

# Collaborative Design with the Software Architecture Warehouse

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Demo Upcoming: WLAN: **SAW** navigate your **Chrome** to: <http://demo.saw>

# Abstract

- Designing a software architecture requires access to domain knowledge and experience, combined with the ability to make good decisions based on partial information. We present the Software Architecture Warehouse (SAW, <http://saw.inf.unisi.ch/>), a Web-based tool that supports distributed architecture design teams by managing their shared knowledge and enabling consensus-based decision making.
- After introducing the extensible knowledge meta-model of SAW, we will present various scenarios of in-meeting design-dialogue mapping and discussion support, along with visual aids. We will demonstrate how SAW can be used to induce synergy effects between knowledge reuse and remote collaboration. We claim that giving immediate feedback to the whole design team about the implications and constraints of a design decision results in an improvement in the quality of decisions made.

# Introduction

- Software architecture is a knowledge intensive design process that requires:
  - Access to domain knowledge
  - Making decisions based on limited information
  - Reaching consensus collaboratively

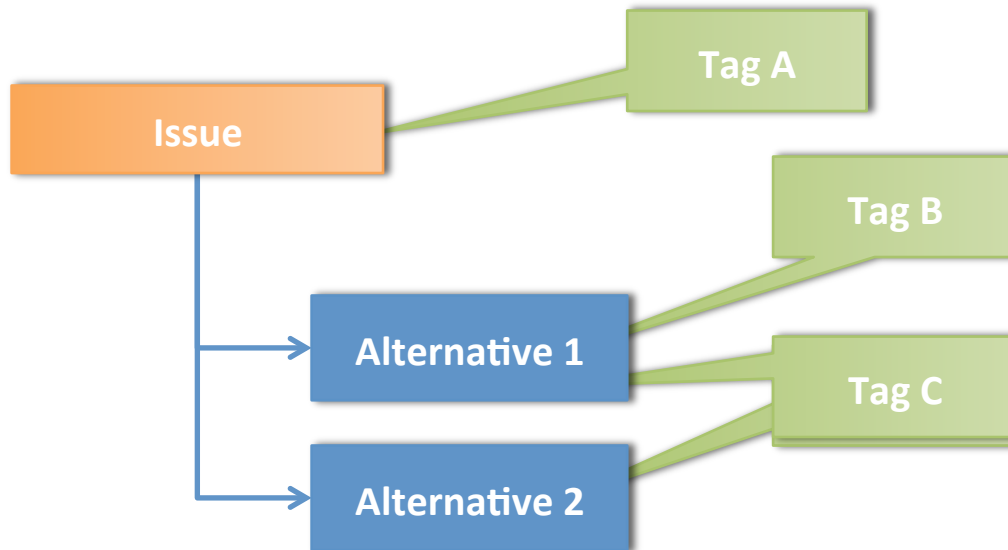
Goal: Support the collaboration in local and remote design workshops

# A Warehouse for Architectural Knowledge

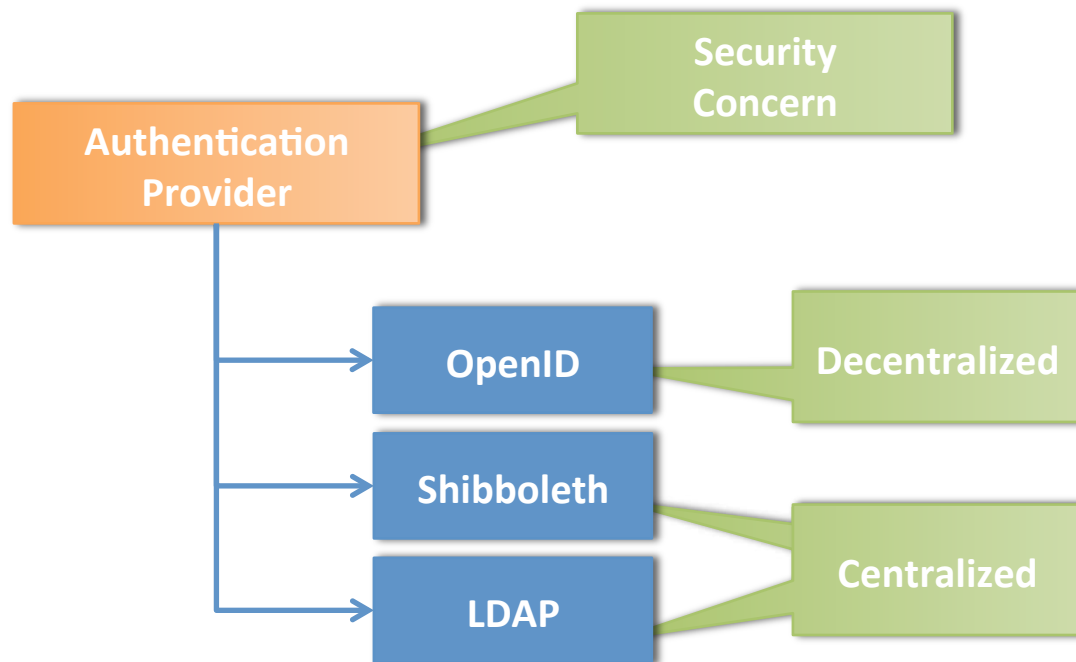
- Capture, Manage, Share and Analyze reusable architectural knowledge across multiple projects
- Minimal assumptions over the knowledge meta-model:
  - IBIS (Issue Based Information System)
  - Capable of handling multiple knowledge and decision models at the same time

# SAW Meta-Model

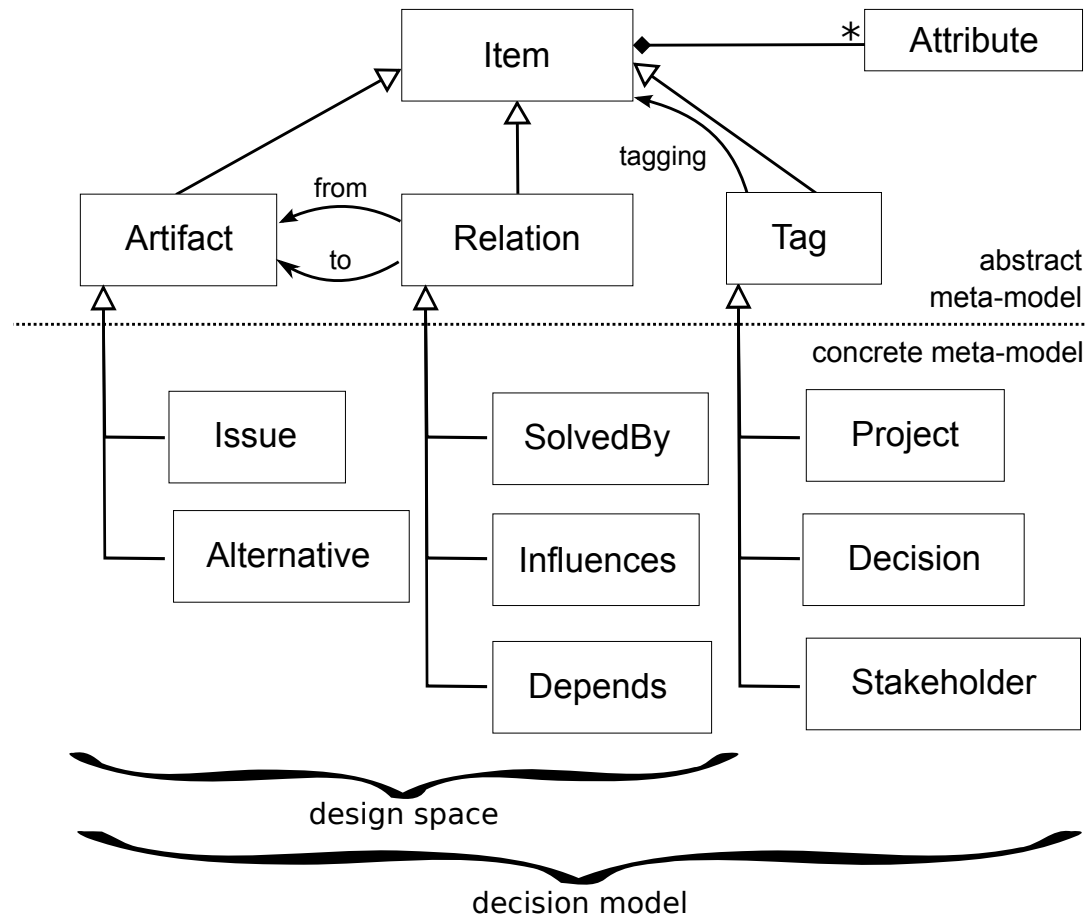
- Abstract issue-based Information Systems



# Example

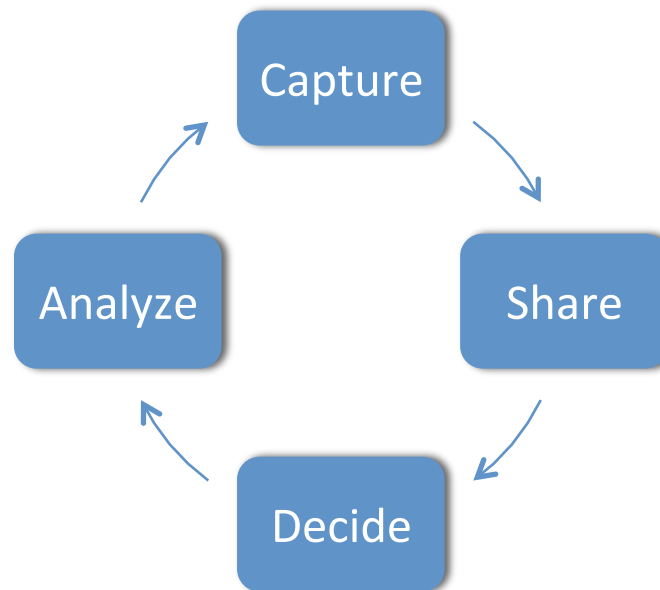


# Knowledge meta-model



# Knowledge management cycle

1. Capture and Acquisition
2. Sharing and Refinement
3. Design Decision Making
4. Analysis





# Architectural Knowledge Management Scenarios

# Knowledge Acquisition

- Capture tentative knowledge efficiently
- Stimulate knowledge sharing and reuse

Challenges:

- Building shared understanding of problems and solutions

Tool:

- Wiki-style access to shared knowledge

# Knowledge Exploration

- Learn about existing shared knowledge
- Browse for interesting design issues and useful alternatives

Challenges:

- Fast identification of related design issues
- Efficient pruning of irrelevant knowledge artifacts

Tool:

- Quick Textual Search
- Tag-Cloud Navigation and Filtering

# Knowledge Sharing

- Exchange knowledge between remote teams
- Refine the knowledge based on local experience

Challenges:

- Versioning of the knowledge
- Access Control

Tool:

- Wiki-style collaborative editing
- Real-time synchronization

# Decision Making

- Manage consensus
- Reuse experience
- Capture rationale

Challenges:

- Reaching an agreement on the right decision

Tool:

- Real-time polling
- Fuzzy Decision Model: *Negative, Positive, Open*

# Analysis

- Prioritize design decisions
- Assess the quality of design space
- Monitor the dynamics of the design progress

Challenges:

- Defining suitable metrics, indicators, and detection strategies to match specific design process methodologies [SHARK'11]

Tool:

- Infer the state of each design issue
- Summarize the workshop discussion

# Software Architecture Warehouse

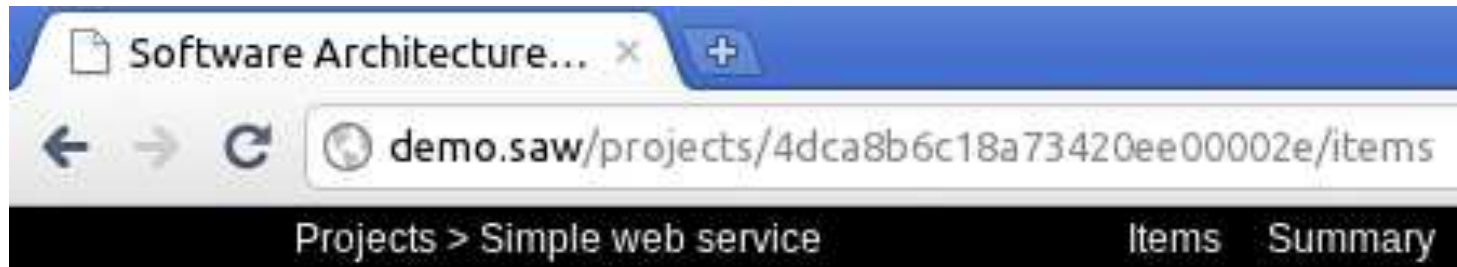
# Software Architecture Warehouse

- Web-based
  - Intra- and inter-net deployable
- Collaboration focused
  - Highly interactive knowledge capturing and decision making
  - Real-time multi-user synchronization
- Search-oriented



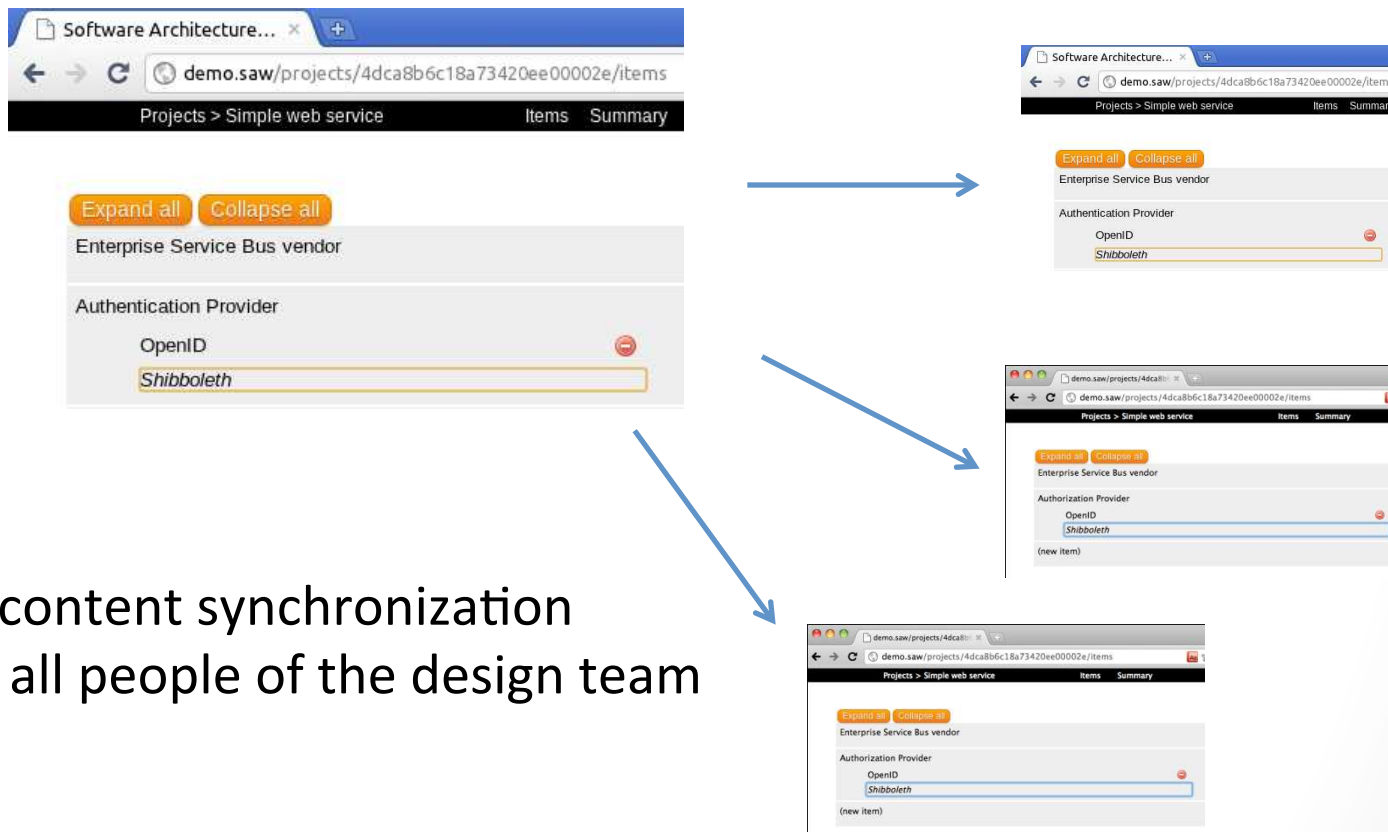
# 1. Capture

Immediate live in-workshop note-taking



# 1. Capture

Immediate live in-workshop note-taking **and sharing**



Live content synchronization  
with all people of the design team

# 2. Refinement

Customizable knowledge model to fit particular needs

The screenshot shows a web browser window with the URL `demo.saw/projects/4dca8b6c18a73420ee000030/items##/4dca8b6d1...`. The page has a navigation bar with 'Projects > IBM adWiki SOA sample', 'Items', and 'Summary'. Below the navigation bar, there are four tabs: 'Index' (highlighted in orange), 'Description' (highlighted in pink), 'Alternatives', and 'Graph'. The main content area is divided into two columns. The left column contains a list of project details: 'Name: ServiceCompositionLanguage', 'Background: The discussion accompanying SE Radio episode 85 touches upon the topic: http://www.se-radio.net/podcast/2008-02/episode-85-web-services-olaf-zimmermann "Web Services Platform Architecture" by S. Weerawarana et al provides an in-depth introduction to the relevant standards.', 'Drivers: Importance of standardization and tool support, as well as expressivity of the workflow language and required education are some of the key decision drivers. Here, we assume that the Service Composition Paradigm, decided on the conceptual level, is workflow.', 'Status: to be reviewed semi-annually', and 'Recommendation: BPEL is the recommended, state-of-the-art choice for true, long-running workflow scenarios; proprietary languages in software package can be used if such packages are already in use. Java development is a solid fallback. Service composition is a key element of the SOA value proposition; flexibility is a key requirement. The decision scope might be process, subprocess or service - one-size-fits-all desired, but not always possible.' The right column contains a 'Tags' section with a table of project metadata. The table has two columns: 'Tag' and 'Value'. The tags are: 'Scope' (Process), 'Phase' (Solution outline), 'SubjectArea' (Governance), 'Role' (Lead architect), 'Project' (IBM adWiki SOA sample), 'IBM-ID' (N151262597-2145983614), and 'TopicGroup' (EnterpriseApplicationDesignDecisions). Each tag has a red minus icon to its right. Below the table is a search bar with the placeholder text '(write to search)'.

**Index** **Description** Alternatives Graph

**Name:** ServiceCompositionLanguage

**Background:** The discussion accompanying SE Radio episode 85 touches upon the topic: <http://www.se-radio.net/podcast/2008-02/episode-85-web-services-olaf-zimmermann> "Web Services Platform Architecture" by S. Weerawarana et al provides an in-depth introduction to the relevant standards.

**Drivers:** Importance of standardization and tool support, as well as expressivity of the workflow language and required education are some of the key decision drivers. Here, we assume that the Service Composition Paradigm, decided on the conceptual level, is workflow.

**Status:** to be reviewed semi-annually

**Recommendation:** BPEL is the recommended, state-of-the-art choice for true, long-running workflow scenarios; proprietary languages in software package can be used if such packages are already in use. Java development is a solid fallback. Service composition is a key element of the SOA value proposition; flexibility is a key requirement. The decision scope might be process, subprocess or service - one-size-fits-all desired, but not always possible.

Tags:	
Scope	Process
Phase	Solution outline
SubjectArea	Governance
Role	Lead architect
Project	IBM adWiki SOA sample
IBM-ID	N151262597-2145983614
TopicGroup	EnterpriseApplicationDesignDecisions

(write to search)

# 3. Artifact linkage

Linkage of related knowledge items within the design space

The screenshot displays a vertical list of four artifact categories: OpenID, Shibboleth, OAuth, and Twitter. Each category has a header with a red minus icon and a row of four buttons: 'Implies (0)', 'Contradicts (0)', 'Influences (0)', and 'Tagging (0)'. The 'Shibboleth' category shows 'Contradicts (1)' in red, with a list item 'Alternative OpenID' and a red minus icon, followed by the text '(type to add new one)'. The 'Twitter' category shows 'Implies (1)' in red, with a list item 'Alternative OpenID' and a red minus icon, followed by a text input field containing 'Oau' and a dropdown menu showing 'OAuth'. At the bottom, there is a section labeled '(new alternative)' with a red minus icon and an empty text input field.

Artifact	Implies	Contradicts	Influences	Tagging
OpenID	0	0	0	0
Shibboleth	0	1	0	0
OAuth	0	0	0	0
Twitter	1	0	0	0

- Alternative OpenID

(type to add new one)

- Alternative OpenID

Oau

OAuth

(new alternative)

# 4. Collaborative Decision Making

Interactive overview over positive, negative and open decisions for each alternative

Enterprise Service Bus vendor		Collapse Details Delete		
Apache ServiceMix	⊖	Positive(2)	Negative(0)	Open(0)
IBM WebSphere	⊖	Positive(0)	Negative(0)	Open(2)
Microsoft Biztalk	⊖	Positive(1)	Negative(1)	Open(0)
Oracle Enterprise Service Bus	⊖	Positive(0)	Negative(2)	Open(0)
Mule	⊖	Positive(0)	Negative(2)	Open(0)
OpenESB	⊖	Positive(0)	Negative(0)	Open(1)
(new alternative)				

Authentication Provider		Collapse Details Delete		
OpenID	⊖	Positive(1)	Negative(0)	Open(0)
Shibboleth	⊖	Positive(0)	Negative(1)	Open(0)
OAuth	⊖	Positive(0)	Negative(0)	Open(0)
Twitter	⊖	Positive(0)	Negative(1)	Open(0)
(new alternative)				

# 5. Rationale linkage

## Rationale recording

Enterprise Service Bus vendor				Collapse	Details	Delete
Apache ServiceMix	⊖	Positive(2)	Negative(0)	Open(0)		
IBM WebSphere	⊖	Positive(0)	Negative(0)	Open(2)		
Microsoft Biztalk	⊖	Positive(1)	Negative(1)	Open(0)		
Oracle Enterprise Service Bus	⊖			Open(0)		
Mule	⊖			Open(0)		
OpenESB	⊖			Open(1)		
(new alternative)						
Authentication Provider					Details	Delete
OpenID	⊖	Positive(1)	Negative(0)	Open(0)		
Shibboleth	⊖	Positive(0)	Negative(1)	Open(0)		
OAuth	⊖	Positive(0)	Negative(0)	Open(0)		
Twitter	⊖	Positive(0)	Negative(1)	Open(0)		
(new alternative)						



# 6. Collaborative Decision Making

Everyone can participate in the decision making process

Service	Implics (0)	Contradicts (0)	Influences (0)	Tagging (0)	Users	Actions
Apache ServiceMix					ian@sonyx.net marcin@sonyx.net	Revoke(2) Negative(0) Open(0)
IBM WebSphere					ian@sonyx.net marcin@sonyx.net	Positive(0) Negative(0) Revoke(2)
Microsoft Biztalk					marcin@sonyx.net ian@sonyx.net	Revoke(1) Negative(1) Open(0)
Oracle Enterprise Service Bus					ian@sonyx.net marcin@sonyx.net	Positive(0) Revoke(2) Open(0)
Mule					ian@sonyx.net marcin@sonyx.net	Positive(0) Revoke(2) Open(0)
OpenESB						Positive(0) Negative(0)

# 7. Analysis

Live decision status reporting helps to summarize the discussion

**Enterprise Service Bus vendor** 6 alternatives, 11 decisions, State: **Decisions not conclusive (open alternatives)**

Positive	Apache ServiceMix
Open	IBM WebSphere
Colliding !	Microsoft Biztalk
Negative	Oracle Enterprise Service Bus
Negative	Mule
Open	OpenESB

**Authentication Provider** 4 alternatives, 3 decisions, State: **Some decisions are missing**

Positive	OpenID
Negative	Shibboleth
	OAuth
Negative	Twitter



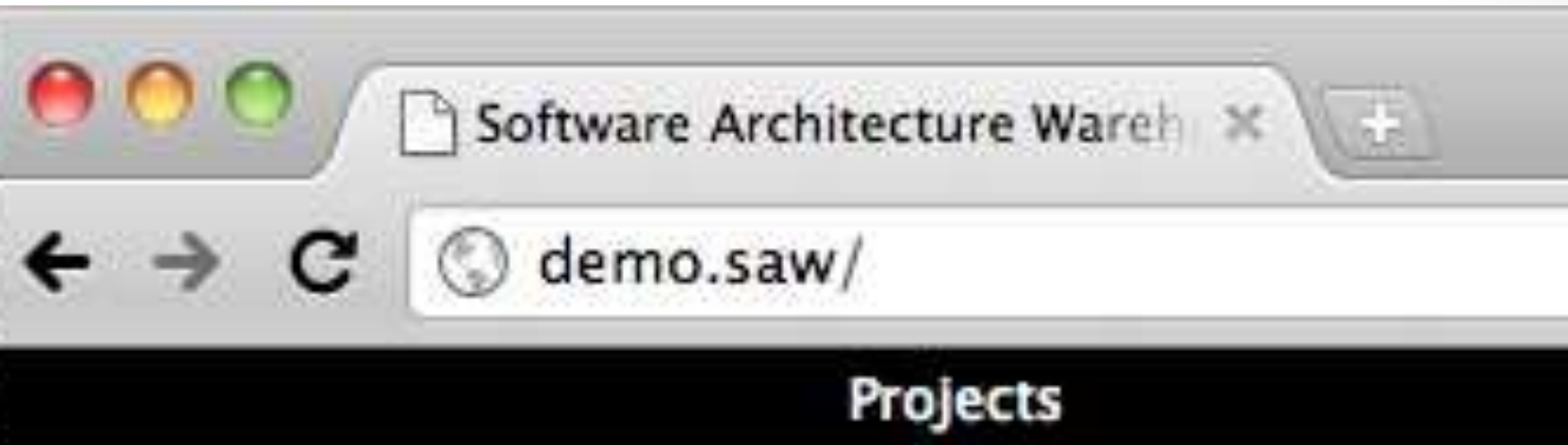
# SAW Demo

WLAN SSID: **SAW**

Navigate to: **<http://demo.saw>**

Supported Browser: **Chrome**

# Getting Started



- IBM adWiki SOA sample
- Simple web service

# SAW Prototype Technologies

- HTML5/JavaScript frontend
  - Backbone.js framework
  - Juggernaut Push-AJAX
- Ruby On Rails server-side logic
  - Mongoid document mapper
- Persistence and synchronization
  - MongoDB
  - Redis
  - Node.js running Juggernaut

# Outlook

- Capture
  - Free-form notes
  - Whiteboard snapshots
  - Audio and video
- Sharing
  - Design and project space exchange patterns
  - Public-private knowledge sharing methods
- Analysis
  - Design hot-spot and defect detection strategies

# Summary

- Collaboration and reuse are key aspects of the Software Architecture Design
- SAW is a Web-based collaborative tool for local and remote design workshops
- Explicit documentation of your design decisions improves quality of the design
- Live collaboration boosts productivity of global design teams

# More Information

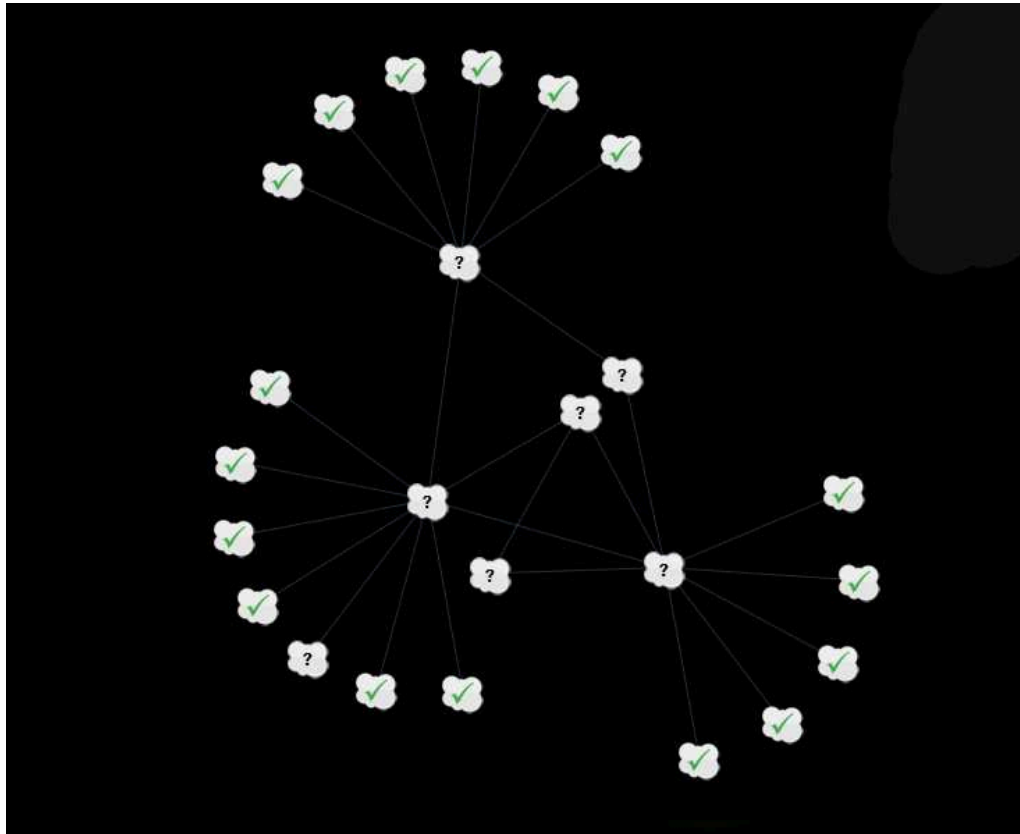
- Please visit our project homepage:  
**<http://saw.inf.unisi.ch>**
- Public software architecture warehouse  
available soon:  
**<http://public.saw.sonyx.net>**
- We are looking for partners to evaluate our tool  
in their design environment

# References:

- Marcin Nowak, Cesare Pautasso, Olaf Zimmermann "Architectural Decision Modeling with Reuse: Challenges and Opportunities". In Proceedings of the Workshop on Sharing and Reusing Architectural Knowledge SHARK'10
- Marcin Nowak, Cesare Pautasso "Goals, Questions and Metrics for Architectural Decision Models". In Proceedings of the Workshop on Sharing and Reusing Architectural Knowledge SHARK'11

## 9. Structure visualization

## Interactive traversal of design and project space.





# 10. Metrics visualization

Knowledge metrics visualization

