Internet of Services – Lightweight Composition and Enterprise Mashups @ SAP Research St. Gallen

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SAP Research Global Network

SAP Labs-based Research Centers
Campus-based Engineering Centers
planned
Summary

Information Intensive Services Are Increasingly Relevant
- Globally networked information service economy emerging
- Performance of information services is low compared to more mature industries
- Current technologies do not provide efficient and effective support

The Internet of Services: A Global SOA
- Modularity as key prerequisite for the Internet of Services
- SOA as a first, important step
- Case studies: Enterprise Mashups and Blogosphere

SAP Research Considers The Topic Highly Relevant
- FAST, Theseus, Open, ServFace, SOA4All and others have been started recently

Agenda

Internet of Services
1. The Rise of Services
2. From stovepipe applications towards the Internet of Services
3. Case studies
4. Selected IoS projects within SAP
5. Conclusion
Trend: “Tertiarisation”

Growth through services*

Gross Value Added in Germany

1991

- Commerce, Hotel and Restaurant Industry and Transport Sector: 17.9%
- Finance, Leasing and Business Service Provider: 23.3%
- Public and Private Service Provider: 20.8%
- Industry (without Building Sector): 30.6%
- Agriculture and Forestry, Fishery: 1.4%

2005

- Commerce, Hotel and Restaurant Industry and Transport Sector: 18.0%
- Finance, Leasing and Business Service Provider: 29.1%
- Public and Private Service Provider: 22.3%
- Industry (without Building Sector): 25.6%
- Agriculture and Forestry, Fishery: 0.9%

The Information Services Sector Represents the Predominant Share of the GDP*, but Shows Poor Performance Indicators

Products

Material

- 6%

Information

- 10%

Services

- 31%

- 53%

- 63%


Trend: Focusing on Core Competencies
Consolidating the Value Chain*

Number of independent OEMs

<table>
<thead>
<tr>
<th>Year</th>
<th>GM</th>
<th>DaimlerChrysler</th>
<th>Ford</th>
<th>VW</th>
<th>Renault/Nissan</th>
<th>Toyota</th>
</tr>
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<tbody>
<tr>
<td>1970</td>
<td>57</td>
<td>41</td>
<td>31</td>
<td>23</td>
<td>17</td>
<td>14</td>
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<td>1995</td>
<td>14</td>
<td>8</td>
<td>0</td>
<td>0</td>
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</tr>
</tbody>
</table>

*Most likely survivors*
- GM
- DaimlerChrysler
- Ford
- VW
- Renault/Nissan
- Toyota

Percentage of value addition

Consequence: Agility
Flexible Business Processes of the Future*

HARD-WIRED VALUE CHAIN

SPECIALIZATION & CONSOLIDATION

BUSINESS WEB

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Stove-pipe Systems in The Internet of Today

“Stove-Pipe” Information Islands

SAP RESEARCH
What Happens if “The Internet” Becomes Fully Modular?

Cross-organizational Service-Oriented Architectures* already support provision and consumption of cross-organizational services

Shortcomings of traditional Service-Oriented Architectures with respect to technological support of a globally networked service economy*

- Lack of interoperability
  - The "corporate household problem" prevents seamless interoperability across company boundaries (data structure as well as semantics differ significantly)

- Lack of service registries/intermediaries
  - Lack of comprehensive, trustworthy and widely accepted service registries prevents global SOAs. Also, intermediaries ensuring governance, navigation, transparency are missing

- „Mute and autistic“
  - The Web Services stack aims at supporting the setup of loosely coupled application interconnections especially in a professional context and assumes users to be technically sophisticated, resulting in a gap between human users and machines

The Modular Internet of Services Reference Architecture*

- Intermediary: Transparency, Navigation, Governance, Empowerment
- Stakeholders: Provider (Firm A), Consumer (Firm B)
- Applications: Rich Resource Types, Standardized Resource Descriptions, New Development Paradigms
- Standardized Interfaces: Interoperable protocols and messages

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IoS Structuring Framework: Agents, Media, and Objects

IoS Structuring Framework: Agents, Media, and Objects

- Resource Provider
- Resource Consumer

Medium
Agent
Representation of Agent
Object

Resource Provision becomes more and more multifaceted*


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Resource Provision becomes more and more multifaceted*

- Advertising
- Answers
- Blogs
- Bookmarks
- Chat
- Classifieds
- Database
- Desktop
- Events
- Hosting
- Identity
- Music
- Office
- Events
- Photo
- Presence
- Shopping
- Social
- Storage
- Video
- Voice
- Website

*SAP RESEARCH [http://www.programmableweb.com]
IoS Structuring Framework: Agents, Media, and Objects


Electronic cross-organizational collaboration: Trade-off between “Richness” and “Reach”

B2B Software and Services lack cross-enterprise view, innovation potential as well as “richness” and “reach”

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Software</th>
<th>Service</th>
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<tbody>
<tr>
<td>Accenture</td>
<td>Multienterprise/ B2B Gateway SW</td>
<td>IaaS</td>
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<td></td>
<td>MFT Suites</td>
<td>B2BPO</td>
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<td>Adv. Data Exch.</td>
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<td>Tumbleweed</td>
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</tbody>
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Electronic cross-organizational collaboration: Trade-off between "Richness" and "Reach"

- Proprietary point-to-point connections/ Software for B2B Integration/ EDI Translators/ MFT/ Integration-as-a-Service
- Enterprise Mash-up Products and Services
- Website- Portals (presentation-layer) E-mail/ Fax/ Telephone

**New Ways of Resource Consumption enable “User Self-Service”: Mashup Platforms**

1. **Google Gadgets**
   - Aggregation/Syndication of content/simple functionality
   - Gadget repository
   - Template for building own gadgets (“De-facto standard”)
   - No interaction between the resources (mere syndication)

2. **Yahoo! Pipes**
   - Pipes can be defined that read in certain RSS-based “feeds”
   - Filters can be applied on the pipes (to sort out information that is relevant for the individual user)
   - The pipes’ outputs can be aggregated and displayed to the user

3. **Kapow Technologies**
   - Mash-ups can be setup on the basis of a visual modeling interface
   - “Stateful” interaction between different resources can be defined and published

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**Yahoo! Pipes allow for content Mashups**

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Overview Mashup Vendors

Mashup Vendor Specialists

Willfindnearby.net

Find a Business by City or Major City

<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
<th>Address</th>
<th>Name</th>
<th>Number</th>
<th>Address</th>
</tr>
</thead>
</table>
| Name1 | 123456 | 7890 Main St | Name2 | 654321 | 987654
| Name3 | 567890 | 123456 Ave | Name4 | 987654 | 321567
| Name5 | 234567 | 987654 Blvd | Name6 | 654321 | 789012

Search for Businesses by City, State, Zip Code, or Category.
Electronic cross-organizational collaboration: Trade-off between “Richness” and “Reach”

<table>
<thead>
<tr>
<th>Richness</th>
<th>Reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proprietary point-to-point connections/ Software for B2B Integration/ EDI Translators/ MFT/ Integration-as-a-Service</td>
<td>Website- Portals (presentation-layer) E-mail/ Fax/ Telephone</td>
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The Future Internet Architecture
Collaboration with richness and reach

Example: Air Traffic Zürich Airport

http://radar.zhaw.ch/

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Fast and Advanced Storyboard Tool

SAP Research CEC St. Gallen, Switzerland

SAP Product Portfolio: From Enterprise SOA to The Internet of Services

**TASK-ORIENTED SERVICES**

**Enterprise SOA**
- Internal value networks...
- focus on key activities, processes and relationships

**COMPOSED ENTERPRISE SERVICES**

**Enterprise SOA 2.0**
- External value networks...
- include customers, suppliers, partners, and consumers
### The FAST project @ SAP Research CEC St. Gallen

#### Goals
- Easy-to-design of complex front-end Gadgets in the Internet of Services
- Empowering Business Users
- Plugin Tool for future Enterprise Mashup Platforms

#### Focus
- Small and Medium-sized Enterprises (SMEs)
- User-Centric Collaboration (Agile Development)
- Visual Programming Environment

#### Approach
- Exploitation of the full power of Semantics for integrating back-end with front-end
- Visual and lightweight Composition of screen-flow Resources and Interoperability with back-end Web Services

#### Benefits
- Putting a visual face to Service-Oriented Architectures (SOAs)
- Covering the profitable „Long Tail“ in Enterprise Applications
- Faster Time to Market

### Challenges in the field of Lightweight Composition

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Additional Access Channels</td>
<td>* Make Services available through devices and media which are preferred by the different kinds of users</td>
</tr>
<tr>
<td>Visual Programming Environment</td>
<td>* Enable consultants and business experts to build and customize solutions in hours rather than months</td>
</tr>
<tr>
<td>Semantic Interfaces</td>
<td>* Semantically annotate services to make them retrievable and processable for machines</td>
</tr>
<tr>
<td>Model-Driven Service Design</td>
<td>* Allow for automated mapping from visual models to executable service choreographies</td>
</tr>
<tr>
<td>Design for Service Consumption</td>
<td>* &quot;Put a face on SOA&quot;: Find adequate means to visualize the capabilities of electronic services and to thus make them comprehensible to human users</td>
</tr>
</tbody>
</table>
FAST Project Consortium

Teléfono Investigación y Desarrollo (Coordinator)
Telecommunication Provider

SAP AG
World’s leading Enterprise Application Provider

University of Ireland, Galway
Leading research institution in Semantic Web

University of Kassel
Strong research experience in scenario-based methodologies

Cyntelix Corporation
Semantic Web technology and collaboration platform

Universidad Politécnica de Madrid
Semantic Web and Web 2.0-based technologies

EU funded Project (FP7)
- March 2008 – February 2011
- Project Budget: 5.6 Mio €
- 6 Partners from academia and industry

Project Consortium

FAST Objectives

New visual programming environment for the development of complex front-end gadgets
- Involves the modeling and execution of relatively complex business processes
- Relies on back-end Semantic Web Services
- Agile software development from a top-down perspective

Exploitation of the full power of semantics for integrating back-end with front-end (user-centric)
- Developers will start from the front-end gadgets
- Connection to back-end Web Services through business execution flows if necessary

Plugin Tool for Enterprise Mashup Platforms
- Conceived as a tool that can be compatible with existing and future Enterprise Mashup Platforms
- Tool that enables to develop Mashup-able gadgets which rely on screen-flow Resources and Semantic Web Services stored in a (semantic enriched) catalogue
Architecture and Components
Overview

User-Centric Collaboration
Knowledge Workers

FRONT-END

Visual Composition of screen-flow Resources and Interoperability with back-end Web Services

Semantic Catalogue of screen-flow Resources and Back-end Web Services

Complex Gadget Logic

BACK-END

Service-Oriented Architecture (SOA)

Semantic Catalogue

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Conclusion

The Internet of Services

- The importance of information intensive services has been increasing significantly
- Traditional technologies are not sufficient
- The Internet of Services is already about to emerge; this can be analyzed on the levels stakeholders, applications and infrastructure
- Enterprise Mashups and the global Blogosphere represent two key application scenarios
- SAP has started several projects in this field

Looking forward to hearing from you!

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