



## S-Cube: Enabling the Next Generation of Software Services

**Klaus Pohl**

Software Systems Engineering  
Institute for Computer Science and  
Business Information Systems (ICB)  
University of Duisburg-Essen, Germany  
[www.sse.uni-due.de](http://www.sse.uni-due.de)



### Software Systems Engineering Overview of Research Group

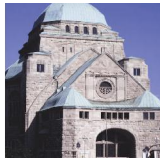
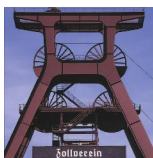
§ Part of the **Institute for Computer Science and Business Information Systems (ICB)**

[www.sse.uni-due.de](http://www.sse.uni-due.de)

§ Founded 1999 in **Essen, Germany**

§ **Head:** Prof. Dr. Klaus Pohl

§ **Team:** 18 staff members (incl. 4 post-docs)  
15 student employees



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## Software Systems Engineering Competencies and Experience

**Software Product Line Eng.** (Green)  
**Quality-Assurance** (Red)  
**Requirements-Engineering** (Blue)  
**Service-based Systems Eng.** (Yellow)

Variability Modelling  
 RE for SPLs  
 (Formal) Analysis of SPL Models  
 SPL Testing  
 Req.-based Testing  
 Feature Interactions  
 Goal- and Scenario-based RE  
 Service-Engineering  
 Risk-based Testing  
 Reference Architectures  
 Service-Technologies

§ Research **projects** (national & EU):  
 – 3 basic research projects  
 – 7 applied research projects

§ **Industry collaborations:**  
 – Daimler, Philips, Siemens, Bosch, ...

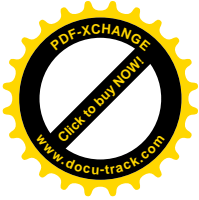
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## Agenda

- § The Future of the Internet  
Some trends
- § S-Cube – The Software Service and Systems Network  
Cross-Disciplinary Research Challenges
- § NESSI & NEXOF (RA)  
Open European Reference SOA
- § Towards Convergence @ European Level  
Future of the Internet Assembly  
ServiceWave 2008

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## S-Cube Overview

### § FP 7 Network of Excellence

### § Project coordination

- Prof. Dr. Klaus Pohl (Project Coordinator),  
University of Duisburg-Essen, Germany
- Prof. Dr. Mike Papazoglou (Scientific Director),  
Tilburg University, The Netherlands

§ **Duration:** 01.03.2008 – 29.02.2012

§ **Total cost:** approx. 11.000.000,- EUR

[www.s-cube-network.eu](http://www.s-cube-network.eu)



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### S-Cube Partners

City University London

Tilburg University

University of Duisburg-Essen (Coordinator)

Lero

University of Stuttgart

INRIA

Vienna University of Technology

Université Claude Bernard Lyon

MTA SZTAKI

Universidad Politécnica de Madrid

Politecnico di Milano

Center for Scientific and Technol. Research (FBK)

University of Crete

Consiglio Nazionale delle Ricerche (CNR)

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### S-Cube Objectives

- § Establish a **unified, multidisciplinary, vibrant research community**
- § Invent the next wave of **service technologies**
- § Establish **agile & holistic service engineering & adaptation** principles, techniques & methods **to foster innovation**
- § Inaugurate a **Europe-wide education and training** programme for researchers and industry
- § Establish a **trust relationship with industry via NESSI**

SOC

BPM

Grid

SE

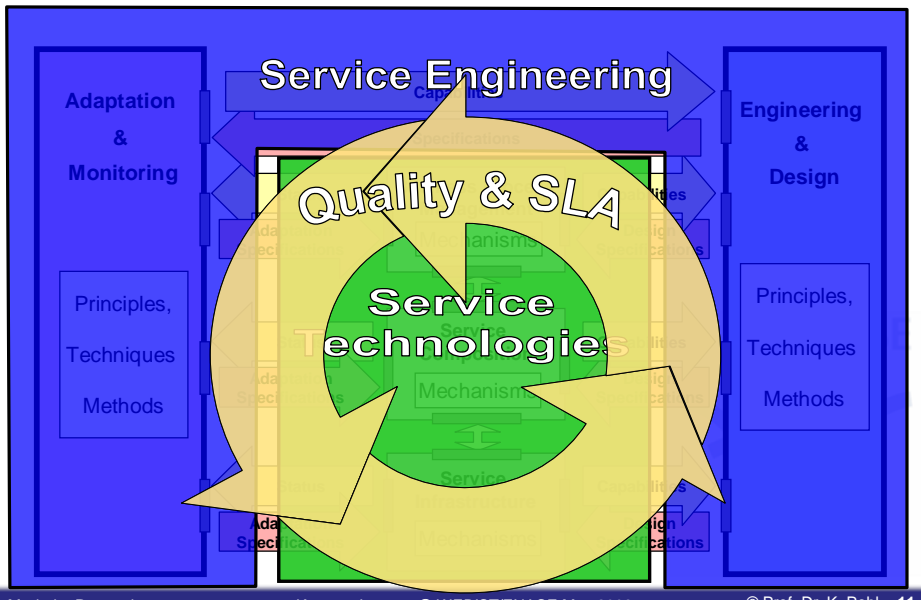
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## S-Cube's Research Framework Overview



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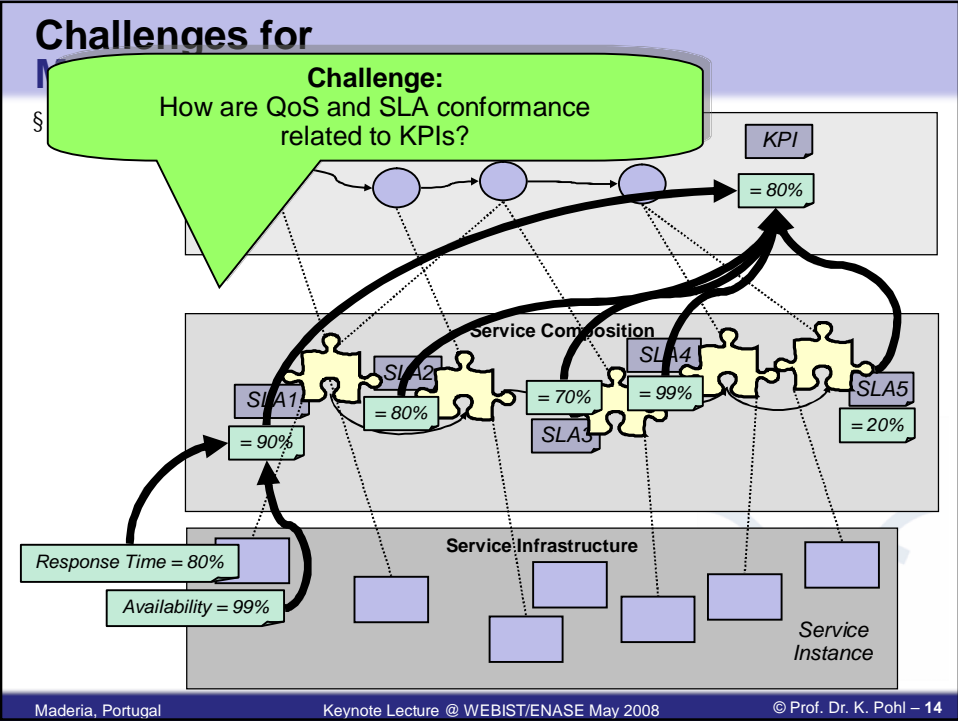
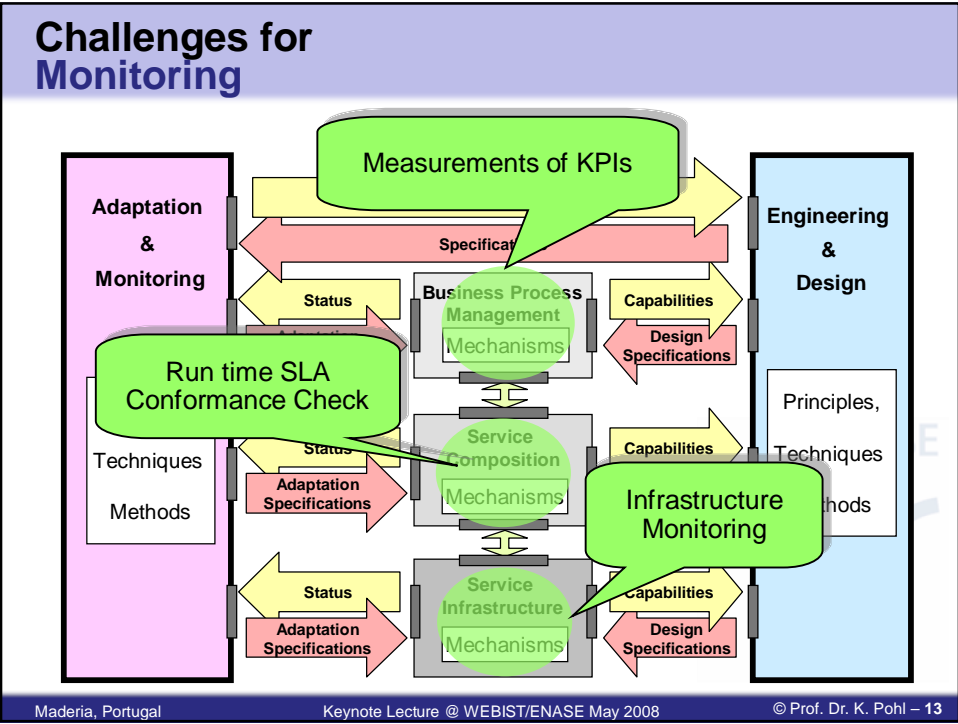
## The Cross-Layer Monitoring Challenge

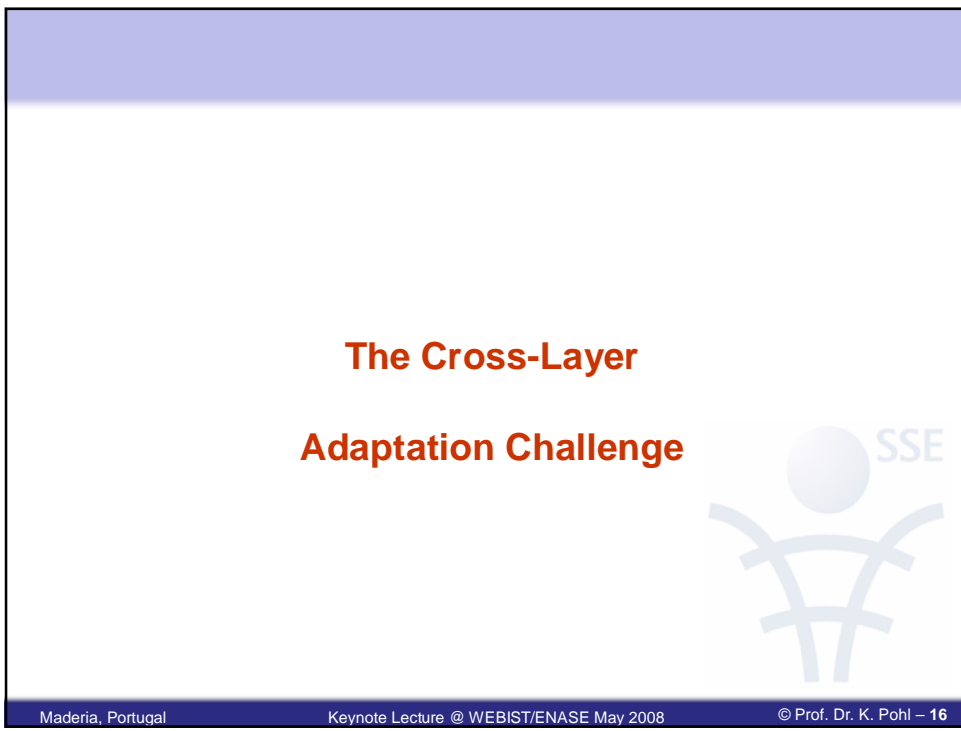
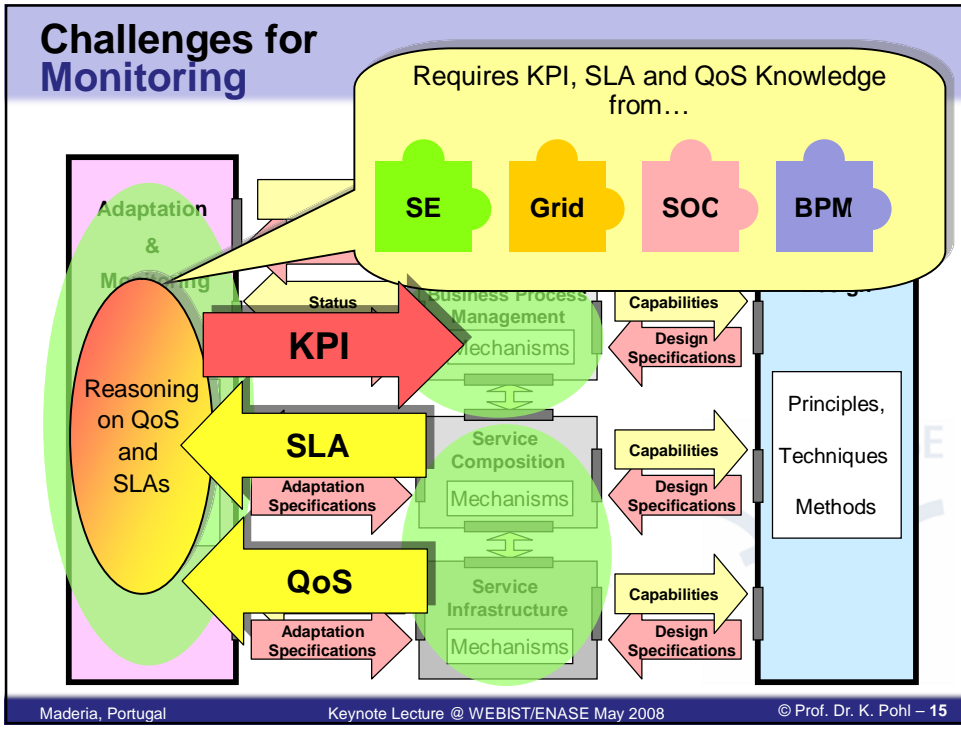


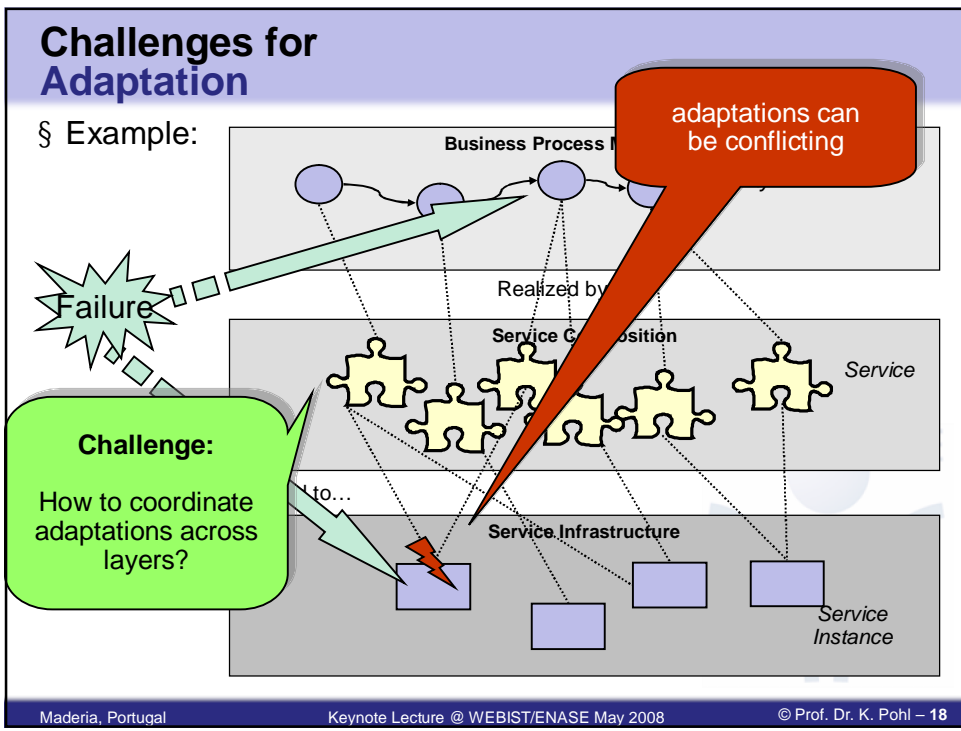
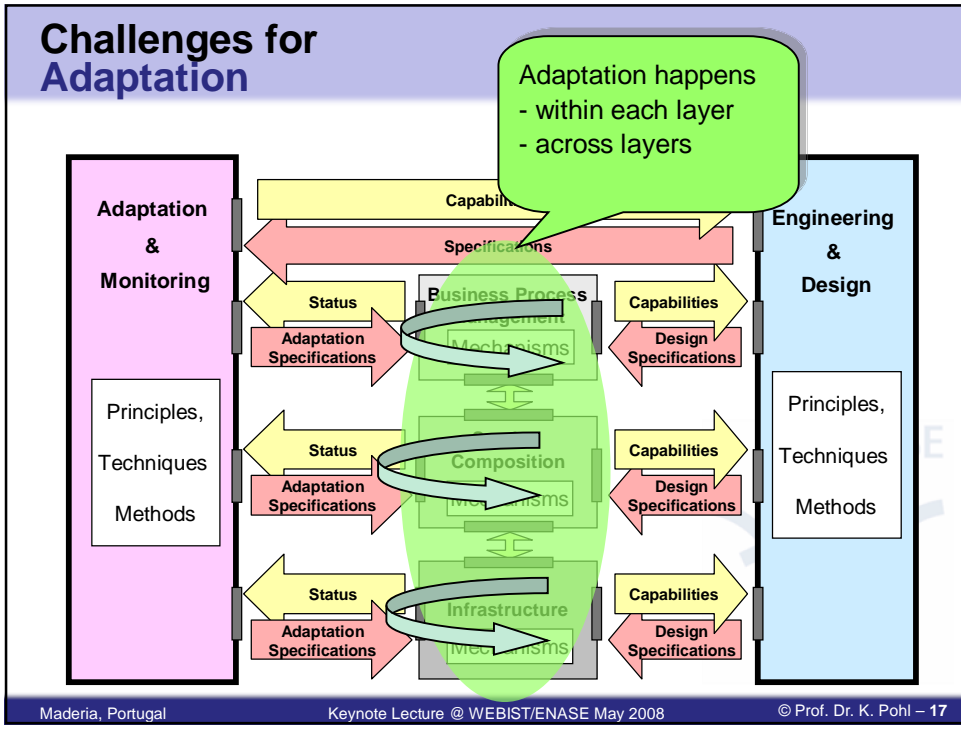
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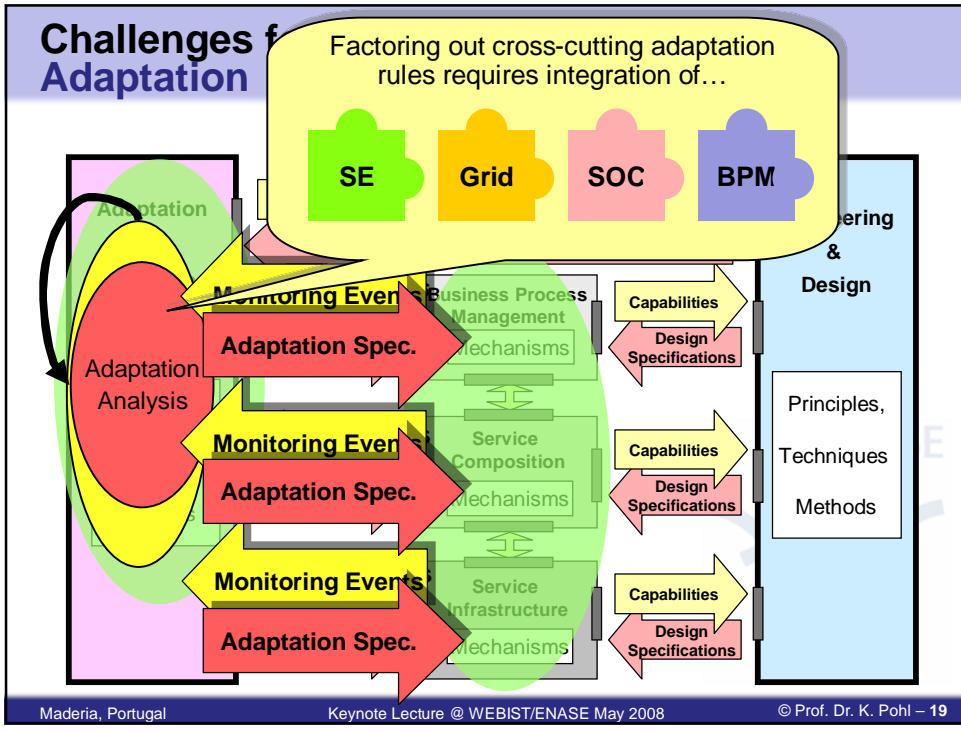
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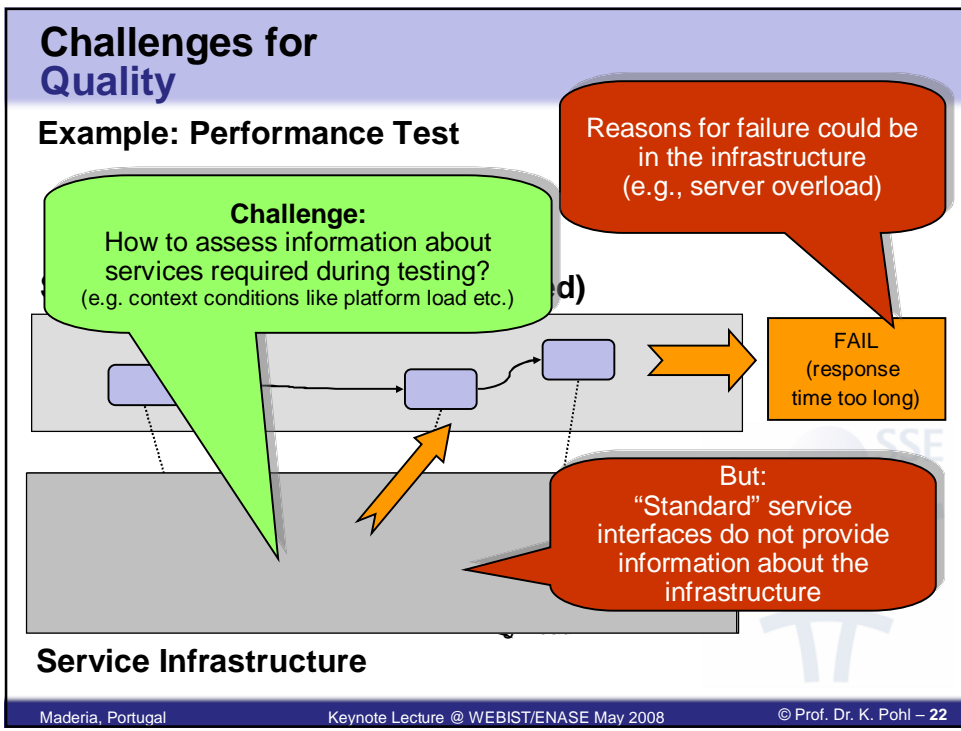
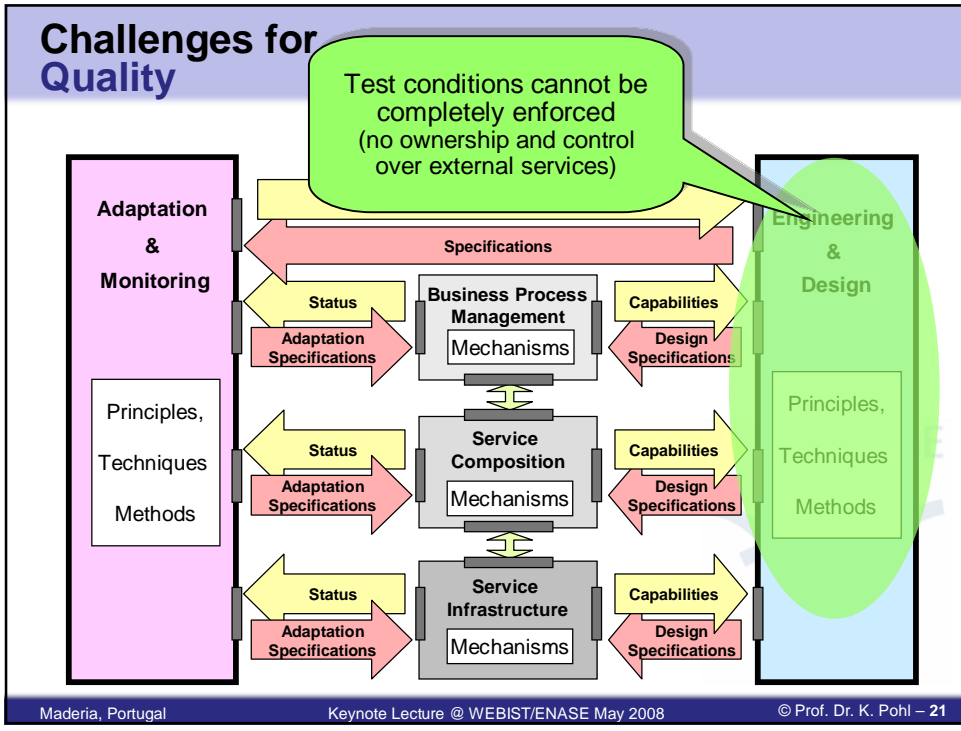


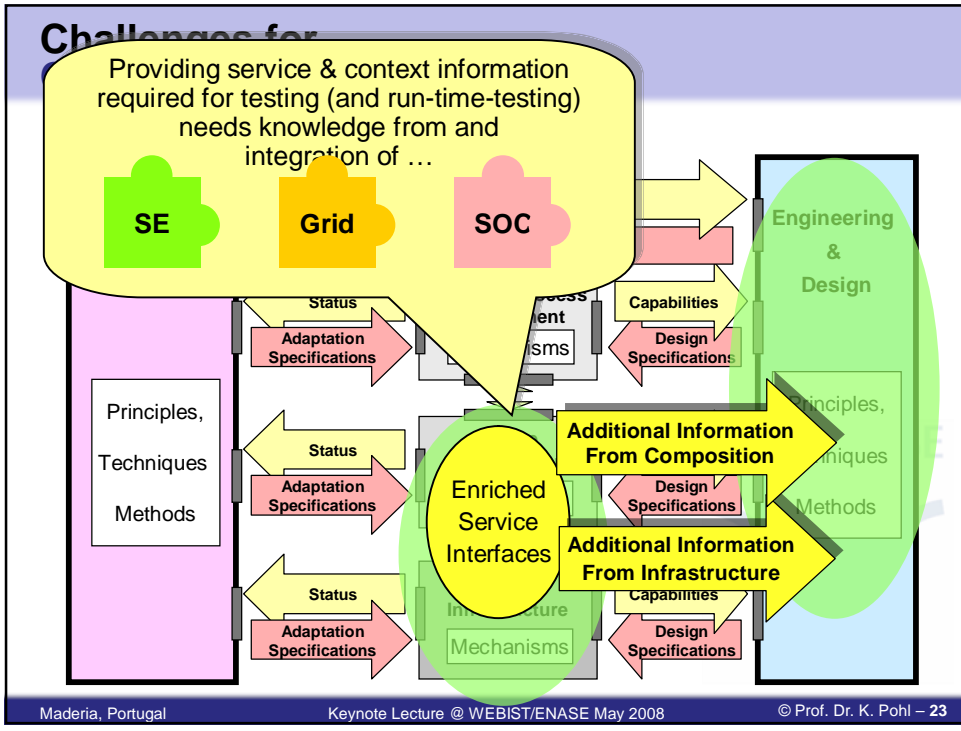


## The Quality "of Service"

### Challenge

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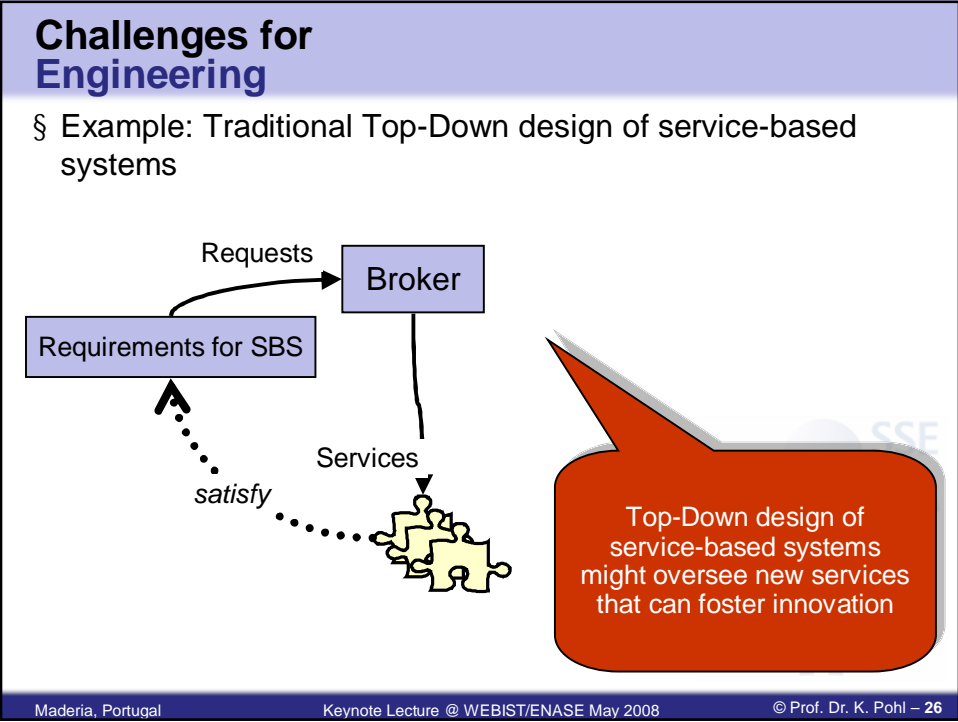
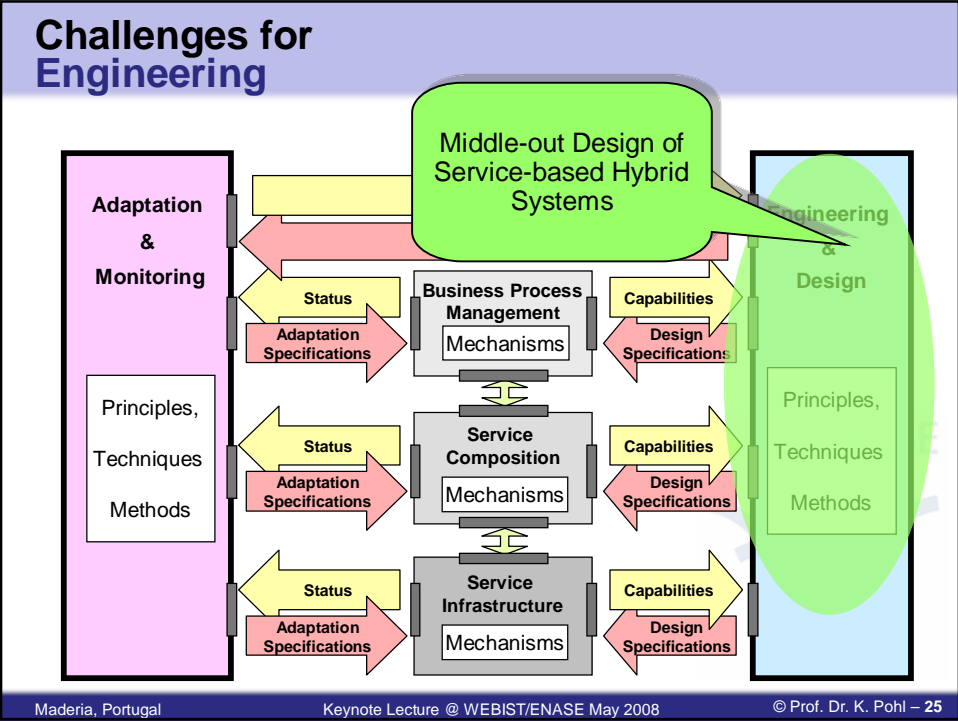




**The Engineering of  
Service-Based Systems Challenge**

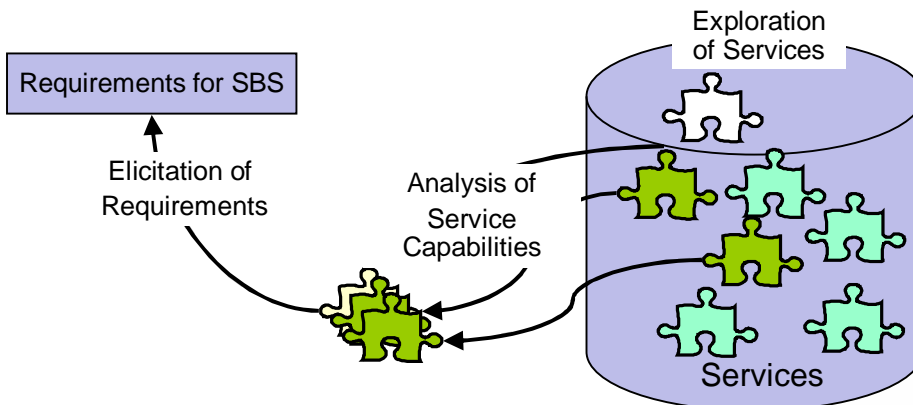
SSE

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## Challenges for Engineering

§ Example: Bottom-Up / Exploratory Design



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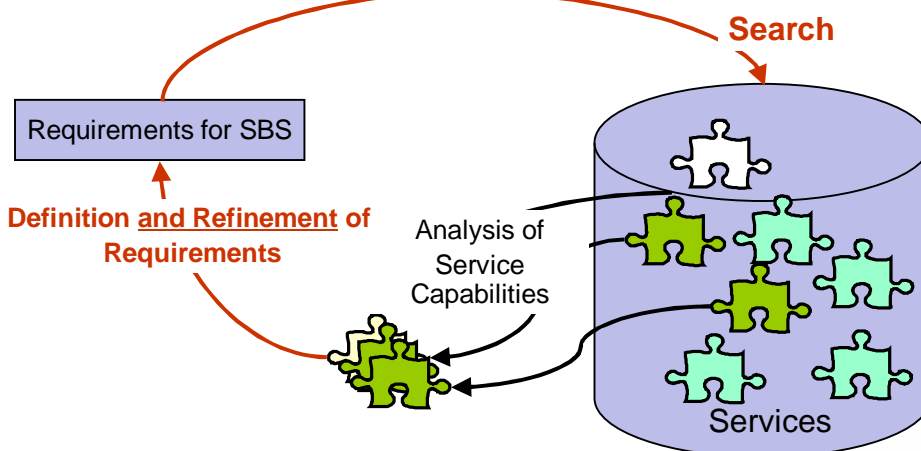
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## Challenges for Engineering

§ Example:

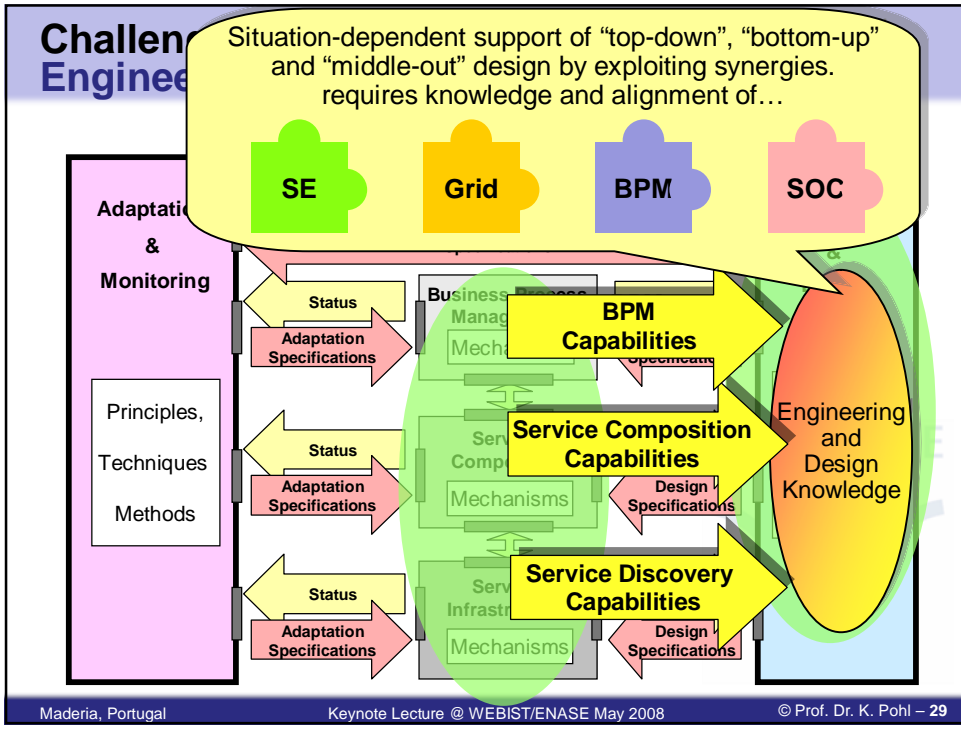
**Challenge:**  
Situation-dependent fusion  
of top-down and bottom-up  
approaches?



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### Mastering the Challenges of the Future Internet of Services

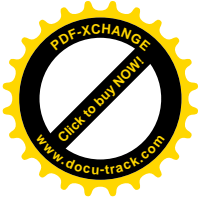
Various attempts to match the challenges:

- agent oriented ...
- end-user empowerment
- formal proofs and reasoning
- high-level composition languages
- self \*
- semantic ...
- virtualization
- +++

à NONE of them will solve the problems (alone J)

à Integrative research is needed !

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**Mastering the challenges requires  
cross-disciplinary research**

**S-Cube provides the “platform”**

**... AND ...**

**you can be part of it**

**à join S-Cube as associated partner**



## Join S-Cube as Associate Partner

### § S-Cube invites

- Organizations, research groups, researchers to join S-Cube as **Associate Partners** on the basis of the identified research gaps.

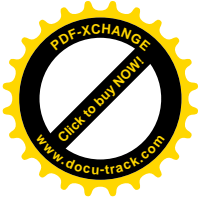
### § Associate Partners

- Receive **travel and subsistence funding** (dedicated S-Cube budget!)
- Have **access to S-Cube internal information**
- Are invited to **attend S-Cube meetings**
- Are invited to attend and contribute to the **training and educational activities**
- Use, experiment with and contribute to the facilities of the **S-Cube Pan European Distributed Services Laboratory**

### § Admission process

- Will be published on the S-Cube Web Portal

[www.s-cube-network.eu](http://www.s-cube-network.eu)



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Future of the Internet Assembly

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There is (only) one way to

handle complexity

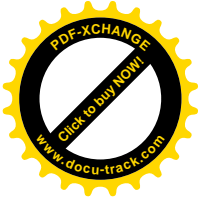
standardization

(abstraction)

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## NESSI Overview



### NESSI:

The European Technology Platform (ETP)  
on Software and Services

[www.nessi-europe.com](http://www.nessi-europe.com)

22 Partners:



Over 250 members from academia & industry

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## NESSI Goals

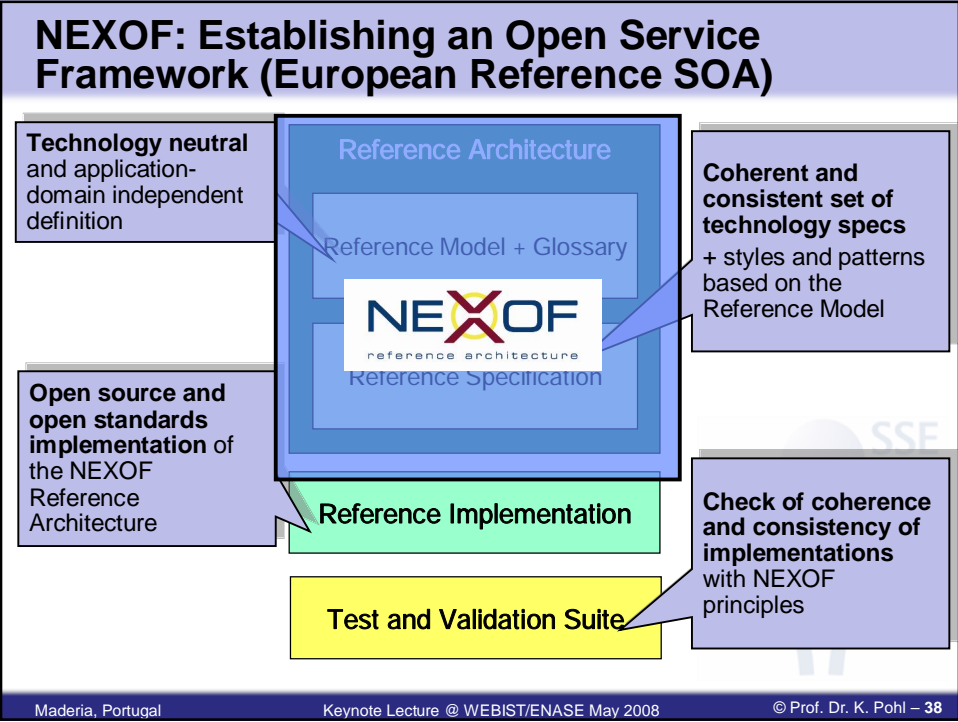
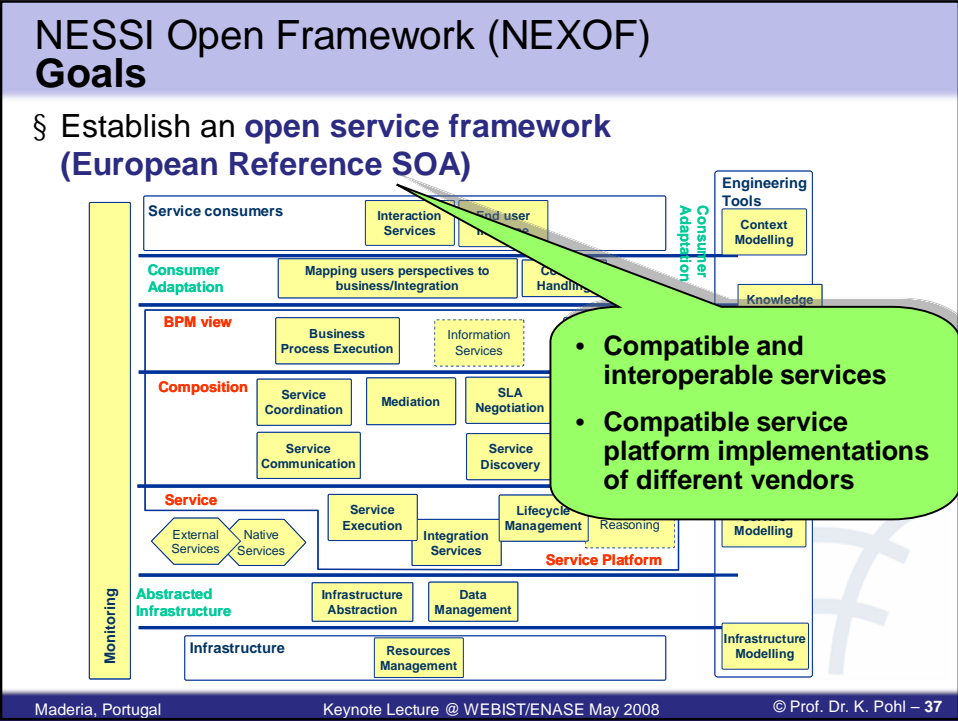
- § Create one **unified pan-European ICT strategy** to encourage investment in European research to promote the development of software and service-oriented ICT architectures. [...]
- § Define **Strategic Research Agenda** areas that need innovative research
- § Drive the standards necessary for implementations of the **NESSI Open Framework (NEXOF)**
- § ...



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## NEXOF-RA General Info


§ **Integrated FP 7 Project**

§ **Project coordination**  
– Stefano Di Panfilis, Engineering, Italy

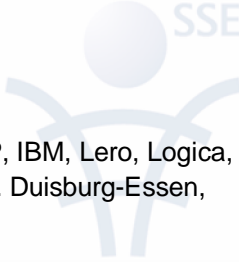
§ **Duration:**  
– 01.03.2008 – 29.02.2010

§ **Total cost:**  
– approx. 4.000.000,- EUR

§ **Partners:**  
Alcatel-Lucent, ATOS Origin, BT, Engineering, HP, IBM, Lero, Logica, Siemens, Telecom Italia, Telefonica, Thales, Univ. Duisburg-Essen, UPM, ...



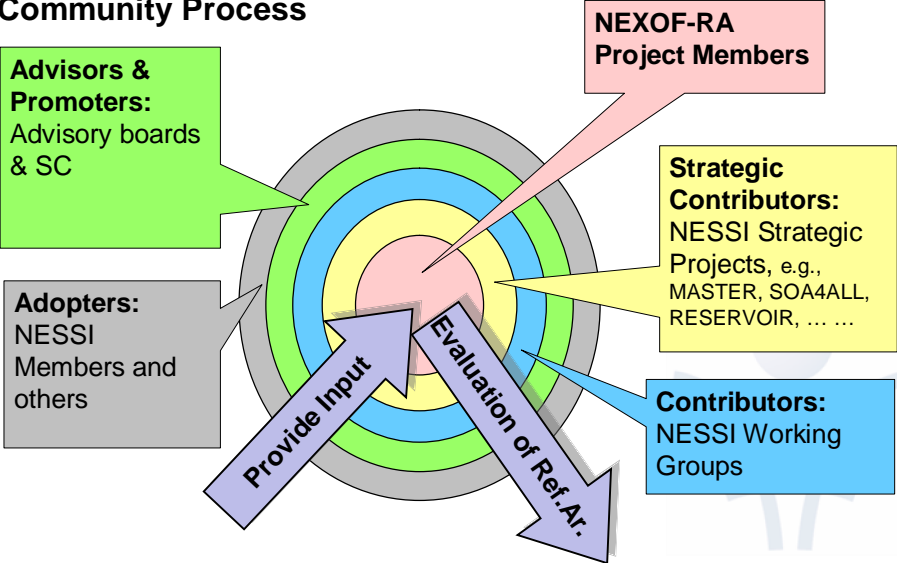
www.nexof-ra.eu



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## NEXOF-RA Defining the European SOA Reference Architecture

### Community Process



**Advisors & Promoters:**  
Advisory boards & SC

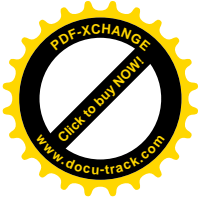
**Adopters:**  
NESSI Members and others

**NEXOF-RA Project Members**

**Strategic Contributors:**  
NESSI Strategic Projects, e.g., MASTER, SOA4ALL, RESERVOIR, ... ..

**Contributors:**  
NESSI Working Groups

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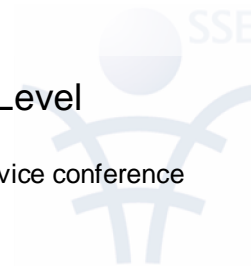
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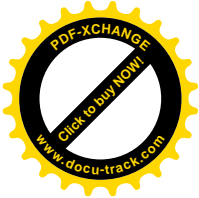
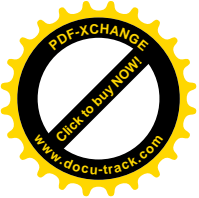
Future of the Internet Assembly

ServiceWave – The European cross-disciplinary service conference



## Future of the Internet Assembly





## Future of the Internet Assembly (FIA)

### Goal:

Trigger open interactions, foster cross-fertilization and enable **convergence** of the following disciplines:

- Network Architectures and Mobility
- Internet of Things
- Content Creation and Media Delivery
- Services and Software Architectures
- Security, Privacy and Trust



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## The BLED Declaration:

Towards a European approach to the Future Internet

30.03.2008

This declaration is endorsed by the following European Technology Platforms and European Research Projects\*:

### eMobility, NEM, NESSI, ISI and EPOSS

2020 3D Media	CHORUS	FAST	N-CRAVE	SAPIR	SOCRATES
4NEM	COIN	FORWARD	NESSI 2010	S-CUBE	SWIFT
4WARD	CONTENT	INTERSECTION	OPEN	SEA	TA2
ADAMANTIUM	CuteLoop	IRMOS	P2P NEXT	SENDORA	TAS3
AGAVE	DICONET	iSURF	PanLab / PII	SENSEI	TECOM
ASPIRE	E3	m CIUDAD	PERSIST	SERVFACE	THINK-TRUST
AUTOI	eCRYPT II	MASTER	PetaMedia	Service WEB 3.0	VICTORY
AVANTSSAR	EFIPSANS	MobileWeb2.0	PICOS	SHAPE	WOMBAT
AWISSENET	EFFEL	MOBITHIN	PRIMELIFE	sISI	
CASAGRAS	eMOBILITY	MOMENT	PRISM	SMOOTH-	
CHIANTI	EURO-NF	NAPA-WINE	RESERVOIR	SOA4ALL	

\*Accession to this declaration is open to existing and future EU Projects that wish to actively contribute

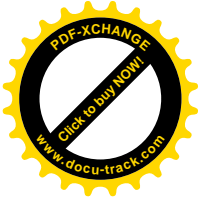
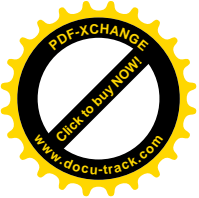
[www.fi-bled.eu](http://www.fi-bled.eu)



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## Future of the Internet Assembly (FIA) Mode of Operation

### § FIA will work towards

- **Common deliverables** creating value for the projects concerned
- **Joint strategic research agenda** regarding common actions and requirements
- Developing a consolidated calendar of events aiming at **avoiding fragmentation** of efforts

### § Two physical meetings per year

- 1st meeting: March, 2008 in Bled, Slovenia
- 2nd meeting: December, 2008 in Madrid, Spain

### § Working groups

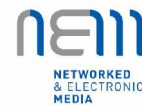
- Carrying out work between the two meetings



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## ServiceWave 2008

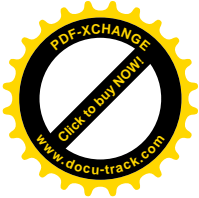
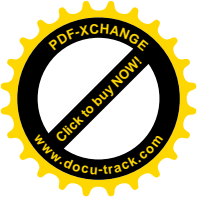
The European Cross-discipline Conference on the  
Future of the Service-based Internet



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**Service Wave 2008**  
December 8<sup>th</sup> - 12<sup>th</sup> - Madrid, Spain



Tue	Wed	Thu	Fri	Sat
Future of the Internet Assembly	Future of the Internet	Research & Industry Tracks	Research & Industry Tracks	Working Groups

**www.servicewave.eu**  
(CFP will be online in 2 weeks)

**ServiceWave 2008**  
A next step toward convergence and integrative research

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**Key Messages**

- § Matching the **challenges of the future internet of services** requires **integrative research**
  - S-Cube provides a platform for it 
- § Handling the **enormous complexity** requires **standardization** (abstraction)
  - NEXOF-RA aims at it on a European level 
- § **Next steps** towards convergences
  - **Future of the Internet Assembly**
  - **ServiceWave 2008**  
Dec. 8<sup>th</sup> - 12<sup>th</sup> - Madrid, Spain

**Questions ?**

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