SENSORIA

Software Engineering for Service-Oriented Overlay Computers

Motivation

*Computing is becoming a utility and software a service. [. . .] applications will
no longer be a big chunk of software that runs on a computer but a combination
of web services; and the platform for which developers write their programs
will no longer be the operating system, but application servers. [The Economist, May2003]*

- Selling services has become the biggest growth business in the IT industry

  - ➢ changes the economics of IT industry and

  - ➢ influences the e-Society as a whole

- Today, services are being delivered through the

  Web, Personal Digital Assistants, mobile phones…

- Tomorrow, they will be delivered on all kinds of

  global computers

Services as Global Computers
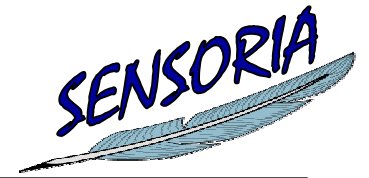
- **Service**

    autonomous, platform-independent computational entity that can be

    described, published, categorised, discovered

- **Services** can be **dynamically assembled** for developing

    massively distributed, interoperable, evolvable systems and applications.

State of Art

- **Service-Oriented Computing**
  - addressed by IT industry only in an ad-hoc and undisciplined way
  - applications have the ability to "talk" to each other but they do not "understand" what they are talking about

    e.g. WSDL only syntactic, BPEL4WS not expressive enough
  - Formal approaches
    - Z, TLA too static, process calculi promising
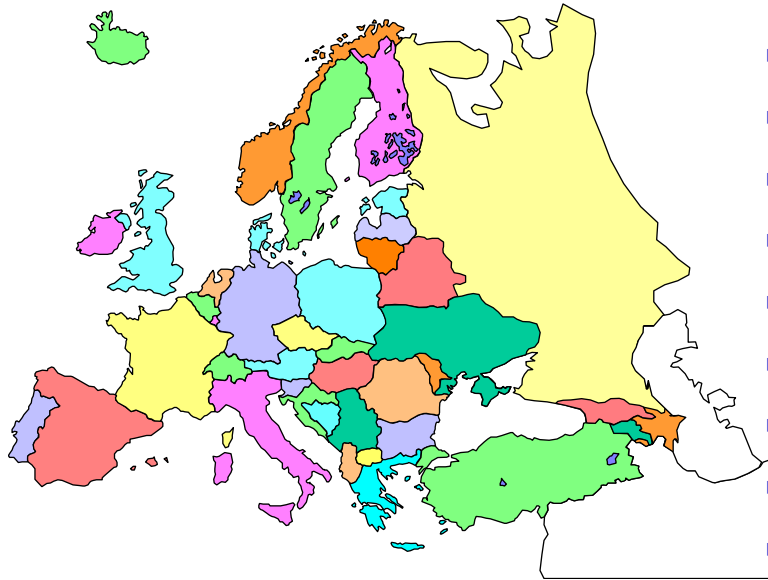   - but no uniform framework for SO Design

- **Web service standards**
  - weakly defined (mainly syntactic, poor semantic foundation, incoherent)
  - next round of standards development: rectification of shortcomings

Aim of SENSORIA

- Novel comprehensive approach to
  **Engineering of software systems for
  Service-Oriented Overlay Computers**
  integrating
  - foundational theories, techniques, and methods and
  - pragmatic software engineering

- **Application areas**
  - e-business,
  - automotive systems,
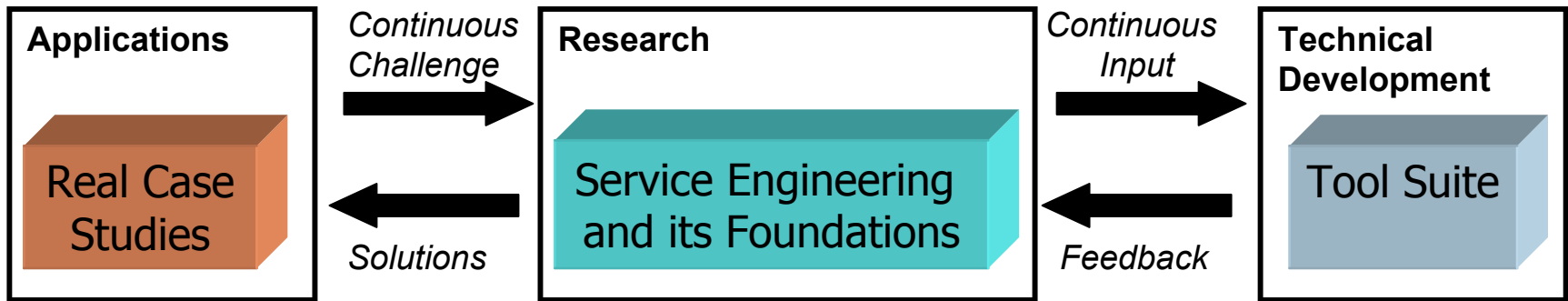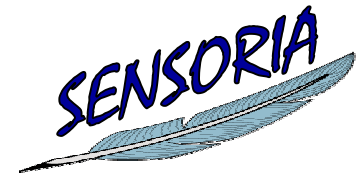 - e-learning
  - telecommunications

SENSORIA – Partners

- **Università di Pisa**
- **Università di Firenze**
- **Università di Bologna**
- **ISTI Pisa**
- **Universidade de Lisboa**
- **University of Edinburgh**
- **ATX Software SA**
- **Telecom Italia Lab**
- **London Software Systems (Imperial College & University College)**
- **FAST GmbH**
- **Budapest University of Technology and Economics**
- **S&N AG**

- **LMU München**
- **Università di Trento**
- **University of Leicester**
- **Warsaw University**
- **TU Denmark at Lyngby**

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Services in SENSORIA

- **General concept of service**
  - independent from particular global computer and from any programming language;
  - described in a modular way, so that
    security issues, quality of service measures and behavioural guarantees are
    preserved under composition;
  - supporting dynamic, ad-hoc, "just-in-time" composition;
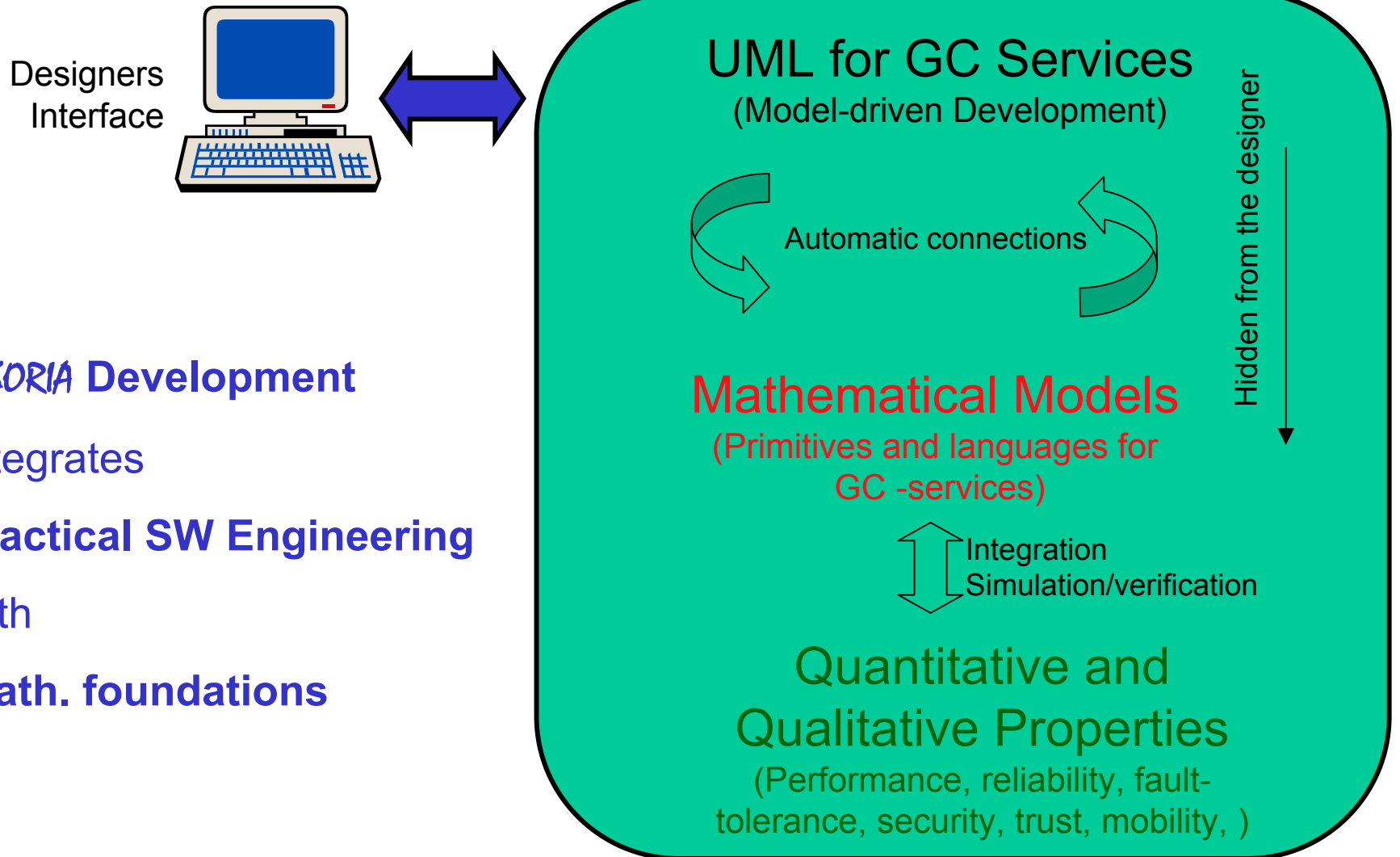 - part of an integrated service-oriented approach to business modelling

General Approach

Applications	*Continuous Challenge* →	Research	*Continuous Input* →	Technical Development
Real Case Studies	← *Solutions*	Service Engineering and its Foundations	← *Feedback*	Tool Suite

- **Research on**
  - Service Engineering and its foundations
- **Tool suite**
  - New SOC language primitives
  - Analysis and CASE tools
- **Case studies**
  - guide research
  - show applicability of research results

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# A Typical Scenario for *SENSORIA* Service Design

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Designers
Interface

UML for GC Services
(Model-driven Development)

Automatic connections

Hidden from the designer

Mathematical Models
(Primitives and languages for
GC -services)

Integration
Simulation/verification

**Quantitative and
Qualitative Properties**
(Performance, reliability, fault-
tolerance, security, trust, mobility,)

SENSORIA **Development**

integrates

practical SW Engineering

with

math. foundations

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SENSORIA Detailed Approach

Summary
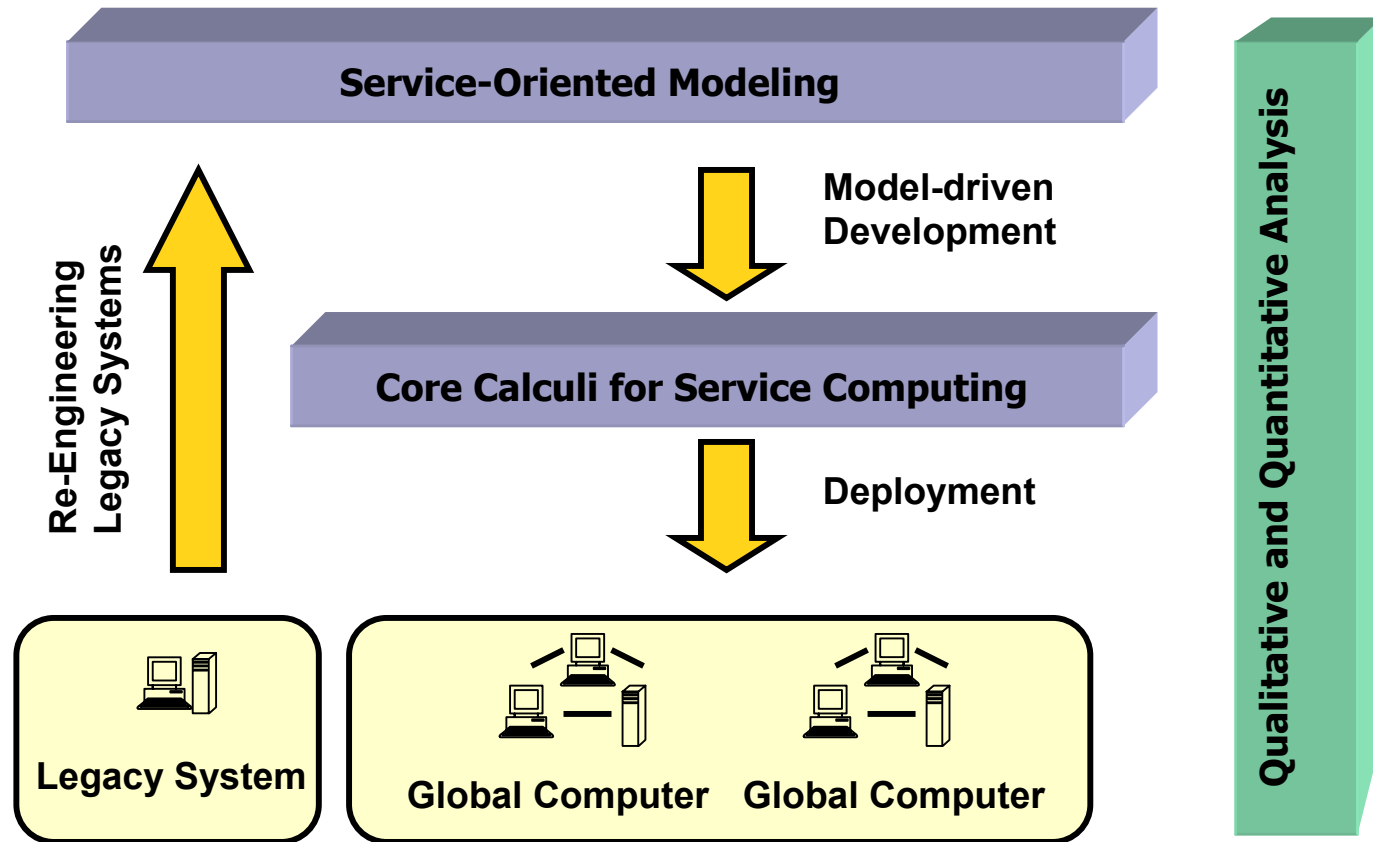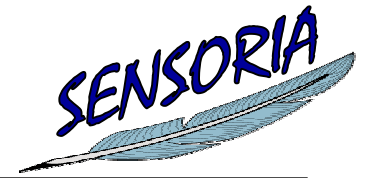
- **Expected results**
  - language primitives for global service-oriented systems
    - modelling and programming
    - full mathematical semantics
  - qualitative and quantitative analysis methods for, e.g.,
    - quality of service, security, performance and resource usage
  - sound engineering methods and deployment techniques
    - forward development through model-based transformations
    - re-engineering of legacy systems
- **Based on**
  - experience of partners covering relevant areas
  - effective collaboration of projects partners, e.g.,
    - in previous FET GC projects (AGILE, DEGAS, PROFUNDIS, MIKADO)
  - continuous information flow between industrial and academic partners

Outlook

- **Service-oriented computing is becoming the driving force behind innovation in IT-industry**

- **Competitiveness of European industries depends on early and successful adoption of this new paradigm**

- *SENSORIA* **will**

  - produce theoretical foundations and practically relevant results

  - strengthen the international position of the EU research community.