NEXOF reference architecture

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Software and Services a future in common: the NESSI perspective

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ENGINEERING INGEGNERIA INFORMATICA

SEVENTH FRAMEWORK PROGRAMME

contributing to NESSI

Agenda

- The Context
  - The company
  - Future Internet
  - NESSI
- NEXOF
  - Motivation
  - Main concepts
- NEXOF-RA
  - Project motivation
  - Main project results
  - Contribution to NEXOF
  - Consortium partners

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The Engineering Group

ENGINEERING INGEGNERIA INFORMATICA

System and Business Integration
Application Management services

ENGINEERING INGEGNERIA INFORMATICA

FINANCE

NUOVA TREND
Software applications for regulatory compliance and governance in finance

CARIDATA
Services and solutions in core banking and wealth management industry

UTILITIES

NETA
Complete solutions in the IT services for energy management

APPLICATION TECHNOLOGIES

OVER.IT
Customer Relationships Management

ENGIWEB SECURITY
Security web based technologies

LOCAL PA and HEALTHCARE

ENGINEERING SANITA' ENTI LOCALI
IT solutions and services for healthcare and local public administration

CONSULTANCY

BUSINESS INTEGRATION PARTNERS
Advisory in energy and telco industries

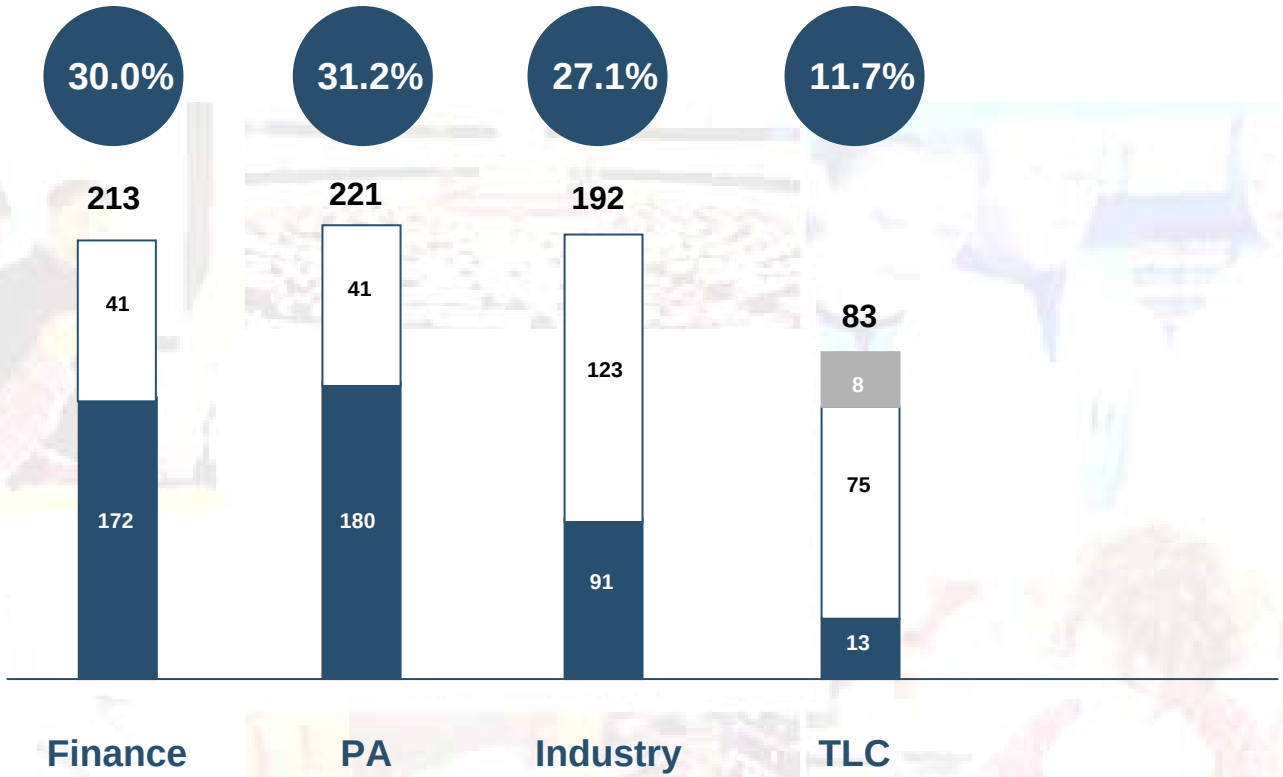
NEXEN
Advisory in finance

SOFTWARE DESIGN, DEVELOPMENT AND SERVICES

SOFTLAB
Software development

ENGITECH
Laboratory for web-based applications and technological observatory

A balanced approach to the market



Dati ufficiali Engineering e BIP 4Q2007. Stime Atos, Xaltia da business plan 2007 – in mln €

A window on the world

Argentina (Telecom Personal, Diasorin)
Australia (IVECO, ENI)
Austria (Coca Cola HBC)
Belgium (Kraft)
Brazil (TIM Celular)
Congo (ENI)
Czech Republic (Coca Cola HBC)
Denmark (Cementir)
Egypt (ENI)
France (AO International, Autogrill, IKEA, FIAT)
Germany (Kraft, Eurofighter)
Greece (Atos Origin Hellas, BAE Systems)
Hungary (Coca Cola HBC)
Portugal (Whirlpool)
Poland (Whirlpool, FIAT, Selenia)
Romania (Whirlpool)

Russia (Whirlpool)
Serbia (Telecom Srbija, Promonte GSM)
Slovakia (Whirlpool, ENEL)
Spain (Whirlpool, Atos Origin Spain, Canon, FIAT)
Sweden (IKEA)
Switzerland (Atos Origin Schweiz)
Turkey (AVEA, FIAT)
United States (ENI)
United Kingdom (FIAT, Ferrero)
Venezuela (Digitel)

The Research & Development

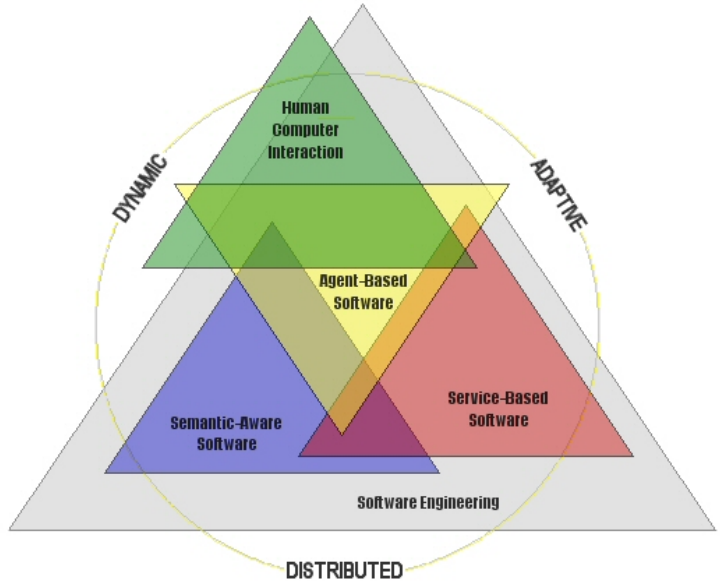
- Operational since **1987**
- Nearly **100** researchers
- **4** Labs
- Participation in **more than 40 research initiatives** (National and International)
- **Wide European co-operation** network with major Universities and Research Institutes
- **Mission**:

  To advance the practice of software engineering so the whole company can acquire it and sustain its software systems development activity with predictable and improved cost, schedule, and quality.

The Main Goal and the Research Lines

exploring the design and implementation of next generation tools to support distributed, dynamic and adaptive software systems

- systems that operate non-stop in a rapidly changing and possibly antagonistic environment, or, in other words, systems that have capabilities to:
  - reason about their own structure, performance and environment;
  - dynamically modify their behavior;
  - act autonomously.



- Service Engineering
- Security
- Service Oriented Infrastructure
- Innovative Business Models
- Engineering of Intelligent Systems
- Engineering of Business Process

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The evolutionary motivation

Internet:

- Phase 1 = “connectivity”
  - 80’s-90’s internet as communica[illegible]n infrastructure (eg. email)
- Phase 2 = “show room”
  - 90’s publication of first web sites, internet as a [illegible] infrastructure
- Phase 3 = “universal library”
  - 2000’s easy access to any kind of unstructured content (Google), active role of users (eg. WikiPedia)
- Phase 4 = “Transform the Internet to service your life”
  - 2015’s …

Dreaming the “net economy”

Implementing the “net economy”

Implementing the “**service** economy”

Future Internet properties and open issues

"Future Internet
to service everyday life"

- "FutureInternet" to be
  - **Alive** (through services)
  - (pervasively) **Trusted**
  - **Rich** (due to knowledge)
  - **Invisible** (ICT)

Can internet interact?

Can trust be real-time?

Can internet react to events and generate experience?

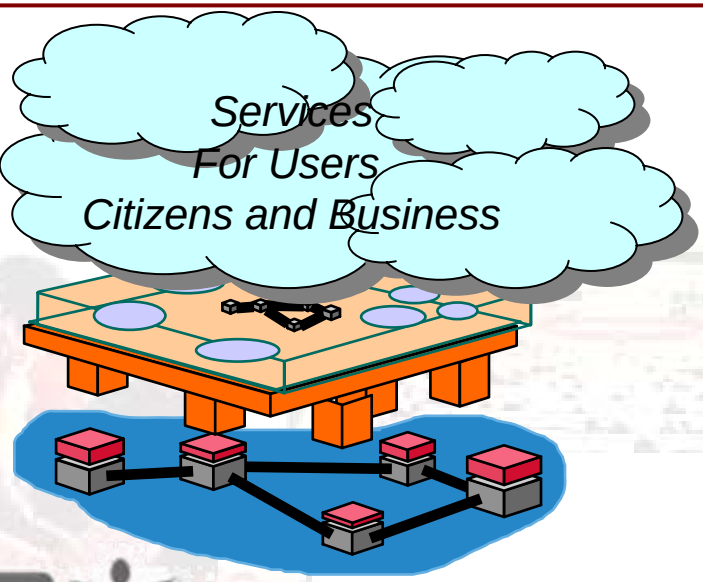
Can computers disappear?

Towards Future Internet

Services
Process
Semantic

Abstraction
Middleware
Grid
Virtualization

Hardware
Network
Devices



Future Internet

2015

USERS at the Centre
Computers at the Edge

«Internet of Services »

2007

WEB 2.0

1990

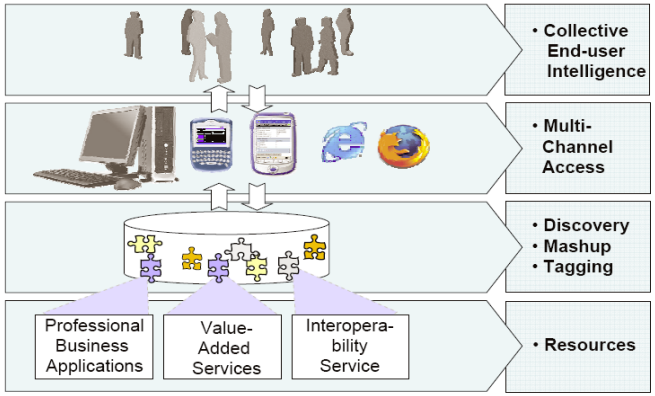
Internet

1960

Specialised networks

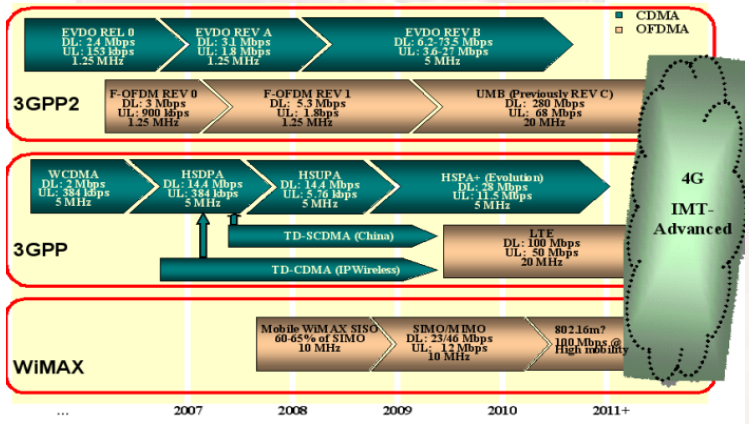
Computer at the Centre
USERS at the Edge

Internet of Services



Internet of contents (3D Internet)

Security



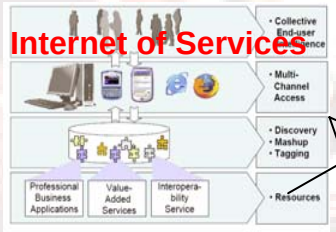
Future Infrastructure

Internet of Things

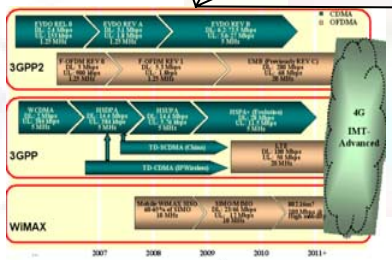
Towards Future Internet

Social aspects

Internet of contents (3D Internet)



Internet of Services

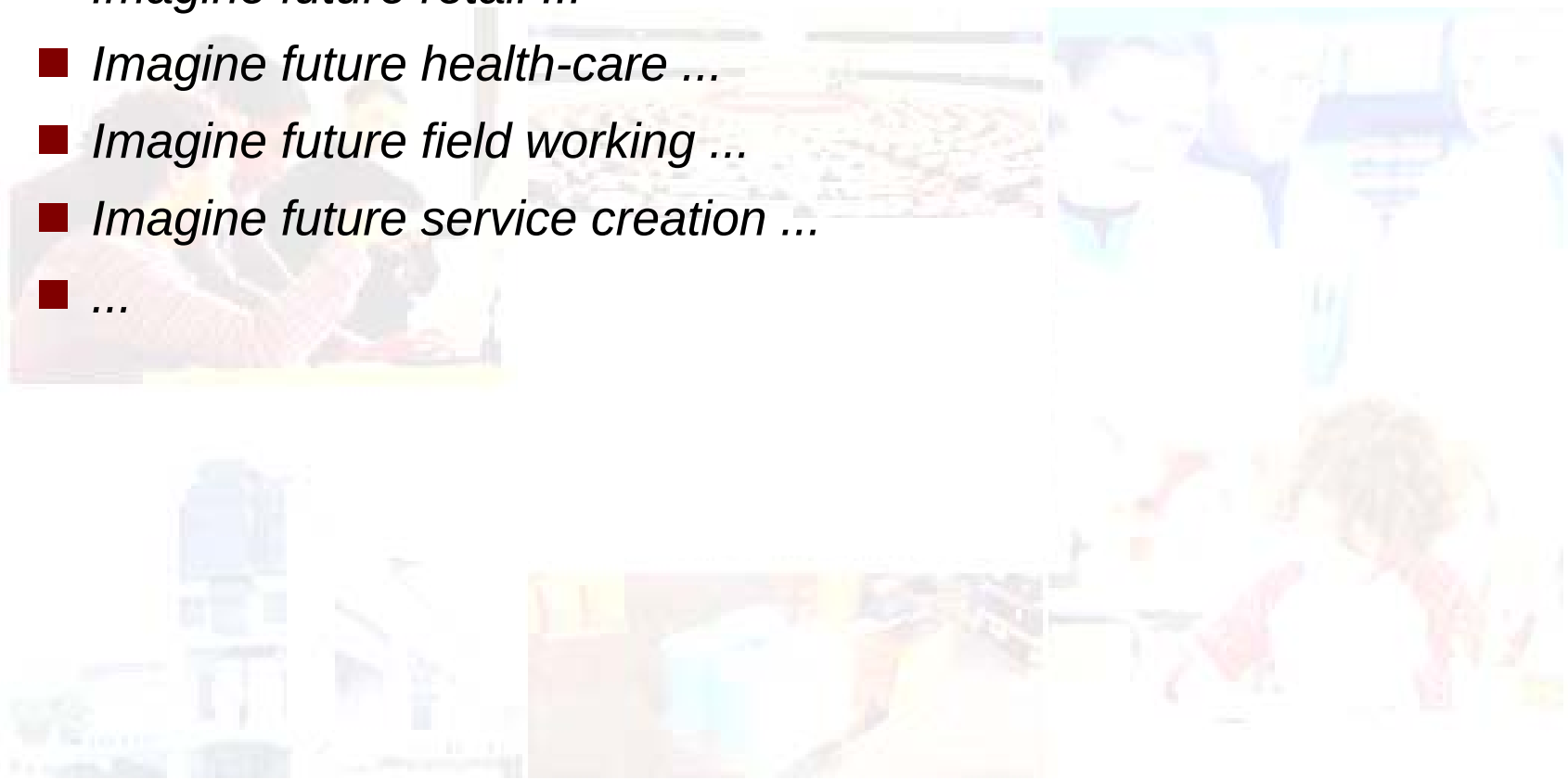


Future Infrastructure

Internet of Things

Example scenarios

- Exemplifying scenarios
  - *Imagine future retail ...*
  - *Imagine future health-care ...*
  - *Imagine future field working ...*
  - *Imagine future service creation ...*
  - *...*



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Services in IT - Market Expectations

Service is something used but not owned

- **Lower the risks for customers and improve value and reliability**
- **Increase process flexibility for businesses as well as public administrations**
- **Accept complex world environments, and co-operate on standards, so the end-user value can be created for a huge number of people**

NESSI is about transforming the EU economy through Service Oriented business models

- The context - European Technology Platform

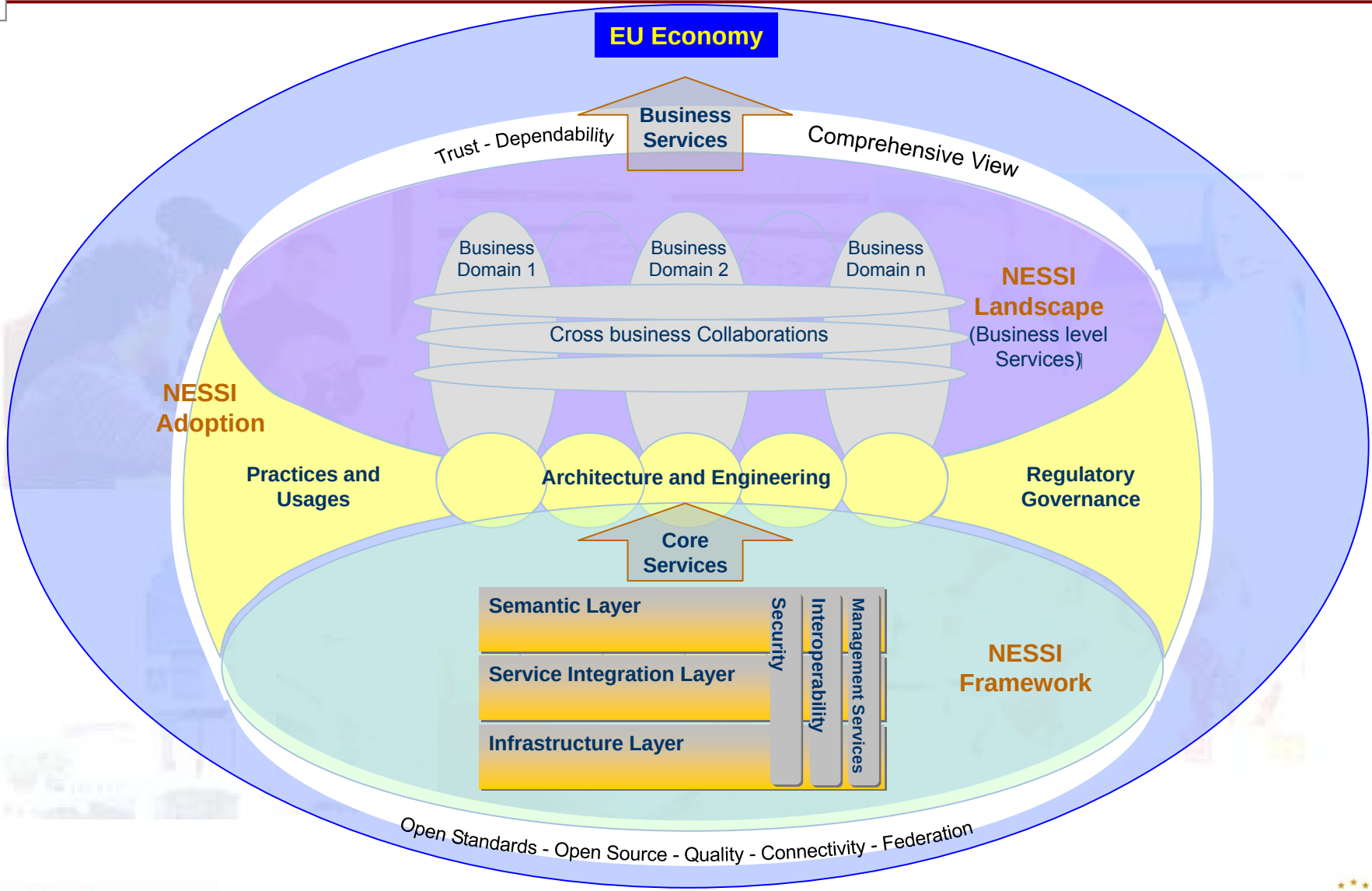
- Strategic?

NESSI aims to provide a unified view for European research in Services Architectures and Software Infrastructures

Today, NESSI partners represent 1.7 Million strong workforce and 490 B€ in revenues

In US, SRII launched in March 2007 (www.thesrii.org)!!!

NESSI Holistic View



Research priorities highlights

	Requirement	NESSI Research	Research Area
1	Provide a flexible infrastructure to support the networked economy	Advanced infrastructure technologies in •HardWare (flexible allocation, virtualization, advanced storage, energy efficiency) •Middleware (new composite system designs, harmonized virtualization) •related programming models	*Service-oriented utility infrastructure*
2	Provide coherence to the composition of uncoordinated services across all layers and all providers	•Modelling, Construction and Management of hybrid service-based systems (situational, spontaneous, goal-based) •Mapping quality of experience of the services to non-functional properties of components •Refining semantics to become appropriate across hybrid service-based systems	*Service and System Engineering*
3	Add the dimensions of knowledge to the interaction between user and (business and societal) services	•Collaborative business intelligence for hybrid service-based systems •Knowledge- and situational-driven personalization of interfaces and services •Embodiment of educating principles in services	*Adaptive interactions*

Research priorities highlights (2)

	Requirement	NESSI Research	Research Area
4	Pave the way towards the collaborative executable enterprise	•Dynamic formation, formalization management and interaction of business processes implemented through services •Support for long-term and transactional business collaboration	*Business process modelling*
5	Define open architectures for intranet- to internet-scale service delivery	Harmonize SOA and SOI architectures to support all kinds of •business and provisioning models •applications and hardware environments •for all stakeholders	*Reference Architecture and Implementations*
6	Materialize the ubiquitous service availability	•Turn devices into enablers of services by embodying SOA principles into embedded systems •Link collaborative devices to services	*Ubiquitous service availability*

Research priorities highlights (3)

	Requirement	NESSI Research	Research Area
7	Provide end-to-end trustability in hybrid service-based systems	•Provide a chain of trust across all levels and trust zones •End-to-end verification and assurance •Embed persuasive tactics and intuitive security	*End-to-end Trust, security and dependability*
8	Ensure social, economical, legal and cultural viability	•Make services accessible to all •Multidisciplinary research to build a theory describing the relationship between organizations and social networks in regards to hybrid service-based systems •Support emerging business models for innovation	*Systemic foundation for a Service Economy*
9	Provide the business context for services in hybrid service-based systems	•Build the specific collaborative service-based business systems for targeted application domains e.g. Industry automation, education •Identify specific and generic parts supporting services in hybrid service-based systems	*Building NESSI*

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NEXOF motivation

The NESSI Open Framework is an integrated, consistent and coherent set of technologies and associated methods and tools intended to

- provide European Industry and the Public Sector with **efficient services and software infrastructures** to improve flexibility, interoperability and quality;
- **master complex software systems** and their provision as service oriented utilities;
- establish the technological basis, the strategies and deployment policies to **speed up the dynamics of the services eco-system**;
- develop novel technologies, strategies and deployment policies that **foster openness**, through the increased adoption of open standards and open source software as well as the provision of open services;
- fostering **safety, security and the well-being of citizens** by means of new societal applications, enhanced efficiency of industry and administrations, and competitive jobs.

NESSI Open Service Framework

- Open Reference Model (ORM)
  - → Concept, Glossary and Principles
- Open Reference Architecture (ORA)
  - → Standards
- Open Reference Implementation (ORI)
- Conformance Test Suite

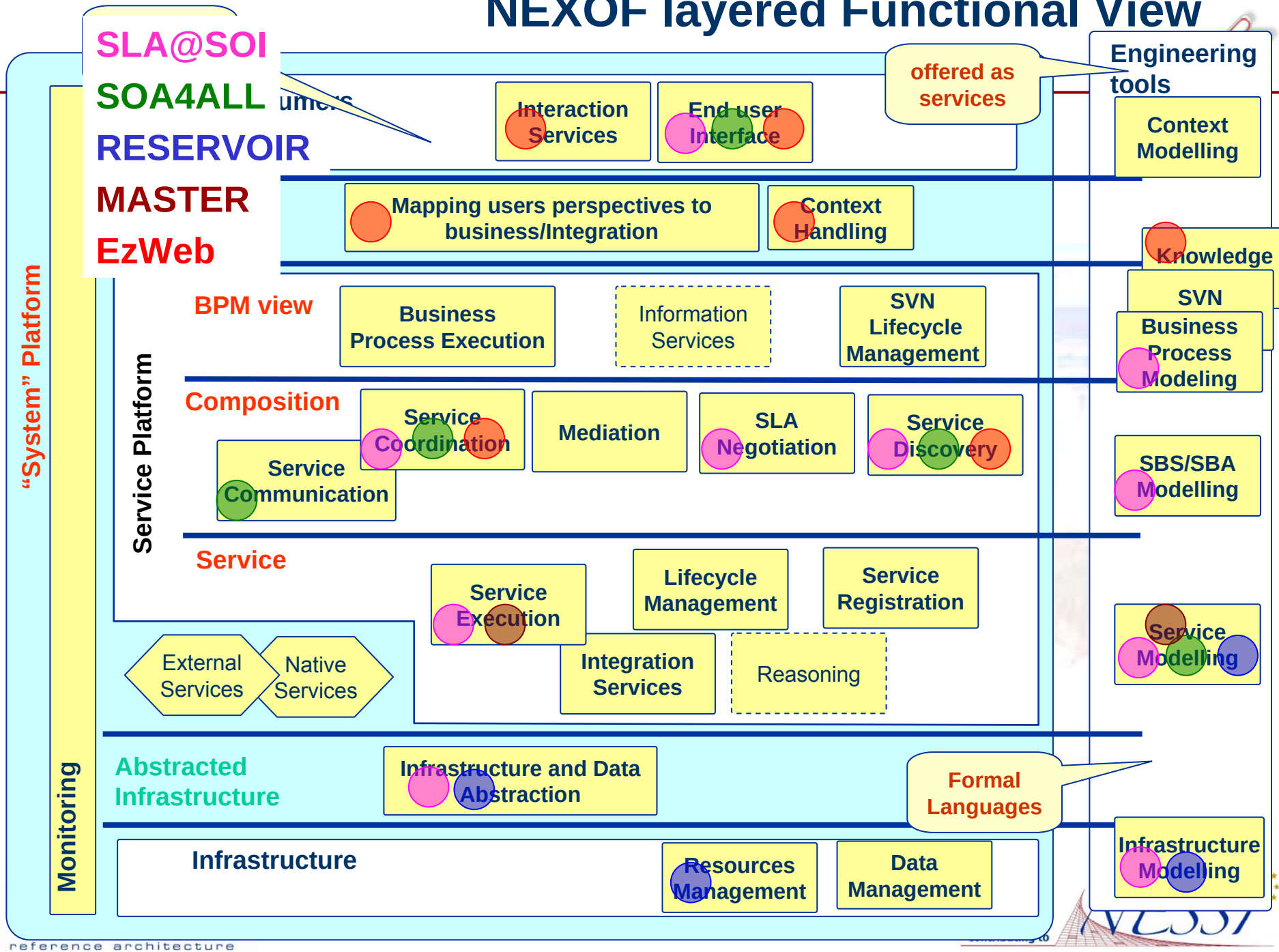
"The Independence Principle"

Size

Domain

Technology

NEXOF layered Functional View



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Project motivation

- "Deliver a **coherent** and **consistent** open service framework, ranging from the infrastructure up to the interfaces with the end users, **leveraging research** in the area of service-based systems to consolidate and trigger innovation in service-oriented economies"

- NEXOF-RA is a step in the process of building and creating the conditions for the adoption of the whole of Open Service Framework
- The aim is that the RA will be built through consensus within the NESSI Community, validated by the NSPs and widely adopted to support the European Service Economy

NEXOF-RA expected results

NESSI Open Service Framework

- Open Reference Model
  - → Concept and Principles
- Open Reference Architecture
  - → Standards
- Open Reference Implementation
- Conformance Test Suite
- Validation of NEXOF instances in real scenarios

NEXOF-RA

- Proof-of-concept
- NEXOF Roadmap

Expected results: proof-of-concept

- Software to prove key architectural choices
  - Possibly multi & cross platform deployments
- Guidelines and blueprints for instantiation
- Possibly based on outcomes from FP6, FP7 (including NSPs)
  - For FP6, consider e.g. Athena, NextGRID, SecSE, Prime, Serenity, QualiPSo
- Not a reference implementation of the RA
- Not designed for any specific user, internal validation use
- Public, but not supported (e.g. IBM alphaworks)

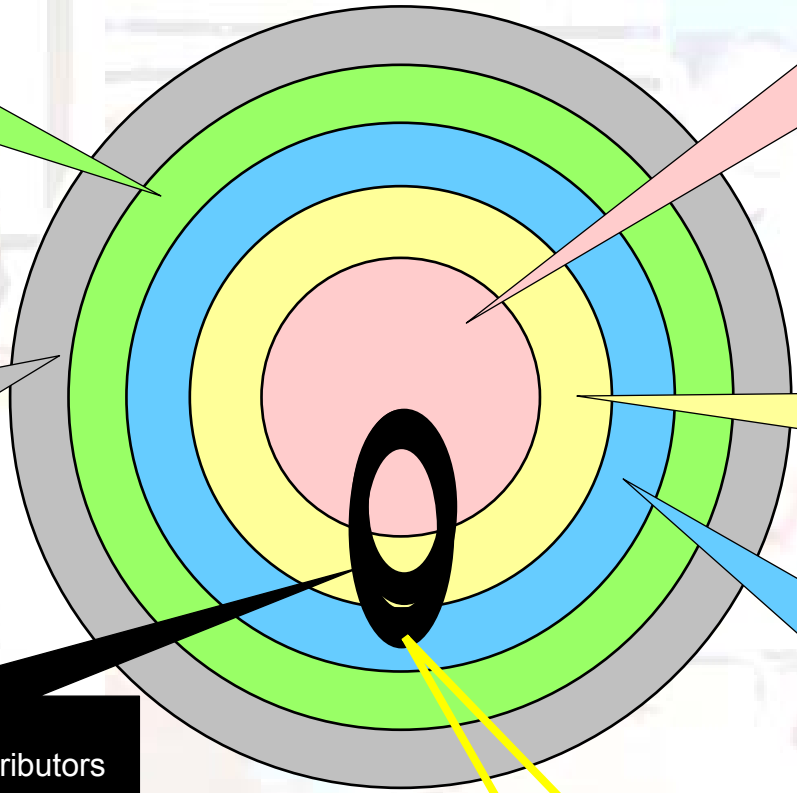
Expected results: Roadmap

It is the strategy for the building and adopting NEXOF.

This consist of:

- Strategic plan
- Requirements for NEXOF
- Methodology to implement the plan
  - Supporting tools (e.g. CWE, Repository)

NEXOF-RA Community



Advisors & Promoters
Advisory boards & SC
→ Input & Validate
→ Topics & Applicability

NEXOF-RA
→ Drives Process
→ Collect & evaluate input
→ Investigate alternatives
→ Write documents
→ In short … do the work

"Adopters"
NESSI Members ++
→ Adopt architecture

"Strategic Contributors"
NSP, key projects
→ Create input
→ Collaborate in process

"Contributors"
NWGs, other projects, other parties
→ Create input
→ Review drafts

Investigation Team
→ NEXOF-RA + Strategic Contributors
→ Collect & evaluate input
→ Investigate alternatives
→ Write documents

"whoever is committed"

Candidate Investigation Topics (1/2)

- SUI.1 – declarative authoring languages for user interfaces
- SUI.2 – contextual adaptation
- SUI.3 – basic definition model for front-end resources
- SUI.4 – REST-based open service catalog APIs
- SP.1 – distributed registries
- SP.2 – distributed (intelligent) deployment / configuration
- SP.3 – interoperability (cross standards)
- SP.4 – event-driven architecture
- SP.5 – system federation → security/policy federation
- SP.6 (+SQ) – semantic description of non-functional aspects
- SP.7 – service description techniques (selection, overcome limits)
- SP.8 – SLA and service negotiation

Candidate Investigation Topics (2/2)

- SP.9 – transaction
- SP.10 – process definition
- SP.11 – access to current assets / legacy integration
- SOI.1 – definition of infrastructure services
- SOI.2 – description of infrastructure services
- SOI.3 – describe functional and non-functional characteristics of infrastructure services
- SOI.4 – usage and management reference points to be exposed
- SOI.5 – SLA parameters (offering guarantees)
- SQ.1 – privacy, incl. data protection architectures
- SQ.2 – access rights framework based on semantics
- SQ.3 – behaviour analysis and dynamic security in SOA
- SQ.4 – multi-level security in interconnected systems
- SQ.5 – secure SOA
- SQ.6 – Architectures for Highly Available Services – includes security aspects
- SQ.7 – identity management

Looks good so far

As of 11-Sep-08 AM

- 93 unique email registered
- Including 12 from NEXOF-RA partner organizations
- From 23 identified countries
  - 4 Outside Europe: Australia, China, Korea, USA
  - 3 European outside EU: Norway, Switzerland and Turkey
  - Well represented: Italy (15), Spain (8), UK (8) (excludes NEXOF)
- Most registrations are recent
  - 64 (2 in 3) registered in September
  - Including 35 (1 in 3) on Sept 5th
  - Including 7 after deadline (NOTE - registration is still open)

Distribution per Topic

Core Service Framework Area
- Service Description (Piero) → 31
- Design Time Service Composition (Yosu) → 35
- Service Discovery (Yosu) → 33
- Interoperability of Message-Based Service Interaction (Katharina) → 16

User Interaction Area
- Declarative Authoring Language for User Interfaces (Nikolaos) → 10
- Context Model and Universal APIs (Jose Manuel) → 20

Infrastructure Area
- Definition of Infrastructure Services (Mike) → 32

Security Area
- Dynamic identity management for SOA (Pascal) → 13
- Privacy Management in SOA (Daniel) → 10

Quality of Service Area
- Scalable Approaches to Service Oriented Infrastructures (Ricardo) → 25
- Highly Availability for Multi-Tier Architectures (Ricardo) → 11

Consortium Partners

Engineering Ingegneria Informatica S.p.A	Italy
Alcatel-Lucent France	France
ATOS Origin S.A.	Spain
British Telecommunications plc	United Kingdom
Hewlett Packard European Laboratories – Bristol	United Kingdom
IBM	Israel
Lero at University of Limerick	Ireland
Lero at University of Duisburg-Essen	Germany
Logica CMG	The Netherlands
MoMa - Modelli matematici ed applicazioni S.r.l.	Italy
Siemens Gmbh	Germany
TIS Techno Innovation Alto Adige S.C.p.A.	Italy
Telefonica Investigacion y Desarrollo	Spain
Thales	France
TIE	The Netherlands
Universidad Politecnica de Madrid	Spain

Conclusions

- **NEXOF-RA** aims at **standardise** the way services are built, offered and consumed. There is the need for a Reference Service Architecture
- The **Reference Architecture** should be defined in order to allow any business domain, size and technology
- Implementing a **Reference Architecture** is not a single shot
- Implementing a **Reference Architecture** requires a large community with contributions from many sources.

20-21 October 2008
NEXOF Investigation teams kick-off

www.nessi-europe.eu - www.nexof-ra.eu