovation. Business owners must continually work to create and sustain a collaborative organisation. The challenge being addressed by CoSpaces is to understand what does such a collaborative organisation look like – and what sort of targets should be recommended to engineering organisations seeking to improve collaboration and innovation.

An important benefit of the ***CoScope*** methodology will be to improve the

communication and understanding of the collaborative processes amongst team members within an organisation or between organisations. The methodology includes assessment interviews with each of the stakeholders (e.g. product designers, production engineers, ICT staff, product development, and planning and strategy personnel) and identifies the contrasting perceptions and differing understandings of the existing collaborative processes. Presenting the collaboration capability profile from these various viewpoints provides an important catalyst for each of these functional areas to reach agreement and to define target collaboration improvements for the organisation, and to adopt appropriate supporting technologies.

Involving any size of group, from a product team to a design and production department, benchmarking with *CoScope* will be an energising process for driving collaboration improvements by looking at how well different practices are carried out and exploring why different people inevitably have different views. This level of understanding is essential to achieve if the introduction of new collaborative technologies are to provide desired benefits.

CoSpaces Collaborative Software Framework

by Paul Benölken, *Center for Applied Informatics, University of Cologne*

1. Introduction

One of the key objectives of the CoSpaces IP is to establish innovative solutions which will support the easy creation of collaborative working environments for distributed developers and teams. This system shall allow engineers to build their own user-specific workspaces for design and construction. The focus lies on developing a software environment that supports collaborative solutions for:

- Distributed development at different locations
- Co-located development
- Mobile maintenance service.

The aim of the CoSpaces distributed software framework is to provide the required technological components, core services and collaboration tools supporting the easy creation and use of such of co-located, distributed and mobile collaborative workspaces.

This contribution outlines the principal design of the distributed software framework which is currently developed by the CoSpaces partners. We present the fundamental considerations and general concepts which provided the basis of our framework design. Afterwards we describe the main components of the CoSpaces software framework and their interrelations. Finally we summarize the current status of the software framework and give an outlook on our future work within the CoSpaces project.

2. General Considerations

The design of our software framework is based on the fundamental assumption that different solutions are required in specific collaborative environments. Furthermore the creation of the collaborative working environment is not built from scratch - existing tools from partner sites like COVISE, Morgan and BSCW need to be integrated, legacy applications have to be considered.

For the general concept we assumed that collaboration is undergoing a lifecycle, during which collaborative sessions are prepared, executed and finalized by a predefined group of collaboration partners. These sessions of active collaboration generally follow a well defined workflow as shown in Figure 1.

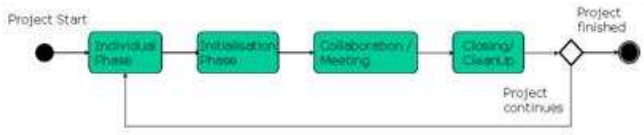


Figure 1: Overview of the Collaboration Lifecycle

The collaborative tasks are preceded by the individual work carried out by the participants of the project. Problems may be encountered which need to be solved collaboratively. Therefore documents describing the problem have to be compiled to be used during the collaborative session or to be distributed beforehand.

During the initialization phase, one participant starts the scheduling process. This determines the date and participants and type of the collaborative session. Afterwards all participants need to agree on the settings. The session may be reconfigured until a common consent has been reached. Configuration includes identifying the availability of the required resources such as applications, hardware resources, rooms, experts, participants, documents like agenda, minutes of previous meetings, and decision documentation. Large data, which cannot be accessed on demand over networks, is distributed to the local hosts. The applications, which now were started on the local

hosts for collaboration, can access the data without large delays.

After the applications are available, the session is ready and open for the users. Subsequently collaboration between the users takes place, during which data is produced and modified. At the end of the meeting these data and a collaborative written summary can be stored. This includes minutes of the meetings, enhanced by recordings, plus documentation of decisions. Finally these results will be sent to all authorized participants and the session will be closed, including all connections, applications, and processes.

3. Framework Design

According to the previously described considerations we distilled a set of components encapsulating the required functionalities. A modular approach dividing the functionality into separate components has been chosen in order to create an adaptable software framework which can be easily adjusted to the specific requirements. The components are to be designed to collaborate on basis of well-established, open interfaces as largely as possible - a service oriented approach is intended. The interfaces should allow for platform independent communication methods, regardless of the programming languages used for the implementation of the individual components. For these reasons Web Services based on the SOAP protocol have been chosen as the preferred communication medium between components. Figure2 illustrates how this conceptual design has been applied in defining the collaboration services specific to the CoSpaces project.

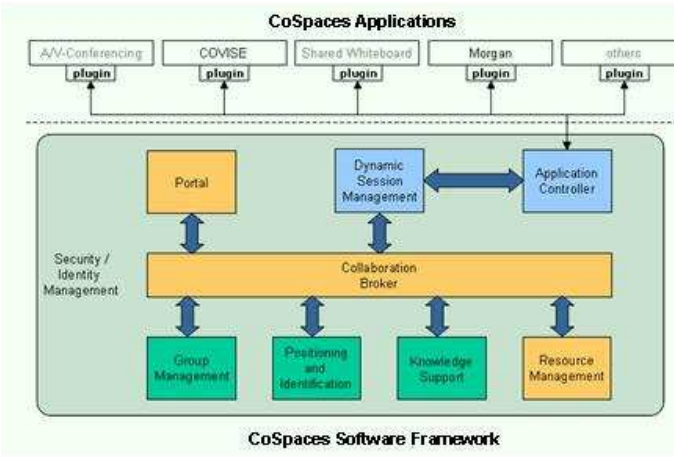


Figure 2: Functional View on the Main Building Blocks

The general entry point into the software framework is the CoSpaces **Portal**. With its graphical user interface it provides the front end to the functionalities implemented by the collaboration broker. The portal is used during the entire lifetime of the collaboration lifecycle. It supports asynchronous tasks carried out during the individual work phase, as well as on the fly reconfiguration of ongoing sessions during the collaboration/meeting phase.

The **Collaboration Broker** is a central service for preparing and setting up new collaborative sessions as well as for configuring and superintending predefined collaborations. In this context the Collaboration Broker provides the backend functionalities of the CoSpaces Portal for the administration and maintenance of collaboration workspaces. The Collaboration Broker supports asynchronous tasks carried out during the individual work phase and is also active during the initialisation phase. Afterwards control is passed over to the Dynamic Session Management for the duration of the collaboration phase and then re-obtained for the cleanup/closing phase.

The **Dynamic Session Management** controls the execution of applications as well as the communication between the involved applications and users during synchronous collaborative sessions. Based on the configuration information provided by the Collaboration Broker the Dynamic Session Management configures, maintains and allows the dynamic, on-demand execution of applications. In particular the Collaboration Broker provides setup information being needed for a specific collaboration session. This is based on data being provided by the Group Management, Knowledge Support and the Resource Management components.

The **Application Controller** mediates between the Dynamic Session Management and external applications used in a collaborative session. It starts, steers and stops applications (tools) by accessing a standardised interface for the tools. This interface is also supposed to basically forward and receive events between the applications, e.g. button press events, scaling operations, changes of viewpoint etc., produced by the connected

application. These are processed by the local Application Controller and sent to the remote counterparts. For obtaining short response times, the Application Controllers communicates directly without going through the Dynamic Session Management or the Collaboration Broker. If a low latency communication is required, the Application Controller will just orchestrate the connection that will be established between the applications directly.

The **Resource Management** component allows teams to create a data space for a particular collaborative instance and share data such as CAD files, simulation results and documents. In order to build on the advances in different systems without duplicating or limiting the CoSpaces software to a specific product, the Resource Management will be designed as a place holder for the files that the partners would like to share. The partners can purely use this place holder for providing a link to their remote systems pointing to the files that they wish to share with others. This ensures that the shared space always have up to date files relevant to the project.

The **Group Management** component allows teams to dynamically create ad-hoc groups on-demand with appropriate services, tools, and resources. It captures roles, responsibilities, access rights, contact and profiling data as well as availability profiles. The Group Manager provides information on presence and location of users and availability of users depending on user-defined availability profiles which allow users to specify if, when and how to best contact them. The individual users, however, will have the choice of making themselves visible or otherwise and to define preferences on by what means they would like to be contacted.

The major objective of the **Positioning & Identification** component is to create visible project communities by tracking the people at fixed and mobile locations as well as allow for positioning and identification of resources, such as rooms or equipment like machines, pipes, etc. Tracking of persons and of resources is used, e.g., by the Knowledge Support component to provide context-sensitive information depending on what resource is at hand or where a human user currently is located.

The **Knowledge Support** component offers support to workers and teams who are engaged in collaborative design and engineering tasks. The specific aspects of a context, which will be considered in CoSpaces, are presence and location of users, current and past actions and tasks, availability of shared and individual data, expertise of users, etc.

Finally the **Security and Identity Management** provides the underlying security mechanisms applied to all of the components throughout the CoSpaces Software Framework. For example data exchange between the integrated applications as implemented by the Application Controller, and the exchange of user credentials between components requires secured transmission channels. Therefore the Security and Identity Management will deliver authentication of users, authorization to preserver data as well as services from fraudulence access and secure data transfer. Accounting functionalities will log all access on security relevant components.

4. Current Status and Future Work

The first conceptual design of the software framework with its logical and physical views as well as the specification of the described components and their interfaces was agreed amongst the partners. Starting from this design the first prototype of the software components have been developed at the partner sites. Subsequently based on the agreed protocol the required functions for establishing the communication between the main components were implemented according to the specified interfaces.

The different components developed by the technology partners have been integrated into the software framework and the communication flow was tested. Integration workshops were held for resolving identified problems of the communication flow and consolidating the different software components. In its initial version the software frameworks includes:

The Portal can be used for entering into the CoSpaces framework as well as for configuring, starting and stopping collaborative sessions.

The Collaboration Broker which provides the Portal with the required information retrieved from the Knowledge Support an. Configurations (user, applications, data sets) are stored in XML-data structures and send to the Dynamic Session Management.

The Dynamic Session Management which receives configuration data from the Collaboration Broker dynamically configures the gateways and forwards the configuration to the corresponding Application Controllers.

The Application Controller which starts and stops applications based on plug-ins and forwards commands (e.g. play, pause and stop) to the remote Application Controller.

The Knowledge Support component provides data on users, workspaces, and calendar information as well as configuration information on collaboration sessions. Positioning and Identification Service provides additional information on partner locations and resources.

The communication with the Portal, Collaboration Broker and the Knowledge Support running on different remote servers as well as with the Application Controller and Dynamic Session Management running on local hosts was successfully validated. Afterwards the first version of the distributed software framework was successfully demonstrated on a CoSpaces partner meeting.

Besides the further completion of the currently implemented prototypes our future work will focus on extending the existing functionality of the framework (e.g. sending invitation to selected partners, configuring and handling collaborative data spaces and resources). Further applications like audio/video conferencing, shared whiteboards or offices tools will be integrated.

Moreover we will install the CoSpaces software framework and carry out end user evaluations within the different Living Labs at our partner sites. After analyzing the end users feedback the design of the framework will be updated. Finally this revised design will provide the basis for the consolidated version of the software framework.

Latest News from CoSpaces Partners

The Open Group's Enterprise Architecture Practitioners Conference in Budapest to Set Agenda on Secure Architectures

The Open Group announced the plenary agenda and preliminary line up of speakers for its 16th Enterprise Architecture Practitioners Conference, to be held October 22nd–26th, 2007 at the Corinthia Grand Hotel Royal in Budapest, Hungary. The Budapest event will focus on several different aspects of Security Architecture and examine their roles in delivering safe and secure enterprise architectures. The three-day event will utilize real-world case studies to illustrate how security architectures can and must evolve to meet the challenges for secure information sharing that today's agile computing business operations demand.
http://www.opengroup.org/comm/press/

"IPCity" Public Event held on 27th September 2007.

IPCity is an integrated project coordinated by Fraunhofer FIT. During the event journalists were asked to participate in a "pervasive game" roaming the old city of Cologne, Germany. Equipped with mobile AR devices (augmented reality devices) the journalists used the new "TimeWarp" prototype developed by Fraunhofer FIT to solve various real-life tasks in the city of Cologne.
http://www.fit.fraunhofer.de/presse/07-09-19.html

BSCW: Version 4.4 released

OrbiTeam and Fraunhofer FIT release the final version 4.4 of the BSCW Shared Workspace System. A host of new functionalities - including Web 2.0 features such as Blogs, Tags, Communities and Wiki-like document-based collaboration - have been added to the widely-used BSCW groupware.
http://www.bscw.de/english/bscw44.html

Pervasive Gaming

Fraunhofer FIT presents latest developments in the area of "Pervasive Gaming" at the Games Convention in Leipzip, Germany.
http://www.fit.fraunhofer.de/presse/07-08-21.html

Fraunhofer FIT releases "Mobota" (Mobile Outdoor Training Assistant).

Mobota is a mobile training assistant for sports people: a mobile application running on devices that are carried by the athletes and a community portal that supports social communities of athletes.
http://www.fit.fraunhofer.de/projects/kooperationssysteme/mobota_en.html

http://www.fit.fraunhofer.de/presse/07-06-26/mobota_fahrer_b.jpg

COWI to advise on Copenhagen Metro

Together with international consultants ARUP and SYSTRA, COWI will be given consulting responsibility for all construction and engineering work for the new City Circle Line Metro to run beneath Copenhagen. In a joint venture with the British consultants ARUP and the French SYSTRA, COWI has signed contracts with the Ørestad Development Corporation to advise on all the construction and civil engineering works for Copenhagen's new City Circle Line. The task will include 15 km of bored tunnels and 17 stations.
http://www.cowi.com/cowi/en/menu/news/

International HPC User Forum Meeting

The High Performance Computing Centre Stuttgart (HLRS) hosted the International HPC User Forum Meeting in Stuttgart on October 1-2, 2007.
http://www.hlrs.de
http://www.hcpuserforum.com

Problems in Parallel Modelling and Simulation

The High Performance Computing Centre Stuttgart (HLRS) participated in an international research seminar on Problems in parallel modelling and simulation. The seminar took place in Sevastopol on September 10-15, 2007.
http://www.hlrs.de

CARSA, 20 Years Living Innovation

This year CARSA celebrates its 20th Anniversary and marked the occasion by hosting a celebratory event on 12th of July at the Euskalduna Congress Hall in Bilbao, bringing together new and longstanding clients to commemorate some of the key experiences and achievements of the past 20 years, and to outline our vision for the future.
http://www.carsa.es

ICE'2008 - to be held on 23-25 June 2008 in Lisbon, Portugal

ESoCE-NET announced the International Conference on Concurrent Enterprising (Concurrent Engineering, Virtual Enterprise, and Collaborative Environments and Innovation) - **ICE'2008** - to be held on 23-25 June 2008 in Lisbon, Portugal. The Call-for-Papers will be available soon, so watch out for it on the ICE conference website at: http://www.ice-conference.org. All ICE conference papers are freely accessible on the ICE Proceedings website: http://www.ice-proceedings.org

Recent Events

eChallenges e-2007 – The Hague, The Netherlands, 24 – 26 Oct 2007
More information

Intuition 2007 – Athens, Greece, 4 – 5 Oct 2007
More information

CoSpaces 1st Annual Conference – Leiria, Portugal, 26 – 28 Sept 2007
Held in conjunction with the VRAP 2007 Conference.
http://www.cospaces.org/conferences.htm

VRAP 2007 – 3rd International Conference on Advanced Research on Virtual & Rapid Prototyping – 24-29th September 2007, Leiria, Portugal

ECSCW 2007 – 10th European Conference on Computer Supported Co-Operative Work, 24-28th September 2007, Limerick, Ireland

CE 2007 – Sao Paolo, Brazil, 16 – 20 July 2007
More information

Up-Coming Events

Automotive Logistics Europe 2008 – Montreux, Switzerland, 4 – 6 March 2008
More information

i-ESA 2008 – Berlin, Germany, 26 – 28 March 2008
More information

European Conference on Human Centred Design for Intelligent Transport Systems
Lyon, France, 3 – 4 April 2008
More information

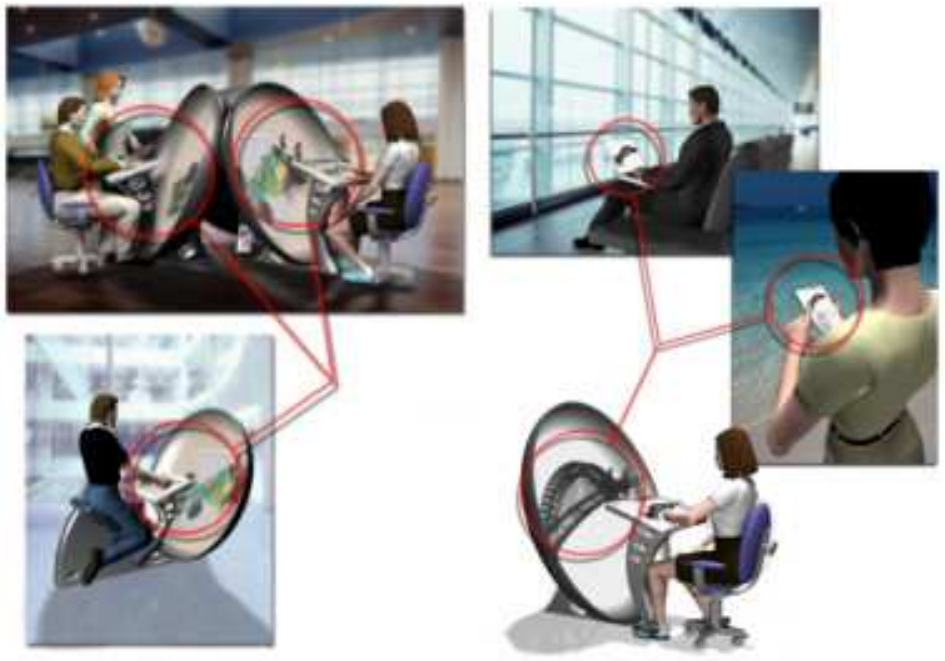
Aerospace 08 – Munich, Germany, 15-17 April 2008
More information

ICE 2008 - 14th International Conference on Concurrent Enterprising
"A New Wave of Innovation in collaborative Networks"
Lisbon, Portugal, 23 – 25 June 2008
More information

IEMC–Europe 2008 – Estoril, Portugal, 28 – 30 June 2008
More information

FISITA 2008 – Munich, Germany, 14 – 19 Sept 2008
More information

CoSpaces Software Framework for Collaborative Workspaces in Engineering Design



CoSpaces Newsletter is published by:	CoSpaces Consortium
Editorial Coordinator:	Marc Pallot
	ESoCE-NET
	Marc.Pallot@ESoCE.net
Editorial Board:	Scott Hansen, Terrence Fernando, Marc Pallot and Simon Hardiman
CoSpaces Newsletter is supported by:	European Commission
	CoSpaces FP6-IST-5-034245
	CoSpaces Integrated Project
	IST-2005-2.5.9 Collaborative Working Environments