

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

SYSTEMATIC THOUGHT LEADERSHIP FOR INNOVATIVE BUSINESS



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THE BEST-RUN BUSINESSES RUN SAP



SAP Research Global Network



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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

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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

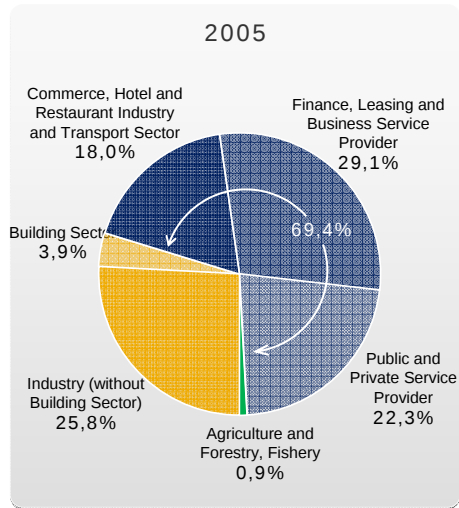
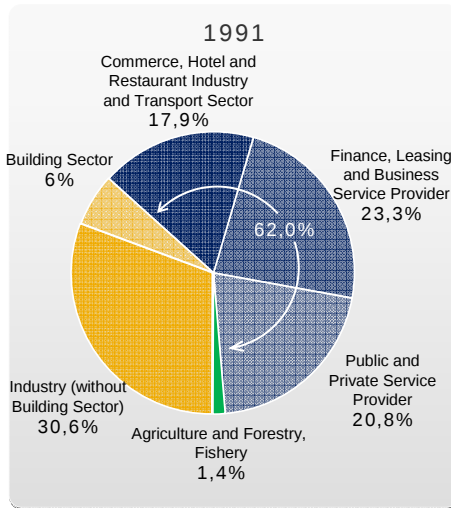
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Trend: "Tertiarisation" Growth through services*



Gross Value Added in Germany

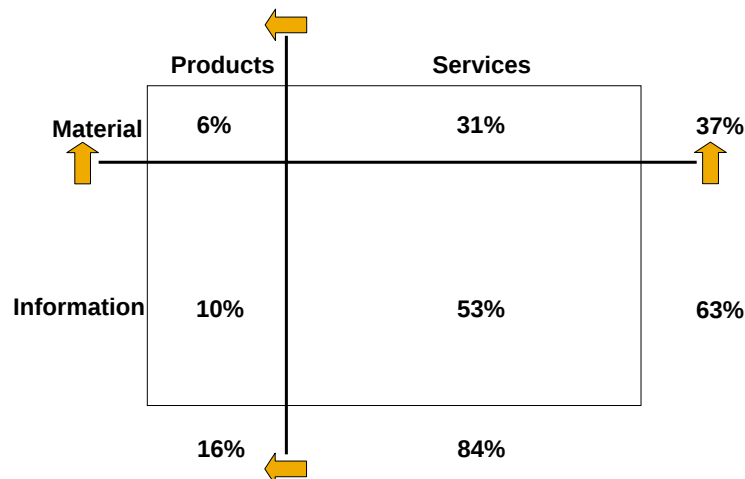


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*R. Ruggaber: Internet of Services SAP Research Vision, Proceedings of the Conference Enabling Technologies: Infrastructure for Collaborative Enterprises, 2007. WETICE 2007, IEEE Computer Society, 2007

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

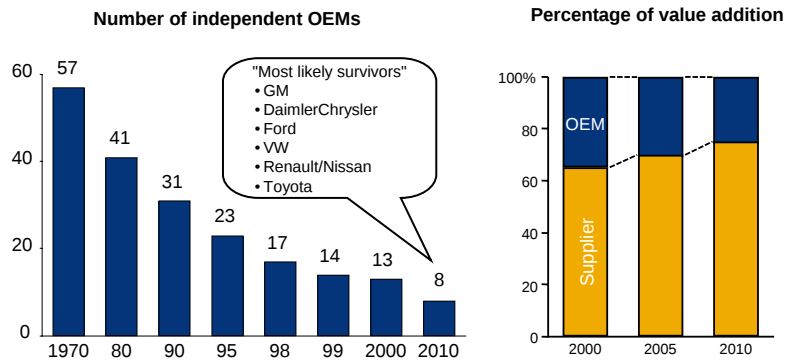


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*U. S. Karmarkar, U. M. Apte: Operations Management in the information economy: Information products, processes, and chains, Journal of Operations Management, Vol. 25, pp. 438-453, 2007

Trend: Focusing on Core Competencies Consolidating the Value Chain*

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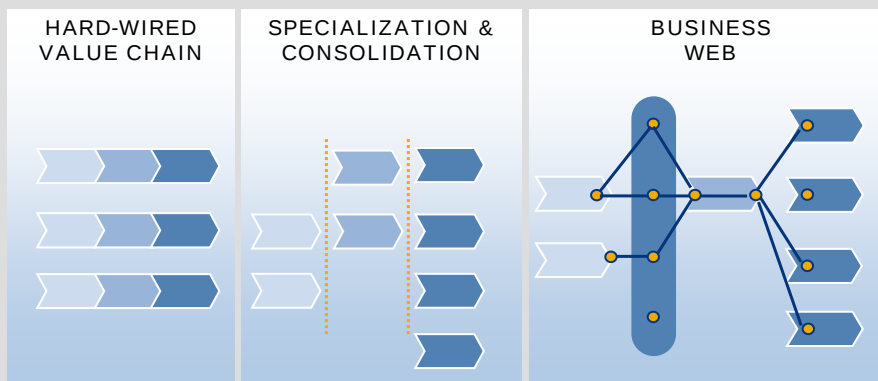
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*R. Ruggaber: Internet of Services SAP Research Vision, Proceedings of the Conference Enabling Technologies: Infrastructure for Collaborative Enterprises, 2007, WETICE 2007, IEEE Computer Society, 2007

Consequence: Agility Flexible Business Processes of the Future*

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*R. Ruggaber: Internet of Services SAP Research Vision, Proceedings of the Conference Enabling Technologies: Infrastructure for Collaborative Enterprises, 2007, WETICE 2007, IEEE Computer Society, 2007

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Internet of Services

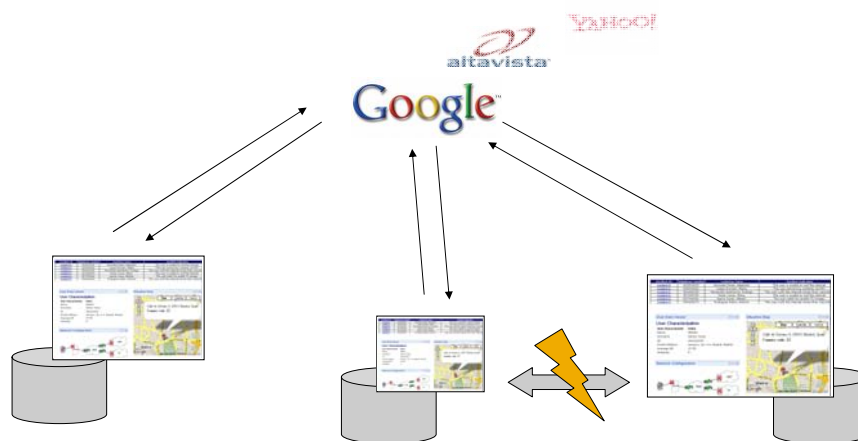
1. The Rise of Services
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Stove-pipe Systems in The Internet of Today

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“Stove-Pipe” Information Islands

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What Happens if “The Internet” Becomes Fully Modular?

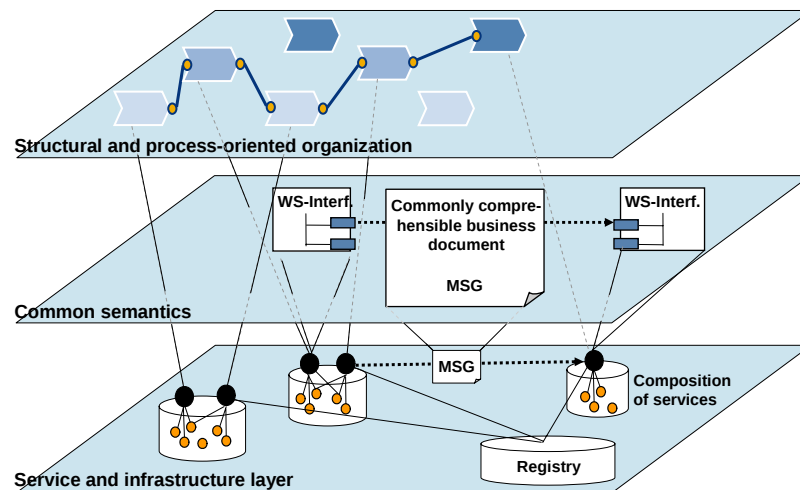
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Cross-organizational Service-Oriented Architectures* already support provision and consumption of cross-organizational services

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*C. Schroth, T. Janner: Web 2.0 and SOA: Converging Concepts Enabling the Internet of Services, IEEE IT Professional Magazine, Vol. 9, No. 3, 2007

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 from 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

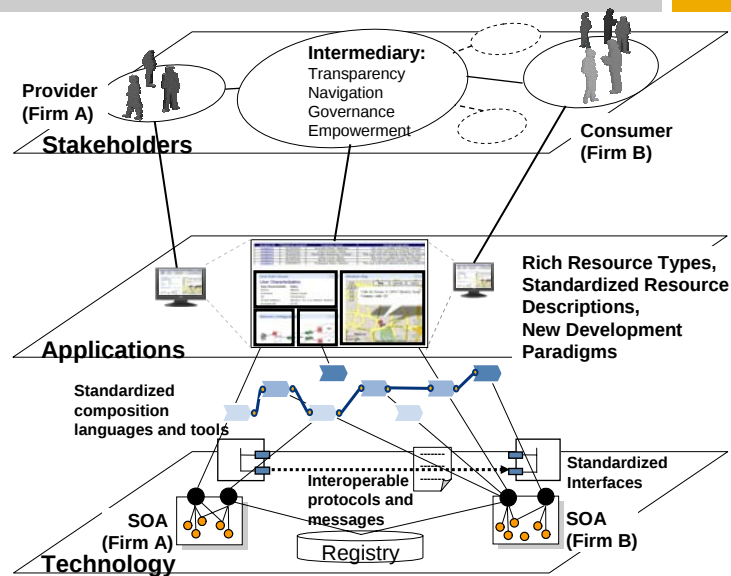
„Mute and autistic“

- 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

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*Schroth, Christoph: The Internet of Services: Global Industrialization of Information Intensive Services. In: Proceedings of the IEEE International Conference on DIGITAL INFORMATION MANAGEMENT (ICDIM'07) : IEEE Engineering Management Society, 2007-Web X.0 and Web Mining Workshop.- Lyon, France, p. 8

The Modular Internet of Services Reference Architecture*



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*Schroth, C.: The Internet of Services: Global Industrialization of Information Intensive Services. In: Proceedings of the IEEE ICDIM'07 : IEEE Engineering Management Society, 2007-Web X.0 and Web Mining Workshop.- Lyon, France, p. 8

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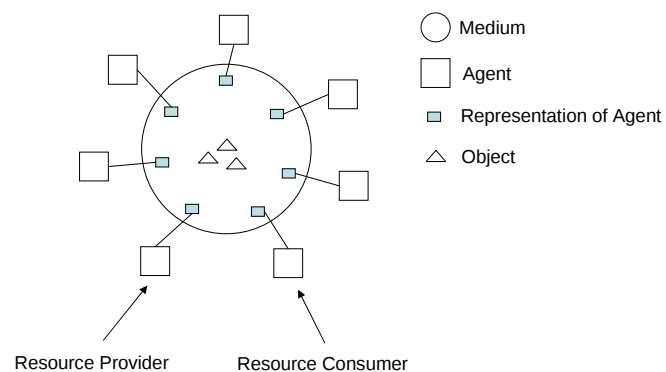
1. The Rise of Services
2. From stovepipe applications towards the Internet of Services
- 3. Case studies**
4. Selected IoS projects within SAP
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IoS Structuring Framework: Agents, Media, and Objects

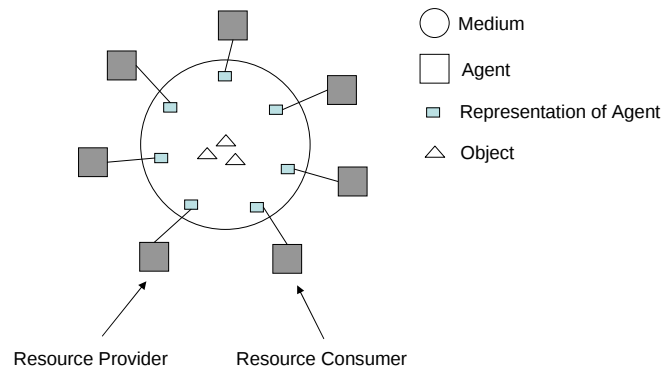
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*Schmid, B. F., Lechner, U., Klose, M., Schubert, P. (1999). Ein Referenzmodell für Gemeinschaften und Medien. in: M. Englin (Hrsg.), J. Homann (Hrsg.): Virtuelle Organisation und neue Medien. Lohmar : Eul Verlag - Workshop GeNeMe 99, Gemeinschaften in neuen Medien.- Dresden.- ISBN 3-89012-710-X, 125-150.

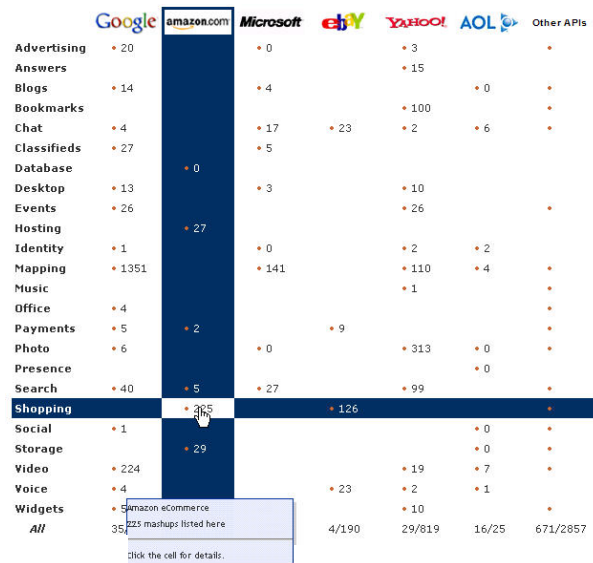
IoS Structuring Framework: Agents, Media, and Objects



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*Schmid, B. F., Lechner, U., Klose, M., Schubert, P. (1999). Ein Referenzmodell für Gemeinschaften und Medien. in: M. Englen (Hrsg.), J. Homann (Hrsg.): Virtuelle Organisation und neue Medien. Lohmar: Eul Verlag - Workshop GeNeMe 99, Gemeinschaften in neuen Medien. - Dresden - ISBN 3-89012-710-X, 125-150.

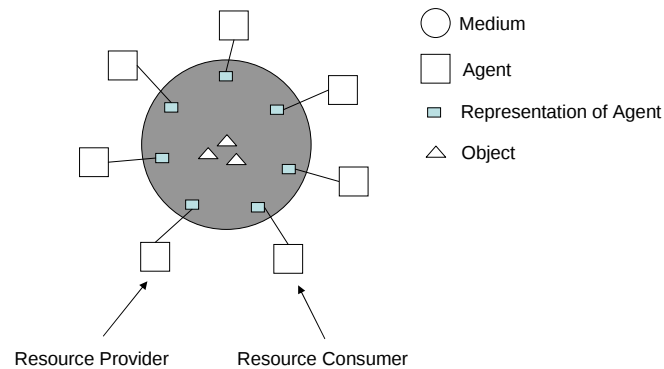
Resource Provision becomes more and more multifaceted*



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* <http://www.programmableweb.com>

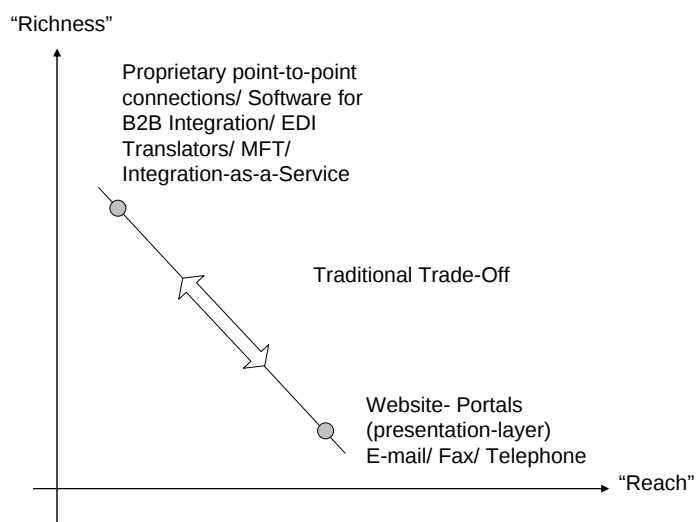
IoS Structuring Framework: Agents, Media, and Objects



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*Schmid, B. F., Lechner, U., Klose, M., Schubert, P. (1999). Ein Referenzmodell für Gemeinschaften und Medien. in: M. Englen (Hrsg.), J. Homann (Hrsg.): Virtuelle Organisation und neue Medien. Lohmar: Eul Verlag - Workshop GeNeMe 99, Gemeinschaften in neuen Medien.- Dresden.- ISBN 3-89012-710-X, 125-150.

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



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*Schroth, C.: The Internet of Services: Global Industrialization of Information Intensive Services. In: Proceedings of the IEEE ICDIM'07 : IEEE Engineering Management Society, 2007.-Web X.0 and Web Mining Workshop.- Lyon, France, p. 8

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

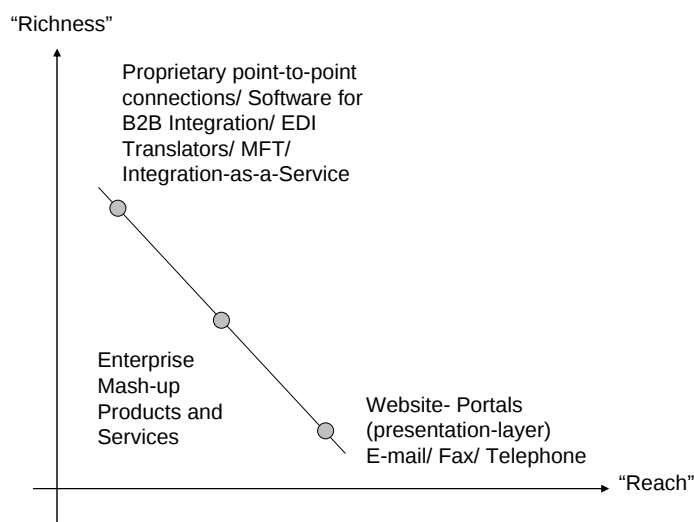


Vendor	Software			Service	
	Multienterprise/ B2B Gateway SW	MFT Suites	EDI Translators	IaaS	B2BPO
Accenture				X	X
Adv. Data Exch.				X	
Axway	X	X		X	
Click Commerce	X	X		X	
Covisint				X	
Crossgate	X			X	
DICentral				X	X
E2Open				X	X
EasyLink Services				X	
eZCom Software	X			X	X
GxS	X		X	X	X
Hubspan				X	X
Inovis	X	X	X	X	X
nuBridges	X	X		X	
Seeburger	X		X	X	
Sterling Com.	X	X	X	X	X
SupplyOn				X	
TietoEnator				X	X
Tumbleweed		X			

* Lheureux, B. J., Malinverno, P. (2006). Magic Quadrant for Integration Service Providers, 1Q06. USA: Gartner Research Paper.
 ** Lheureux, B. J., Biscotti, F., Malinverno, P., White, A., Kenney, L. F. (2007). Taxonomy and Definitions for the Multienterprise/B2B Infrastructure Market. USA: Gartner Research Paper.

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



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

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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

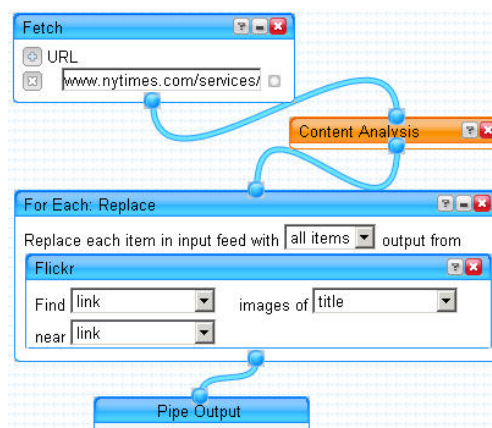
- Mash-ups can be setup on the basis of a visual modeling interface
- “Stateful” interaction between different resources can be defined and published

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*Schroth, Christoph ; Christ, Oliver: Brave New Web: Emerging Design Principles and Technologies as Enablers of a Global SOA. In: Proceedings of the 2007 IEEE International Conference on Services Computing (SCC 2007) ; IEEE Computer Society, 2007. - 2007 IEEE International Conference on Services Computing (SCC 2007) - Salt Lake City, Utah, USA, S. 8. - URL <http://www.alexandria.unisg.ch/Publikationen/37038> (2008-03-15)

Yahoo! Pipes allow for content Mashups

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*Schroth, Christoph ; Christ, Oliver: Brave New Web: Emerging Design Principles and Technologies as Enablers of a Global SOA. In: Proceedings of the 2007 IEEE International Conference on Services Computing (SCC 2007) ; IEEE Computer Society, 2007. - 2007 IEEE International Conference on Services Computing (SCC 2007) - Salt Lake City, Utah, USA, S. 8. - URL <http://www.alexandria.unisg.ch/Publikationen/37038> (2008-03-15)



Wii.findnearby.net

Find a Wii Within? ...of Where?

100 Miles 02125

Find a Wii and Wii Accessories

[Search by CityState Directory](#)

Online Inventory Tracker		Last Refresh In: 4/13
Amazon.com	Nintendo Wi	Too slow to display 72 Available
Amazon.com	Wii Action States/Bundla	N/A Not Available
eBay	Nintendo Wi	N/A Available

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sort price time distance

- Ebay! (100 Found)
- Amazon.com! (15 Found)
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Phone: (860) 448-2022

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Phone: (860) 447-3646

Address: 220 Galem Turnpike, Norwich, CT 06360
Phone: (860) 899-7745

Address: 149 Connel Highway, Newport, RI 02840
Phone: (401) 948-5167

Address: 137 Teaticket Highway, East Falmouth, MA 02536
Phone: (508) 549-8995

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Phone: (401) 294-0025

Address: 180 River Road, Lisbon, CT 06351
Phone: (860) 376-3254

Address: 506 State Road, North Dartmouth, MA 02747
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Address: 650 Bald Hill Road, Warwick, RI 02896
Phone: (401) 821-1766

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map Accessories & Games Wii Auctions Wii News Wii

☐ Map
 ☐ Satellite
 ☒ Hybrid

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Legend: ● Expiring Auction ● Auction ● Retail Location ● Retail Location with live discussion

Find a Nintendo Wii by state or major city.

States		Major Cities	
Alabama	Montana	Dallas, TX	San Diego, CA
Alaska	Idaho	Denver, CO	San Francisco, CA
Arizona	Nebraska	Cincinnati, OH	San Jose, CA
Arkansas	New Hampshire	Dayton, OH	Sarasota, FL
California	Ann Arbor, MI	Des Moines, IA	Seattle, WA
Colorado	Adirondack, VA	Fort Lauderdale, FL	
	New Mexico	Fort Worth, TX	
	Atlanta, GA	New Orleans, LA	
		New York, NY	
		Oakland, CA	
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Search
Where: [Waldorf, germany]
[set default] [+ focus]

Display:
English (°F)
Metric (°C)

Favorites:
Examples:
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Chicago
Reno
Sydney
Tokyo
New York

Ads by Google

Free Live Webcam Chat
Get Free Cutting-Edge Video & Voice Chat with Real People. Get It Now!
Fotok.com

Current Online Weather
Free Live Streaming Conditions, Multi-Day Forecasts, Radar & More
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Map Builder
Build interactive maps online. No programming required!
www.liveatm.com

The Weather Channel's forecast
Haldorf, Germany

Friday Mar 14
Rain, 80% chance of precipitation. Winds 8 kph from S. Humidity 84% Sunset: 6:29 PM
6.6 °C

Saturday Mar 15
AM Fog, 20% chance of precipitation. Winds 6.4 kph from SE. Humidity 66% Sunrise: 6:20 AM
16.1 °C

Light Rain, 70% chance of precipitation. Winds 24.1 kph from SSE. Humidity 74% Sunset: 6:31 PM
8.3 °C

Sunday Mar 16
Rain, 70% chance of precipitation. Winds 20.0 kph from SW. Humidity 72% Sunrise: 6:30 AM
11.6 °C

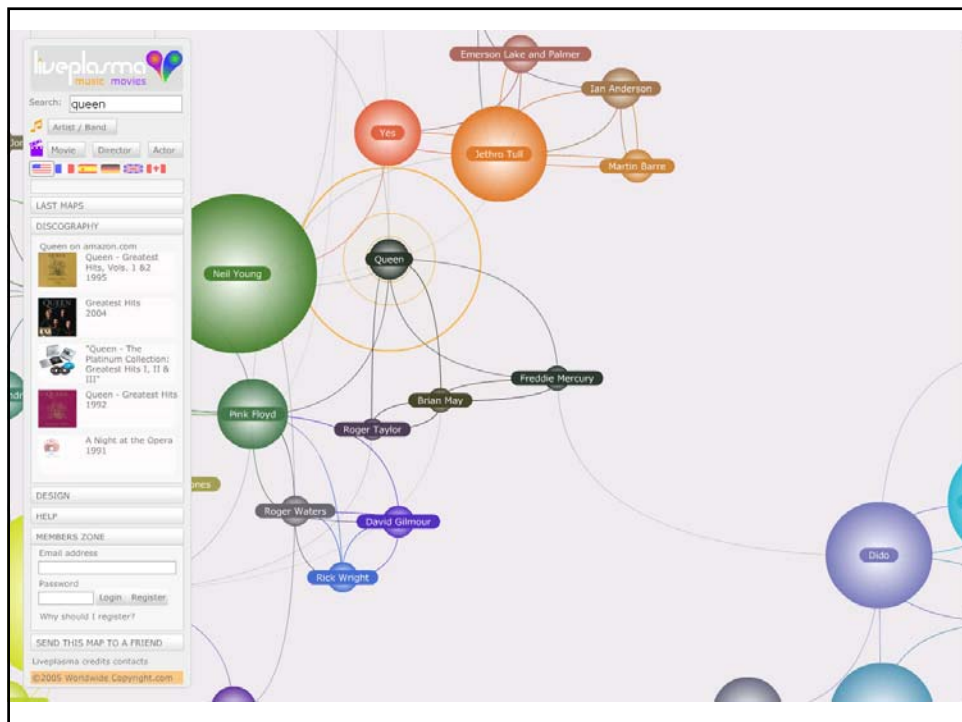
Provider: [set default]

Neighboring Webcams
More local cams Popular cams My favorites

Marktplatz Karlsruhe
Feb 25, 14:00-20:00

Monthly Averages
Based on Waldorf, Germany

	High	Low	Precip
January	3°	-4°	4
February	5°	-4°	4
March	10°	1°	4
April	13°	4°	4
May	17°	8°	4
June	22°	11°	4
July	24°	15°	4
August	24°	15°	4
September	21°	10°	4
October	14°	6°	4
November	8°	2°	4
December	4°	0°	4



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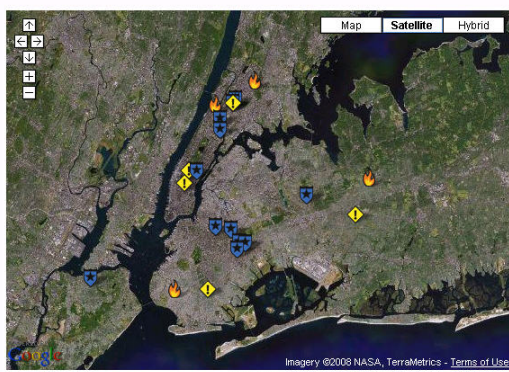


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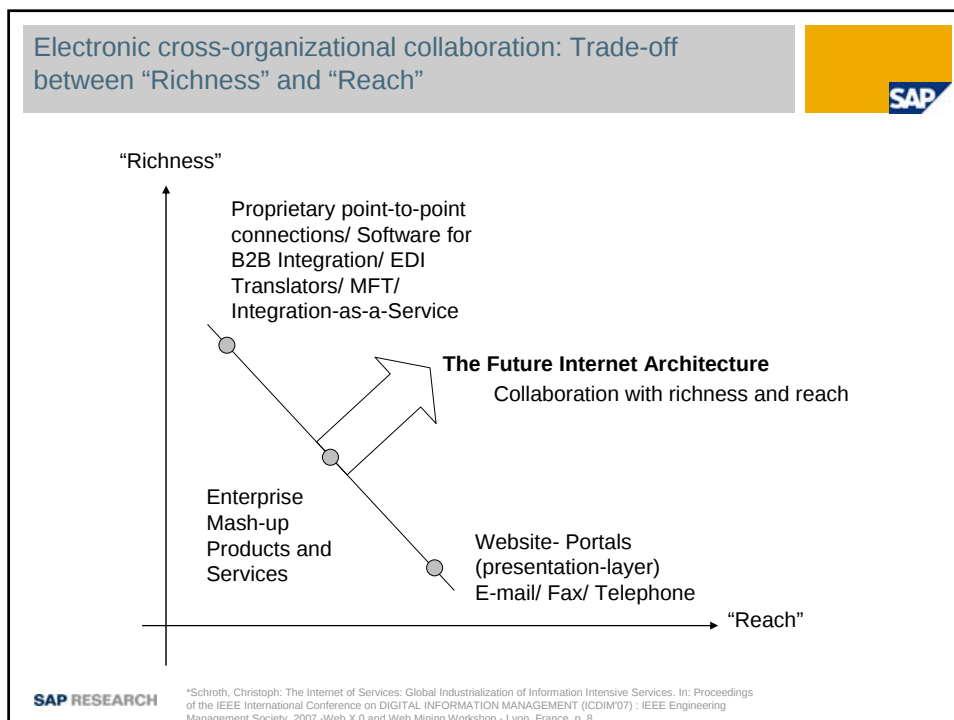
VIEW INCIDENTS: [BNN](#) | [MNS](#) | [ALL](#)

LATEST INCIDENTS

- [Sexual Assault](#) | 1156 College Ave Bronx, NY | 3/14/2008 7:48 p.m.
- [Car Vs Bldg](#) | 1349 Forest Avenue Staten Island, NY | 3/14/2008 7:10 p.m.
- [Shooting](#) | 400 Williams Ave Brooklyn, NY | 3/14/2008 6:51 p.m.
- [Carjacking](#) | 224 St & 115 Ave Queens, NY | 3/14/2008 5:57 p.m.
- [Motorcycle MVA](#) | 380 Tompkins Avenue Brooklyn, NY | 3/14/2008 5:35 p.m.
- [All Hands](#) | 1576 82nd St Brooklyn, NY | 3/14/2008 4:12 p.m.
- [Shooting](#) | 335 Sutter Ave Brooklyn, NY | 3/14/2008 3:32 p.m.
- [Pedestrian Struck](#) | 6th Ave And W 35 Street Manhattan, NY | 3/14/2008 3:27 p.m.
- [All Hands](#) | 2469 Crotona Ave & 187 St Bronx, NY | 3/14/2008 3:23 p.m.
- [Bank Robbery](#) | 184 St & Union Tmpk Queens, NY | 3/14/2008 2:16 p.m.
- [Large Crowd](#) | East 42nd St & 2nd Ave Manhattan, NY | 3/14/2008 1:51 p.m.
- [Q/T Auto](#) | East 15th & Ave O Brooklyn, NY | 3/14/2008 10:19 a.m.
- [Water Main Break](#) | East 13th St & 5th Ave Manhattan, NY | 3/14/2008 9:43 a.m.

UNMAPPED INCIDENTS

- [Serious MVA](#) | Iao Northbound FDR At East 30th Street Manhattan, NY | 3/14/2008 5:56 p.m.
- [10-75](#) | 83-15 Pettit Ave X Ithaca St Queens, NY | 3/14/2008 5:11 p.m.



Example: Air Traffic Zürich Airport

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Project Presentation

SYSTEMATIC THOUGHT LEADERSHIP FOR INNOVATIVE BUSINESS

Fast and Advanced Storyboard Tool

SAP Research CEC St. Gallen, Switzerland

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THE BEST-RUN BUSINESSES RUN SAP

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

TASK-ORIENTED SERVICES

Enterprise SOA

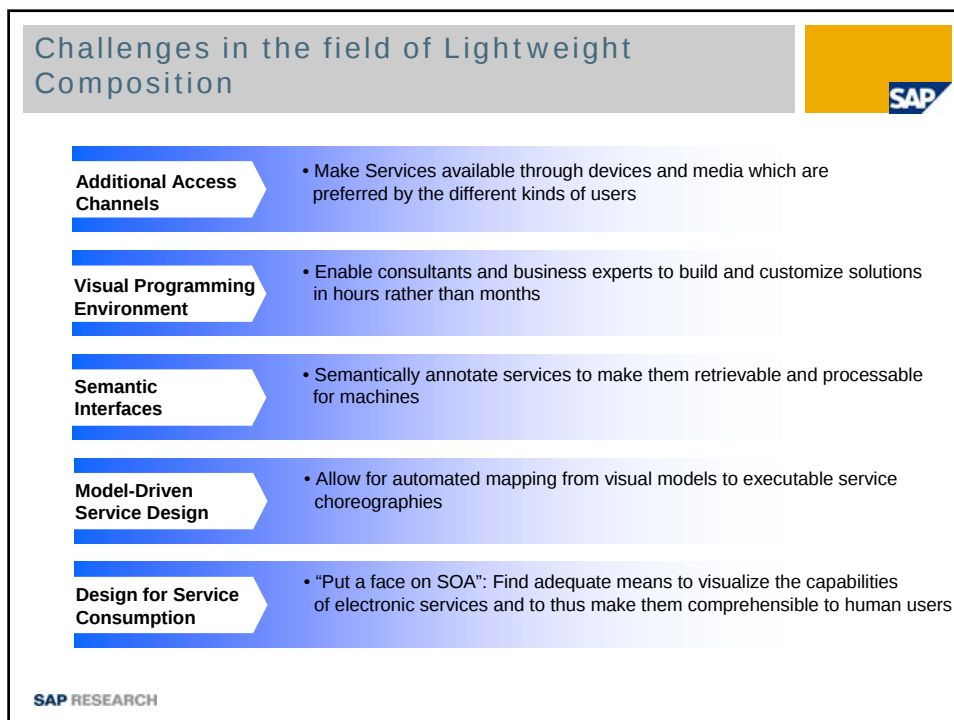
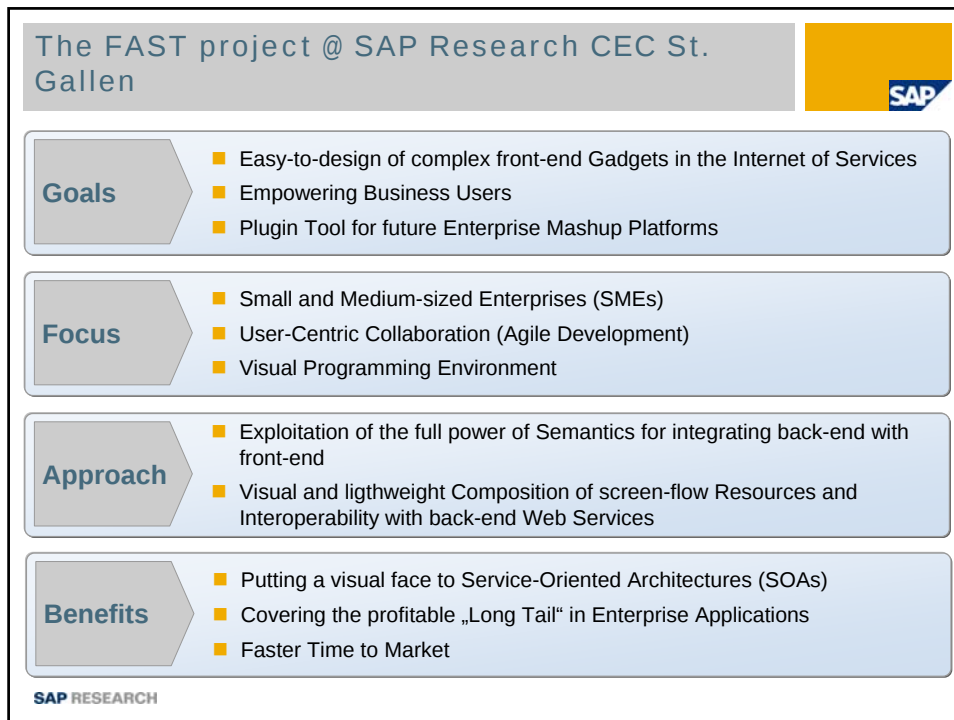
Internal value networks...
focus on key activities, processes and relationships

COMPOSED ENTERPRISE SERVICES

Enterprise SOA 2.0

External value networks...
include customers, suppliers, partners, and consumers

Page



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

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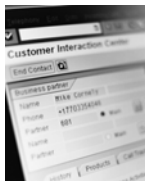
EU funded Project (FP7)

- 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)

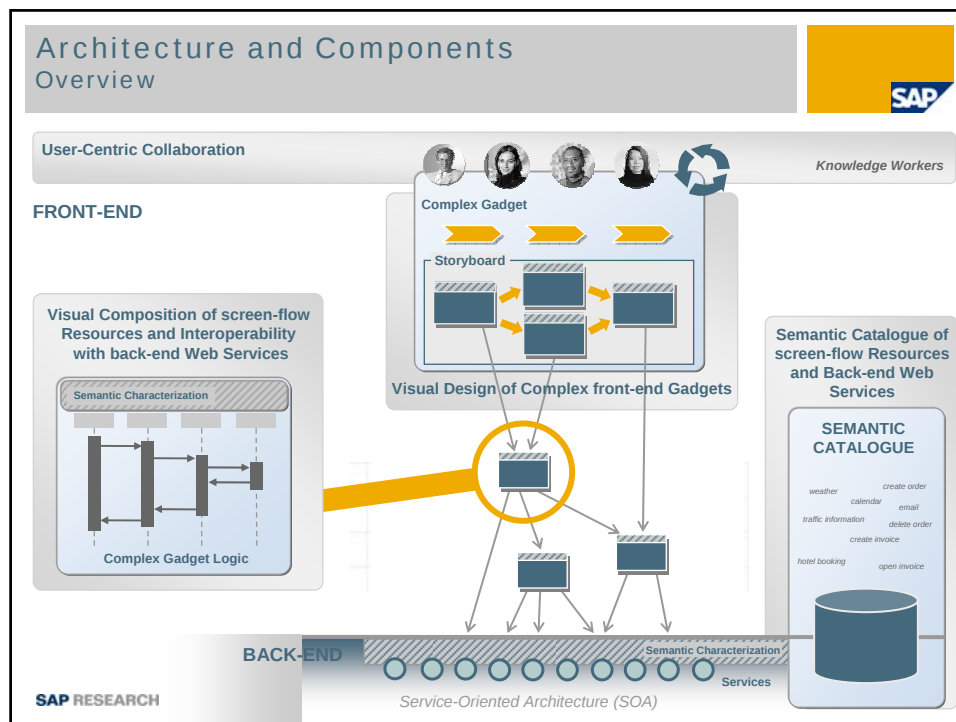
- Developers will start from the front-end gadgets
- Connection to back-end Web Services through business execution flows if necessary



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

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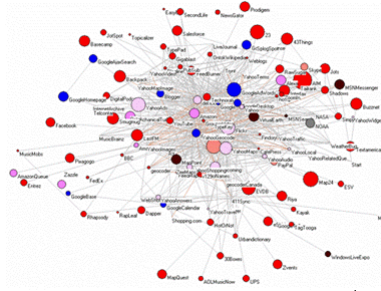
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Conclusion



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

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Looking forward to hearing from you!



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- Fokus: Enterprise SOA, Innovation Management, Enterprise Interoperability



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- Research Associate **SAP Research** Switzerland
- Fokus: Technology Management, Cross-organizational Interoperation, SOA, Organizational Theories, Service Science

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