Topics

- Future Internet
- Internet of Services
- SOA
- Services
- Semantics
- Use cases
What is the “Future Internet”? 
Future Internet

Internet of Services, Service Web
- Collective End-user Intelligence
- Multi-Channel Access
- Discovery
- Mashup
- Tagging
- Resources

Professional Business Applications
Value-Added Services
Interoperability Service

Networks of the Future

3D Internet

Trust

Security

Internet of Things
Future Internet: Simple Terms

• Internet of Services, where services are ubiquitous;
• Internet of Things where in principle every physical object becomes an online addressable resource;
• Mobile Internet where 24/7 seamless connectivity over multiple devices is the norm;

• Need for semantics in order to meet the challenges presented by the dramatic increase in the scale of content and users.
Future Internet: Expectations

• **Open**
  – Status, size, nature of organisation; individual circumstances are no barrier

• **Scalable**
  – A platform which integrates billions or trillions of entities;

• **Dynamic and Proactive**
  – Services and service requesters may appear and disappear
  – Services should adapt smoothly

• **Decentralised**
  – New approaches to management are required in order to extract business value from utilisation

• **Partially predictable**
  – Size, dynamicity and distribution of coordination prohibits a predictable global behaviour

• **Perfectly Interactive**
  – Permanent, transparent, seamless, trustworthy
AKARI - New Generation Network (NWGN)
Europe/Japan Collaborative Efforts:
• This year: Cooperation Forum & Symposium – USA?
• **GENI** - develop a shared experimental facility (test-bed) for promoting research and development of new Internet architectures or network services. *Clean slate approach*

• **FIND** - comprehensive network architecture design research towards the establishment of the Internet architecture of the future

• **SING** - Another clean-slate approach to network design focusing upon communications, computing, signal processing and network science

• **NGNI** - development of both the information systems and the networking technologies
International Service Industry

Core Business Services
- Trust
- Identity Management
- Dependability
- Reliability
- Scaleability
- 

Global Service Delivery Platform

Core Internet Infrastructure Services

Devices and Components

Future Internet

Internet of Services

Future Network Infrastructure
Future Internet

Internet of Services, Service Web

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- Multi-Channel Access
- Discovery
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- Resources

Professional Business Applications

Value-Added Services

Interoperability Service

3D Internet

Trust

Security

Networks of the Future

Internet of Things
Future Internet Assembly

Network Architecture and Mobility
Internet of "Things"
Content creation and delivery
Services Architectures

Trust, Security, Privacy

FIRE Future Internet Res & Exp

emobility - NEM - NESSI - ePosss - ISI

P2P NEXT
TA2
2020 3D Media
NAPA-WINE
SEA
ADAMANTINUM
SAPIR
VICTORY
PetaMedia
CONTENT
4NEM

IRMOS
NEXOF-RA
RESERVOIR
SLAdSOI
SOAdALL
OPEN
SHAPE
m CIUDAD
PERSIST
SERVFACE
S-CUBE
Service WEB 3.0
NESSI 2010

MASTER
TAS3
PRIMELOFLFIE
TECOM
AVANTSSAR
AWISSENET
WOMBAT
PRISM
SWIFT
PICOS
eCRYPT II
FORWARD
THINK-TRUST

ASPIRE
COIN
CuteLoop
iSURF
CASAGRAS

TRILOGY
4WARD
EFIPSANS
E3
SENSEI
CHIANTI
PSIRP
N-CRAVE
MOBITHIN
MOMENT
AUTOI
SMOOTH-IT
SOCRATES
ETNA
SENDORA
EURO-NF (NoE)
sISI
EIFFEL
eMOBILITY
MobileWeb2.0

ONELAB2
PII
FIREWORK
PARADISO
OPNEXT
ECODE
N4C
SmartNet
Perimeter
Echos
ResumeNet
SelfNet
VITAL++
WISEBED

IP
STP
NOE
SA
Future Internet:
Network Architecture & Mobility

Network Infrastructures and Architectures

Application Server

Public Internet

Optical Transmission

Gateway

Operator A

Optical Switching

High Speed Broadband Access

Personal Space

Ad-hoc Mesh Relay

Cellular and beyond

Object and Sensor Networks

Broadcast

Technologies for the Future Internet

Operator B

Application Server
Future Internet: Network Architecture & Mobility

IP Bottleneck

downloading/delivery email WWW phone...
transport layer/transport protocol
TCP UDP...
transport layer/IP
IP
link layer/physical layer
ethernet PPP...
physical layer
CSMA async sonet...
copper fibre radio...
Future Internet: Internet of Things

- Chip Size 0.4mm x 0.4mm
- Radio Frequency 2.45GHz
- ROM
- ID Data Length: 128bit
- ID written in Silicon Wafer
- Unique ID Assignment
Future Internet: Content Creation & Delivery

April 2008 “Web3D: The Next Major Internet Wave”

Evolution Of The Multidimensional Web

Interactivity

Static

Immersive

Pre-Web Internet

Text UI

Basic graphical UI

Rich, interactive graphical UI

3-D digital experience

Hybrid virtual/real-world experience

Richness of experience

Web 2.0

Web3D

WebXD
Future Internet: Services Architectures

**Service Front-ends:**
- FAST, m:Ciudad, Persist, OPEN, ServFace

**Service Architectures:**
- SOA4ALL, SLA@SOI, SHAPE, Romulus, OMP

**Virtualised Infrastructures:**
- RESERVOIR, IRMOS, SmartLM, STREAM, ADMIRE

Reference service architecture: NEXOF-RA

**Service/Software Engineering**
(complexity, dependability):
- DEPLOY, Protest, COMPAS, ALIVE, MOST, MANCOOSI, DIVA, Q-Impress

Network of Excellence: S-Cube

**Support actions:**
- NESSI 2010, Service Web 3.0, Flossinclude

*IP/NoEs in bold*
Future Internet: Trust, Security, Privacy
4oD uses peer to peer ("P2P") technology. This allows content to be transferred directly from the computers of users of the Service (rather than through a website or directory). If you download Content to your computer, during the License Period, we may upload this from your computer (using part of your upstream bandwidth) for the purpose of transferring Content to other users of the Service. Please contact your Internet Service Provider ("ISP") if you have any queries on this.
Topics

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- Semantics
- Use cases
Internet of Services

Service Front-ends:
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*IP/NoEs in bold
Internet of Services

• **Service Front-ends**
  – Automatic service discovery, description, composition, negotiation; SLA QoS; access rights

• **Service Architectures**
  – Robust, scalable, open

• **Service and Software Engineering**
  – Methods and tools for faster development
  – Higher-quality lower-cost services.

• **Virtualized Infrastructures**
  – Abstraction over different platforms
Internet of Services

- **Openness** – everybody can act as a provider or consumer of services.
- **Heterogeneity** – services are created in isolation from one another thus interoperability is an issue.
- **Distributedness** – there is no central control of services. Services can appear, change or disappear at any time in an uncontrolled fashion.
- **Scalability** – with so many services available on the Internet of Service, the Human may become the bottleneck.
### Questions: Software and Service Challenges

- What will be in the network and what in the service layer? How will content and media impact be addressed?

- How do we address the likely architectural differences between Telecoms, Media and IT service cultures?

- Is there scope for an open service framework? What are the security and trust implications? How to best address standards issues?

- How will we personalise and contextualise applications for individuals and empower them to compose their own services?

- Do we need to rethink current business processes in light of the upcoming Internet of Things? What are the implications from a service architecture perspective?

- Will this lead to a lowering of the barriers for service development and the repositioning of industrial players or opportunities for new players?

### Challenge areas

<table>
<thead>
<tr>
<th>Service front-ends</th>
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<tbody>
<tr>
<td>Services platforms</td>
</tr>
<tr>
<td>Virtualisation of the Infrastructure</td>
</tr>
</tbody>
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*European Commission: Information Society and Media*
Where are we now?

- **Internet =**
  - *Urgent necessity to redesign the Internet, taking a broad multidisciplinary approach, to meet Europe’s societal and commercial ambitions.*
    » The BLED Declaration - European Commission
  - *With over a billion users, today's Internet is arguably the most successful human artifact ever created.*
    » Service Web 3.0 & STI International
  - *One global machine – the most reliable machine ever made.*
    » Kevin Kelly – Executive Editor Wired Magazine
One Machine
2 million emails per second
1 million IM messages per second
8 terabytes of traffic per second
65 billion phone calls per year
255 exabytes of magnetic storage
1 million voice queries per hour
2 billion location nodes activated
600 billion RFID tags

... all of which only uses 5% of global electricity
170 quadrillion transistors
55 trillion links
2 megahertz email
31 kilohertz text messages
162 kilohertz instant messages
14 kilohertz search
9 exabytes RAM
7 terabytes/second bandwidth
800 billion kwh/year power consumption

Specifications of the **One Machine**
• There is only One machine
• The web is its OS
• All screens look into the One
• No bits will live outside the web
• To share is to gain
• Let the One read it
• The One is us

Kevin Kelly’s predictions
Topics

- Future Internet ✔
- Internet of Services ✔
- SOA
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- Semantics
- Use cases
“A set of components which can be invoked, and whose interface descriptions can be published, discovered and invoked over a network.” (W3C)

» http://www.w3.org/
SOA – Further Defined

• The policies, practices, frameworks that enable application functionality to be provided and consumed as sets of services published at a granularity relevant to the service consumer. Services can be invoked, published and discovered, and are abstracted away from the implementation using a single, standards-based form of interface. (CBDI) www.cbdiforum.com
SOA

• Web services offer a technological means for exposing functionality on the Web
• Very easy to create bad Web services
  – Wrong granularity
  – Wrong abstraction
  – Wrong generality
  – Not decoupled
• SOA is a paradigm for building applications from Web services to achieve business goals but…
SOA

- It is also a discipline ensuring services are right for consumer and producer
  - Reduces the effort of integration
  - Minimizes the impact of change
  - Delivered at appropriate levels of granularity, abstraction and generality
SOA Model

• Service provider - Provides software applications for specific needs as services.
• Service requester - A requester could be a human user/application program/another service accessing the service through a desktop or a wireless browser; it could be an application program.
• Service broker - A service broker provides a searchable repository of service descriptions. Examples of service brokers are UDDI (Universal Description, Discovery, and Integration).
Topics

- Future Internet ✔
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- SOA ✔
- Services
- Semantics
- Use cases
The Rise of the Service Economy
Services

• Wide range of services:
  – Communication Service
  – Ticket Reservation Service
  – Transport Service
  – Information Service
  – Finance Service
  – E-government Service

But what is a Service?
What is a service?

Main Entry: ser·vice
Function: noun
Etymology: Middle English, from Anglo-French servise, from Latin servitium condition of a slave, body of slaves, from servus slave
1 a: the occupation or function of serving <in active service> b: employment as a servant <entered his service>
2 a: the work performed by one that serves <good service> b: help, use, benefit <glad to be of service> c: contribution to the welfare of others d: disposal for use <I'm entirely at your service>
3 a: a form followed in worship or in a religious ceremony <the burial service> b: a meeting for worship —often used in plural <held evening services>
4: the act of serving: as a: a helpful act <did him a service> b: useful labor that does not produce a tangible commodity —usually used in plural <charge for professional services> c: serve
5: a set of articles for a particular use <a silver tea service>
6 a: an administrative division (as of a government or business) <the consular service> b: one of a nation's military forces (as the army or navy)
7 a: a facility supplying some public demand <telephone service> <bus service> b: a facility providing maintenance and repair <television service>
8: the materials (as spun yarn, small lines, or canvas) used for serving a rope
9: the act of bringing a legal writ, process, or summons to notice as prescribed by law
10: the act of a male animal copulating with a female animal11: a branch of a hospital medical staff devoted to a particular specialty <obstetrical service>
What is a service?

• For different people the term Service has different meaning:

• In Computer Science:
  – the terms service and Web service are often regarded as interchangeable to name a software entity accessible over the Internet.
  – a service is seen software system designed to support interoperable machine-to-machine interaction over a network
What is a service?

• **In Business and Economics:**
  
  – a service is seen as a business activity that often results in intangible outcomes or benefits
  
  – a service is the non-material equivalent of a good. Service provision has been defined as an economic activity that does not result in ownership, and this is what differentiates it from providing physical goods.
  
  – a process that creates benefits by facilitating either a change in customers, a change in their physical possessions, or a change in their intangible assets.
Service vs. Web Service

• **Service**
  – A provision of value in some domain (not necessarily monetary, independent of how service provider and requestor interact)

• **Web Service**
  – Computational entity accessible over the Internet (using Web Service Standards & Protocols), provides access to (concrete) services for the clients.
Service properties

• **Functional**
  – contains the formal specification of *what* exactly the service can do.

• **Behavioral**
  – *how* the functionality of the service can be achieved in terms of interaction with the service and as well in terms of functionality required from the other Web services.

• **Non-functional properties**
  – captures constraints over the previous mentioned properties
Service related tasks

• **Discovery:** “Find services that matches to the service requester specification”

• **Selection and Ranking:** “Choose the most appropriate services among the available ones”

• **Composition:** “Assembly of services based in order to achieve a given goal and provide a higher order of functionality”.

• **Mediation:** “Solve mismatches among domain knowledge used to describe the services, protocols used in the communication, data exchanged in the interaction (types used, and meaning of the information) and business models of the different parties”.

• **Execution:** “Invocation of a concrete set of services, arranged in a particular way following programmatic conventions that realizes a given task”.

• **Monitoring:** “Supervision of the correct execution of services and dealing with exceptions thrown by composed services or the composition workflow itself”.

• **Handover:** “Replacement of services by equivalent ones, which solely or in combination can realize the same functionality as the replaced one, in case of failure while execution”.

Service Lifecycle

- Analysis
- Design
- Build, Buy, Integrate
- Deploy, Maintain, Support
- Evolve Services

www.sti2.org
Topics

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• Semantics
• Use cases
Web 2.0
Web Services

Semantic Web → Web 3.0

Web → UGC

Web Services → Dynamism

UGC → Semantics

Web 2.0 → Web 3.0

Web 2.0 → Web

Web → Web Services

Semantics

Dynamism
A Web of Applications

Semantic Web  \rightarrow  Web 3.0

Web 2.0  \rightarrow  Web of Applications

Web Services  \rightarrow  UGC

Semantics  \uparrow

Dynamism  \downarrow
Web services

• Bring the computer back as a computational entity on the Web

• Discrete pieces of functionality exposed for consumption

• Aim of Web services:
  – Platform independence
  – Loose coupling
  – Facilitate reuse
  – Reduce maintenance costs and impact of change
  – Consistent approach to integration
  – Reduce integration costs

• Two main approaches to services
  – WSDL/SOAP services
  – Restful services
WSDL/SOAP Web Services

- **UDDI Registry**: Points to Description
- **WSDL**: Describes Service
- **Service Consumer**: Finds Services
- **Web Service**: Points to Service
- **SOAP**: Communicate with XML Messages
Rest Web Services

- Much more flexible means for service creation…. 

- …. but flexibility can make them harder to consume and easier to get wrong

- 4 methods:
  - GET
  - PUT
  - POST
  - DELETE

- No necessity for using XML

- Appear to be becoming more common but WSDL/SOAP still prevalent
Service Oriented Architectures

- Web services offer a technological means for exposing functionality on the Web

- Very easy to create bad Web services
  - Wrong granularity
  - Wrong abstraction
  - Wrong generality
  - Not decoupled

- SOA is a paradigm for building applications from Web services to achieve business goals but....

- It is also a discipline ensuring services are right for consumer and producer
  - Really reduces the effort of integration
  - Truly minimizes the impact of change
  - Delivered at appropriate levels of granularity, abstraction and generality
Deficiencies of Web services

- UDDI Registry
  - Points to Description
  - Points to Service
  - Finds Service (Manual)
  - Syntactic
- WSDL
  - Describes Service
  - Communicate with XML Messages
  - SOAP Manual
- Service Consumer
  - Communicate with SOAP
  - Service
  - Manual
Service Engineer activities

• Find services that can be integrated within an application
  – Browse UDDI repository reading textual description
  – Check WSDL to ensure it says what it says it does

• Identify the best service
  – Lookup additional data sources
  – Very hard without invoking each service
  – Find someone who used it before?

• Understand the interface
  – What is the order of the operations?
  – What do I have to send? and What do I get back?

• Compose services together
  – Make different identified services work together
  – Lots of XML transformation

Lots of Manual Labor
What happens when...

• New services appear
  – May be cheaper, faster, more available
  – Application cannot use them until engineer finds and integrates them

• Existing services change
  – Web services promise decoupling but interface changes still break integration
  – Application goes offline until engineer can repair integration

• Existing services disappear or go offline
  – Services may be discontinued
  – Services may go down due to overload or maintenance
  – Application goes offline until engineer replaces service or services returns from outage

=> Failover can be built in but catastrophic failure is just one or two services away
Semantic Web Services

- Brings the benefits of Semantics to the executable part of the Web
  - Ontologies as data model
  - Unambiguous definition of service functionality and external interface

- Reduce human effort in integrating services in SOA
  - Many tasks in the process of using Web services can be automated

- Improve dynamism
  - New services available for use as they appear
  - Service Producers and Consumers don’t need to know of each others existence

- Improve stability
  - Service interfaces are not tightly integrated so even less impact from changes
  - Services can be easily replaced if they are no longer available
  - Failover possibilities are limited only by the number of available services
Semantic Web Services

- Semantic Web Services are a layer on top of existing Web service technologies and do not aim to replace them.

- Provide a formal description of services, while still being compliant with existing and emerging technologies.

- Distinguish between a Web service (computational entity) and a service (value provided by invocation).

- Make Web services easier to:
  - Find
  - Compare
  - Compose
  - Invoke
Semantic Web Services

Service Consumer

Describes Requirements

Semantics Goal

Semantic Execution Environment

Published to

Semantic Web Service

Describes Service

WSDL

SOAP

Communicate with XML Messages

Web Service
Service Oriented Architecture

Custom Application

Web Service

Web Service

Web Service

Web Service

Web Service

Web Service

Web Service

Web Service

Web Service
Semantically Enabled SOA
Semantic Web Layer Cake
Technology Trends

- AI
- Semantic Web
- SOA

... all still alive and well.
Topics

• Future Internet ✔
• Internet of Services ✔
• SOA ✔
• Services ✔
• Semantics ✔
• Use cases
Use Cases

• SUPER

• SOA4ALL

• COIN
- Semantics Utilized for Process management within and between Enterprises (SUPER)
- The major objective of SUPER is to raise Business Process Management (BPM) to the business level, where it belongs, from the IT level where it mostly resides now. This objective requires that BPM is accessible at the level of semantics of business experts.
### Key Objectives

**Scientific objectives**
- construction and assessment of technological framework for SBPM,
- acquiring new generic languages suited for representation of processes, different process models and goal description having in mind all aspects of system behaviour (e.g. costs, dependencies, constraints, other data flows, time limitations),
- creation of automated annotation techniques of already existing BPs, their fragments, IT components etc,
- development of process query tools
- adjustment existing reasoners to the specific needs of SUPER
- elaboration of industrial-strength mediation procedures for automated coupling between business and IT perspectives
- augmentation of SWS foundations on the basis of new experiences obtained from their deployment to large-scale test environments.

**Technical objectives**
- building horizontal ontologies in aim to annotate both complete BPs and their fragments,
- assembling vertical ontologies for the chosen implementation domain,
- complete inventory of tools supporting every stage of SBPM.
How Semantics Help

• Semantic technology improves the utility of BPM by creating a semantic glue between different layers, artefacts and models
• Links between business artefacts help to keep the big picture and to improve the overall understanding of complex relationships and interdependencies
• By unifying the vocabulary and explicating differences in a structured way, semantics support the understanding of business people and technicians
SUPER Model Stack

- Making sense of a domain/problem
- Communication tool
- What is it all about?
- Solution maps
- Mind maps
- Ad-hoc modelling techniques
- ...

- Visualizing/specifying business process
- Focus: Business Problem
- Who does what, when, how and why?
- Usually multiple layers
- Business Scenario Maps
- Event-driven process chains
- Flowchart techniques
- BPMN
- ...

- Process execution specification
- Formal, clearly specified grammar
- Focus: Implementation
- Which component is called when, how, by whom with which data?
- BPEL
- ...

- Web service encapsulation
- Focus: Implementation
- Which components can and should be exposed as services?
- WS*
- ...

- Implementation of components
- Programming languages
- ...

Use of semantics allows us to cross business process representational boundaries
The **SUPER methodology** is a set of phases, methods and techniques to perform activities using SUPER technologies. Like a traditional BPM methodology, the SUPER methodology owns a proper business process lifecycle, that is enriched with the semantic connotation of the overall SUPER framework.
SUPER Architecture

Semantic BPEL Execution Engine
Semantic Execution Environment
Modelling Tool
Monitoring & Management Tool
Analysis Tool
Deployment
Event Sink
Protocol Binder

SBP Composition
SBP Process Mediation
Business Process Library
Semantic Web Services Repository
SUPER Repositories

SBP Discovery
Data Mediation
Transformation

SBP Reasoner

Semantic Web Services
Repository
Execution History

SUPER Execution
SUPER Tooling

SUPER Execution
SUPER Tooling

Semantic Service Bus

SUPER Platform Services

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STI INTERNATIONAL
Benefits

- Explicate Semantic Meaning of Data & Models
- Semantic Coherency of Information among several levels of BPM
- Higher Flexibility for Web Service usage
- Automated Handling of Potential Heterogeneities
- Make process definitions better understandable
Semantic Business Process Modelling

• First step of the SUPER Life Cycle

• Development of the Business Processes Model based on the Business Process Modelling Ontology (BPMO)

• Use of a Semantic Process Modelling Environment
  – WSMO Studio
  – Integrated BPMO Editor
Modelling Requirements and Methodology

- **Business Process Model based on:**
  - Company specific Business Function and Domain Ontologies
  - Semantic Web Services and Goals

- **Business Process Model sources are:**
  - Business Analyst implicit knowledge and studies (business questions, Key Performance Indicators (KPIs), business outcomes, etc.)
  - Analysis reports created in an eventual previous Semantic Business Process (SBP) Analysis phase

- **Several modelling methodology are possible:**
  - Start business process modelling from scratch
  - Modify existing semantic business processes
  - Annotating non-semantic business processes
  - Re-use process patterns previously modeled
Benefits of SUPER Modelling

- Business Process Modelling Notation (BPMN) independence (BPMO representation)
- Discovery of existing Business Processes exploiting the semantic information
  - Search on specified Business Function, Business Domain and Business Patterns
  - Search on specified Business Goals, KPIs and Business Rules
- Automatic validation and simulation of the BPM
- Better readability of models through a clear semantic

Screencast: http://www.wsmostudio.org/demo/BPMO-editor.htm
Seminar Business Process Configuration

- Modelled Business Processes are configured
- Functions supported
  - Mapping of semantic BPEL processes (BPEL4SWS)
  - Integration of BPEL with SWS
- SUPER functionalities used
  - Task and process composition (SBP Composition)
  - SWS and process fragment discovery (SBP Discovery)
  - Semantic Business Process Repository
Example: SBP Configuration Scenarios

CRM & Fulfilment (eTel)

DSL Fulfilment (TP)
Configuration Requirements

• Each subsystem (its functionalities) represented by Semantic WS’s (SWS)
• Each SWS described by the ontology
• BPMO process composition
  – Task Composition implements each BPMO task with a combination of WS
  – Consistency Checking finds and removes bugs in the overall process
• Use of SUPER Ontologies
  – Mapping BPMO into executable BPMO – all tasks bound to existing WS
  – Domain ontologies specify how WS affect the world – basis for combining WS and for checking/fixing the process
Benefits of SUPER Configuration

• Binding process to company IT infrastructure
• Coming from general process model to its concrete realisation
• Bridging the gap between business process analyst and IT professional
Semantic Business Process Execution

- Modeled and configured Semantic Business Processes are executed
- Execution history for SBP Analysis is produced
- Automates business activities
- Minimizes time-to-offer
- Supports
  - Execution of semantic BPEL processes (BPEL4SWS)
  - Discovery and execution of Semantic Web Services (SWS)
After the process execution has been finished, the result is returned to the user.

A user initiates the semantic BPEL process by sending a service request through the Semantic Service Bus to SBPELEE.

SBPELEE delegates the invocation of SWS to SEE by passing the WSMO Goal to it.

SEE queries the SWS repository to discover the desired SWS.

SEE invokes the selected SWS.

SEE returns the result of “Achieve Goal” to SBPELEE.

During the execution, execution events are published to Execution History for persistence and to the Monitoring Tool for tracking process executions.
Example: Nexcom Customer Order Management Process

Customer uses a client application to start the Nexcom process.

Nexcom process is deployed as a semantic BPEL process.

Supplier exposes its process as SWS.

Supplier

Customer

Receive Service Request

Check for Price and Quality

Receive Price and Quality Preference

Supplier Match?

Yes

Send Offer

Send Service Request

Receive Price and Quality

Receive Offer

Negotiate Price and Quality

Supplier Match?

No

Receive Price and Quality

Send Preference

Receive Price and Quality Preference

Obtain Price and Quality data

Exhibits:

<table>
<thead>
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<th>Supplier Exposes Its Process as SWS.</th>
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Nexcom process is deployed as a semantic BPEL process. Nexcom process is deployed as a semantic BPEL process.

Customer uses a client application to start the Nexcom process.

Customer uses a client application to start the Nexcom process.
Benefits from SUPER SBP Execution

- Nexcom Use case requirements addressed by the SUPER SBP Execution phase
  - Supplier **matching** supported by Semantic Web Service discovery and invocation from within semantic business processes
  - Allows for more **flexible** traffic routing
  - **Automates** supplier matching and traffic routing process taking into account all existing suppliers
  - **Minimizes** time-to-offer

Semantic Business Process Analysis

• Analysis of executed processes
• Support of various analysis goals
  – Overview over process usage
  – Detect business exceptions
  – Detect technical exceptions
  – Compare As-Is with To-Be
• Analysis Methods
  – Semantic Process Mining
  – Semantic Reverse Business Engineering
Semantic Process Mining

- **Semantic auditing**
  - Use semantic information to check for properties in logs

- **Semantic control-flow mining**
  - Use semantic information to support different levels of abstraction in the mined models

- **Semantic organizational mining**
  - Automatically derive the teams and groups in the organization based on task similarity

- **Semantic performance analysis**
  - Use semantic information to check for Service Level Agreements (SLAs), throughput times, bottlenecks etc.
Semantic Reverse Business Engineering (RBE)

How do I get the relevant information to redesign and improve my business processes?

- Scenario based analysis with predefined content to ensure continuous business improvement
  - As-Is-Analysis
    Provide Details and statistics about executed processes
  - Exception analysis
    Focus on business exceptions (deviation from the standard processes)
  - Standardisation & Harmonisation
    Check compliance of processes between organisational units or with predefined guidelines
  - User & Role analysis
    Check user and role behaviour and authorizations

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Scenario Based Analysis

I am interested in all exceptions of the sales process.

The query results are formatted and aggregated for the business user.

Business questions are executed on the Execution History Repository (log file) either directly or through Process Mining.

The results are formatted and aggregated for the business user.

Business questions semantically assigned to Exception Analysis and to the Sales Process are to be selected.

RBE Ontology

Business Function Ontology

Exception Analysis

Sales Process

How many sales orders were cancelled?

Which sales orders are locked for further processing?

How many sales orders are delayed?

Where are the bottlenecks in the sales process?

Business Question Repository

Process Mining

Analysis Results

Execution History Repository
Analysis Results

How many sales orders were cancelled?

- Successful Sales Orders
- Cancelled Sales Orders

Which sales orders are locked for further processing?

<table>
<thead>
<tr>
<th>Locked Sales Orders</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO_0040</td>
</tr>
<tr>
<td>SO_0345</td>
</tr>
<tr>
<td>SO_0423</td>
</tr>
<tr>
<td>...</td>
</tr>
</tbody>
</table>

- Get overview about system usage
- Find out exceptions within process flow
- Check conformance to defined Process model
- Find bottlenecks
SUPER Benefits

- SUPER bridges the gap between Business experts and IT experts in setting up new products and processes
- SUPER provides a new set of integrated BPM tools for
  - Modelling
  - Automated Composition of Processes
- SUPER uses Semantics to gain a new level of automation for the modelling and configuration of business processes
- SUPER tools are based on open standards to guarantee independence from particular vendors
- Economic advantages
  - lower development costs and
  - shorter time-to-market for new services and products
- Target Group Business Users
  - Global players
  - SMEs and government agencies
SUPER - Business Impact

• Better process monitoring leading to more transparency
  – Faster reactions to emergency situations (technical problems, market requirements…)
  – Optimization of CRM, customer analysis, market analysis

• Flexible product design and management
  – Design: SUPER offers the opportunity to create new products out of a library of existing processes - in short time, without involving IT resources and without additional costs
  – Flexible product provisioning: technical realization of business processes can be changed without redesigning the process itself

• Enabling the user to rapidly implement and test business processes
SUPER - Business Opportunities

- Improved service discovery & matching in existing products
- Ontology modelling support and semantic search for existing BPM products
- R&D and consultancy services for early adopters
- Creation of custom components for the alignment of existing products with recent SWS and BPM standards
- Introduction of semantic BPM solutions to heterogeneous service landscapes
SOA4All will facilitate a Service Web of billions of services revolutionizing the access and usage of software.

SOA4All will significantly impact the competitiveness of the European Software and IT Services industry.
SOA4All - Main Innovations

Web principles
To scale SOA to a world wide web communications infrastructure

SOA
As the emerging dominant paradigm for application development which abstracts from software to the notion of a service

Context
Adapting to meet local environment constraints, organizational policies and personal preferences

Web 2.0
As a means to structure human-machine cooperation in an efficient & cost-effective manner

Semantic Web
To automate service discovery, mediation & composition
Use Case: Public Sector

• **Current Situation**
  – high number of administrative procedures
  – for many procedures manual execution and monitoring
  – wide variety between locations and countries (e.g., 3-28 steps for registering a business within different EU states)

• **Goals**
  – accelerate, simplify, and unify administrative procedures
  – intensify cooperation among administrations

• **Requirements**
  – electronic procedures and document exchange
  – single point of contact
  – information transparency (responsibilities and status)
  – limited and well-known execution time for procedures
BT Web21c Case Study

• Currently Web21c offers a Web Services based toolkit for accessing and using some of BTs ‘capabilities’ (such as VOIP, SMS etc.), allowing 3rd party developers to create mash-ups with other services.

• This case study will investigate creating the future Web21c infrastructure based on SOA4ALL technology.

• The case study will aim to utilise the key advances in research conducted in the technology work packages to help provide the next generation of Web21c where the process of discovering, integrating and using BTs capabilities can be done much more effectively, reducing the cost and time of using and combining the services.
C2C Service e-Commerce Case Study

- Use Case Scenarios:
  - "Enable social Internet TV"
  - "Build your own eCommerce applications"
  - "Create an open webshop environment"
  - "Find and Integrate Services easily"
COIN
COIN – Global Service Platform

Core Business Services
Including:
- Trust
- Identity Management
- Dependability
- Reliability
- Scaleability
- .......

Global Service Delivery Platform

Core Internet Infrastructure Services

Devices and Components
Virtual Travel Agent
Virtual Travel Agent