An Intelligent Service Oriented Infrastructure supporting Real-time Applications

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At a Glance

- **Duration**
  - 36 months (Started on February 2008)

- **Effort**
  - 1.133 PM

- **Budget**
  - Total Cost: 12.6 M€
  - EC funding: 7.9 M€, under FP7, ICT-2007.1.2 Service and Software Architectures, Infrastructures and Engineering

- **Consortium**
  - 11 partners from industry and academia belonging to 6 European countries (DE, UK, GR, IT, NO, ES)

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Service Oriented Infrastructures

- **Today**
  - Numerous success stories (Amazon EC2/S3,...)
  - But most current SOI realizations are computational Clouds
    - Huge remote data centers
    - Primarily manage computing related resources (CPU, RAM, persistent Storage...)
    - Execute mainly batch jobs with no or low timing and location constraints

- **Tomorrow**
  - Vision of future SOIs
    - Facilitate real-time interactivity
    - Provide QoS guarantees
    - Are economically viable
    - Not only provide resources but also supporting tools to make the development and deployment of applications is easy

- This is the territory of IRMOS

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The IRMOS Vision

- **Main outcome of the project:**
  - *Service Oriented Infrastructure*, which allows the adoption of interactive real-time applications

- **To make it feasible we have a set of challenges to face:**
  - Enabling real-time attributes at various levels of the infrastructure (network, storage, processing, application)
  - Providing QoS Guarantees
  - Achieving automated SLA Negotiation
  - Mapping between high-level application terms and fine-grained resource-level attributes
  - Provisions of supporting tools to develop applications with predictable performance
  - ...

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The IRMOS Story

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The IRMOS Story

Application

Application Component

Application Component

Application Component

Framework Services

Monitoring

SLA Management

Workflow Management

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Client

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Mapping IRMOS to the Cloud

Application Adaptation

Service Engineering Tools

SLA Management, Workflow Management, Advertisement & Discovery

Virtualized Resources & Execution Environment

SaaS

PaaS

IaaS

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ISONI – A service infrastructure enabling real-time applications

- ISONI is an infrastructure, consisting of a network of resources that allows resource sharing among multiple services.

- Major tasks of ISONI:
  - Provide fully virtualized resources and QoS guarantees as required by interactive real-time applications.
  - Configure and instantiate the Virtual Service Network (VSN), automatically and autonomously.
  - Monitor the VSN status and the resources consumed.
Abstracting the Service View

**Virtual Link Description:**
- Best effort
  - Bandwidth

**“Real-time”**
- Bandwidth
- Loss rate
- Delay
- Jitter

**Metadata:**
- Image ID
- CPU type
- Performance
- RAM
- Disk...

VSN - Virtual Service Network
SC - Service Component

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QoS classification, mapping...

**Virtual Link Description (VLD)**

**Application**

**Available abstract resources**

- QoS class 1
- QoS class 2
- QoS class 3
- QoS class n

**ISONI QoS overlay adaptation (IQOA)**

- best effort
- Diffserv (TOS)
- intserv (RSVP)
- Leased Lines

**Transport network**

**Path Manager Domain view**

**Path Manager Node views**

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Service Deployment

- ISONI: Intelligent Service Oriented Network Infrastructure
- VMU: Virtual Machine Unit
- PH: Physical Host
- IXB: ISONI eXchange Box (Network Virtualization)

Internet (minor QoS)
Routed IP networks with QoS (e.g. MPLS...)
Leased p2p connection → high QoS (e.g. Metro Ethernet E-VC over SDH, Ethernet over SDH, ...)

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ISONI – key features

- Intelligent Networking
  - Network topology hiding by virtualization
  - Allocation of link resources and provisioning of connectivity
  - Sustaining individual QoS guarantees for co-existing services on a shared transport medium
  - Supervision and monitoring.

- Execution Environment
  - Consolidation of the infrastructure and its services
  - Live migration of services between Execution Environments
  - Methods for temporal (timely scheduling) isolation between services running on different shares of a resource
  - Integration of processing and storage resources
Summary

- IRMOS project
  - brings together two worlds: SOIs & Real-time
  - provides an infrastructure enabling Real-time attributes at various levels of it

- Framework Services and ISONI are under specification accompanied by prototypical implementation.
  - First ISONI deliverables are available for download on IRMOS website: [www.irmosproject.eu](http://www.irmosproject.eu) (e.g. ISONI White Paper, ISONI addressing schemes, Initial version of Real-time Architecture of Execution Environment,...)
  - We have already very promising results, an initial IRMOS Integrated Prototype will be ready in April 2010.

- For more details, please have a look at: [www.irmosproject.eu](http://www.irmosproject.eu)
BUT, we need to Standardise...

- CHALLENGERS Research Agenda: Why Grids have not been widely accepted yet?
  - Lack of standards

- Cross-ETP Vision Document – Future Internet: Opportunity
  - Coordinated international standards in the emerging areas of the Future Internet will be essential to guarantee its interoperability and its openness as an innovation space.

- Future Internet 2020 – Vision of Industry Expert Group: Action Areas and Recommendations
  - Standards need to be created in many areas to ensure interoperability in the Future Internet and to realise economies of scale that are essential for widespread deployment of new applications (e.g. standards for unique identification of objects in the Internet of Things).

- What do we do in IRMOS?
  - Started from the early stages of the project (especially at ETSI Grid) following up the standardization efforts in Akogrimo (FP6 EU Project)
  - Up to now we have more than 20 contributions focused on Service Infrastructures

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Thank you!

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Further Information
http://www.irmosproject.eu

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Applications

- Demonstration of the IRMOS functionality in three different application areas
  - Collaborative Digital Film Postproduction.
  - Virtual and Augmented Reality.
  - Interactive collaborative e-learning.

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IRMOS Approach