

## **IRMOS – Interactive Real-time Multimedia Applications on Service-oriented Infrastructures**

Traditionally, 'real-time' refers to *hard* real-time systems, where even a single violation of the desired timing behaviour is not acceptable, for example because it leads to total failure, possibly causing loss of human lives. However, there is also a wide range of applications that also have stringent timing and performance needs, but for which some deviations in Quality of Service (QoS) are acceptable, provided these are well understood and carefully managed. These are *soft* real-time applications and include a broad class of interactive and collaborative tools and environments, including concurrent design and visualisation in the engineering sector, media production in the creative industries, and multi-user virtual environments in education and gaming

Soft real-time applications are traditionally developed without any real-time methodology or run-time support from the infrastructure on which they run. The result is that either expensive and dedicated hardware has to be purchased to ensure good interactivity levels and performance, or that general-purpose resources are used as a compromise (e.g. commodity operating systems and Internet networking) with no way to guarantee or control the behaviour of the application as a result.

### ***IRMOS in general***

IRMOS aims to break this mould by enabling 'soft real-time' applications to be delivered through value chains that span organisational boundaries by a service oriented infrastructure that enables the real-time interaction of a distributed set of people and resources.

IRMOS is set apart from today's Service Oriented Infrastructures through the following key features:

- i)** IRMOS will make it possible to distribute interactive real-time applications across organisational boundaries, instead of having to use dedicated, expensive and collocated hardware at a single site.
- ii)** Businesses will be able to come together quickly and efficiently using IRMOS to identify, agree and deliver real-time applications without the need for protracted manual negotiations or service provisioning.
- iii)** Providers will be able to deliver services that are cost effective and have guaranteed Quality of Service by using IRMOS to give them full control over their resources.
- iv)** IRMOS will give all participants in inter-organisation value chains including service providers and consumers the confidence that interactive real-time applications will be delivered in a predictable, reliable and efficient way.
- v)** IRMOS provides a comprehensive approach that addresses real-time at all levels (network, processing, storage, application, workflow and business) to allow complete end-to-end solutions to be built using a single infrastructure.

Each of these benefits will be demonstrated by using a range of applications including collaborative film post production, virtual and augmented reality application, and interactive online learning using shared virtual environments. This broad range of demonstrators will

enable the benefits of IRMOS to be promoted to the widest possible audience and achieve significant impact in the industrial, civil and educational sectors.

Objectives in IRMOS include:

- Facilitate real-time interactivity in SOIs
- Consolidate management and control of the infrastructure and services
- Enable integration between network and application services
- Engineer a platform of services
- Toolbox and best practices for real-time interactive applications.
- Semantic descriptions and modelling of application characteristics
- Contribution to standardisation bodies

At the end IRMOS provides a framework that eases usage of services, either pure software-based or hardware-related, across organisational boundaries. For example it provides the possibility to SMEs to gain temporary access to specialised services on a rental basis that are only affordable to maintain with high acquisition costs and specialised staff. In addition the IRMOS provides certain guaranteed environment properties, e.g. in terms of network link quality, which are negotiated on the basis of a service level agreement, which acts like a contract between service-consumer and service-provider.

### ***HLRS in IRMOS***

The role of HLRS in the IRMOS project is to provide an application scenario for the service-oriented infrastructure, to show its advantages and benefits compared to today's existing solutions, as well as contributing to the development of the framework. The application scenario focuses on Virtual and Augmented Reality in collaborative working sessions. It comprises cross-organisational provision of Augmented Reality as a service to remote locations. Several partners join in a visualisation session where one partner site has the capabilities to perform the Augmented Reality. This partner site however does not only provide Augmented Reality locally, but also to all collaboration partners over the internet. The application used in this scenario is called COVISE (which stands for Collaborative Visualisation and Simulation environment). In IRMOS a service will be developed that performs video transmission of real-time video data which additionally is synchronized with position and orientation data of the Augmented Reality software. The video stream is then received by the collaboration partners and incorporated into their Virtual Reality environment and overlaid over simulation data based on the position and orientation that was received with the additional synchronized stream. This way partners in the collaboration can share the Augmented Display even though they don't have the hardware equipment at their site, but instead benefit of the so called Remote Augmented Reality where the Augmented Reality service is provided by a specifically equipped remote partner. The COVISE application needs certain adaptations for interfacing with the IRMOS framework to allow the required SLA-negotiation for IRMOS and the service development to be able to transparently utilise the hardware features provided by IRMOS.

Such a transmission of video data as well as metadata is done in real-time in a synchronized way. The constraint of real-time in this context raises requirements considering bandwidth, which has to be large enough for the video data of the appropriate resolution, as well as latency to ensure that all participants of such collaboration more or less see the visualisation at the same time. These constraints are the issues to be solved by IRMOS through its framework services that lookup and determine appropriate resources for a gateway service as well as selection of an appropriate network link. These features requested through the application are, once setup, guaranteed for the requested time. With its features for SLA-based QoS, e.g. in

terms of latency, bandwidth or even synchronisation of multiple streams, as well as monitoring and feedback provision of the acquired link, IRMOS makes the scenario more stable and reliable.

The HLRS application scenario poses high requirements on the IRMOS framework in the area of guaranteed bandwidth, latency and processing power. For the IRMOS framework to be able to provide resources and network links that fulfil these constraints an interface is provided, that allows an application to specify its requirements on a high abstraction layer using a specification language. For that reason framework services are provided by the IRMOS framework, that offer webservice for requirements specification, SLA negotiation, service discovery, resource booking and service monitoring. With its experience in the field of web technologies HLRS provides a good knowledge in that field of technology and also contributes to the IRMOS project to successfully establish such a framework service.

### **Facts**

IRMOS is a project funded by the European Union within the 7th Framework program in the 1st call of ICT. The consortium consists of eleven project partners with a total project budget of €12.9M. It runs for 36 months and started on 1<sup>st</sup> of February 2008.

### **Partners**

Xyratex (UK), University of Stuttgart (DE), ICCS/NTUA (GR), Alcatel-Lucent (DE), SINTEF (NO), University of Southampton (UK), Scuola Superiore Sant'Anna (IT), Telefonica I+D (ES), Giunti Labs (IT), Grass Valley (DE), Deutsche Thomson OHG (DE)

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