Università
della
Svizzera
italiana

**Faculty
of Informatics**

Collaborative Design with the Software Architecture Warehouse

Marcin Nowak, Cesare Pautasso

Faculty of Informatics, University of Lugano, Switzerland

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

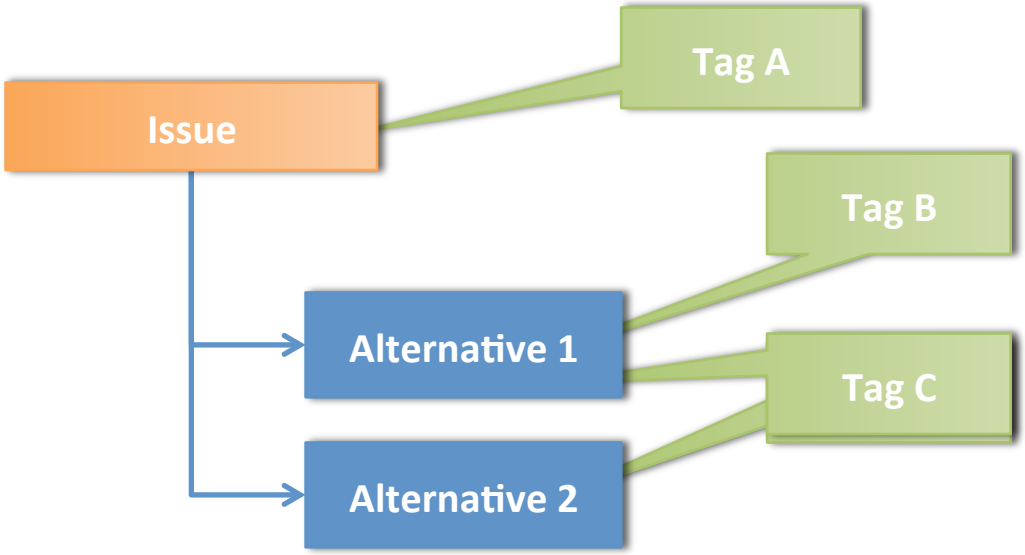
Goal: Support the collaboration in local and remote design workshops

A Warehouse for Architectural Knowledge

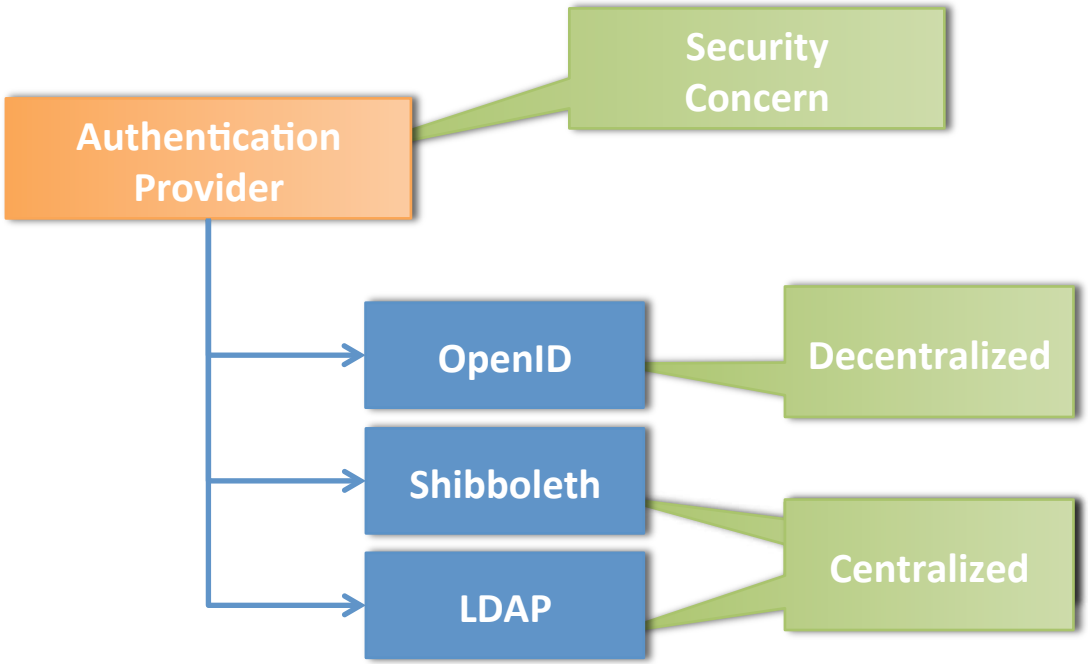
- Capture, Manage, Share and Analyze reusable architectural knowledge across multiple projects
- Minimal assumptions over the knowledge meta-model:
  - IBIS (Issue Based Information System)
  - Capable of handling multiple knowledge and decision models at the same time

SAW Meta-Model

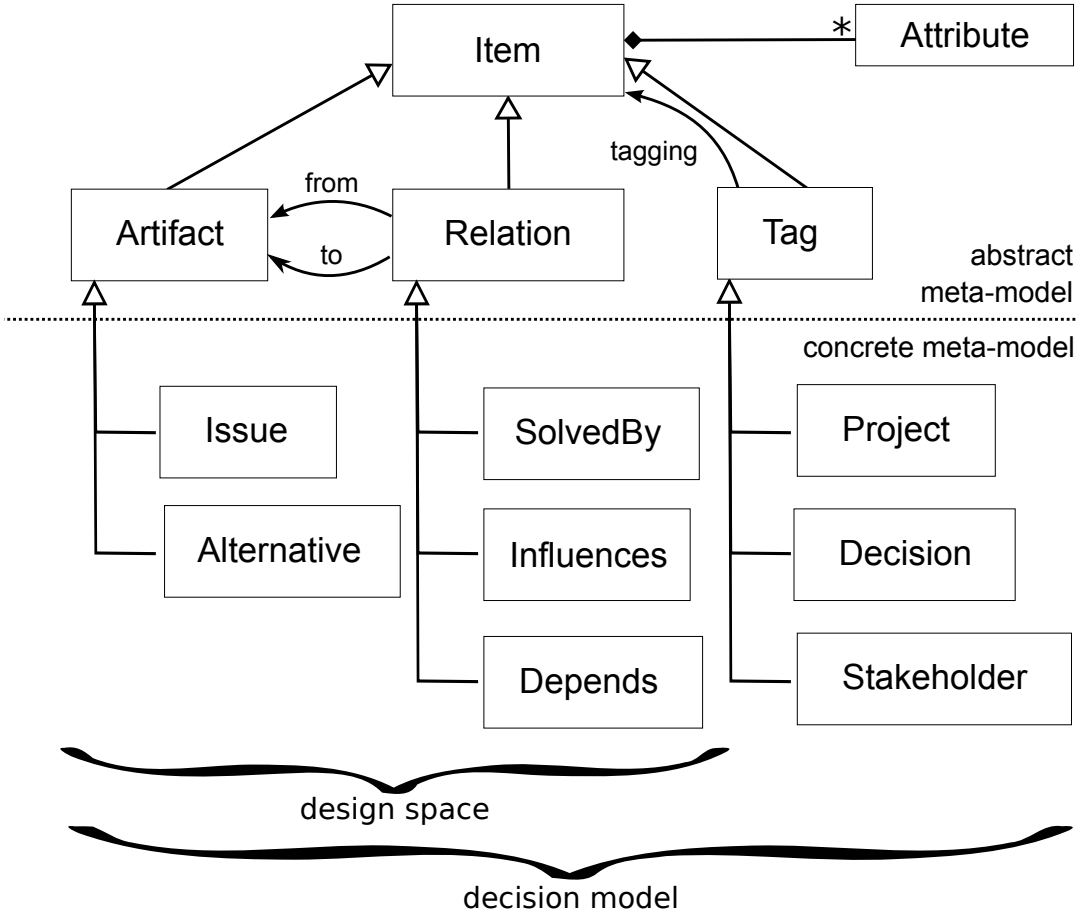
- Abstract issue-based Information Systems



Example

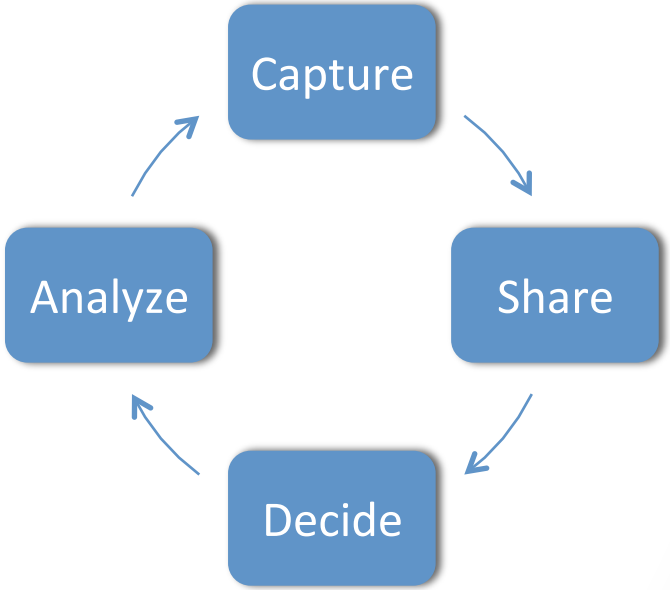

Security Concern
Authentication Provider
OpenID
Decentralized
Shibboleth
Centralized
LDAP

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

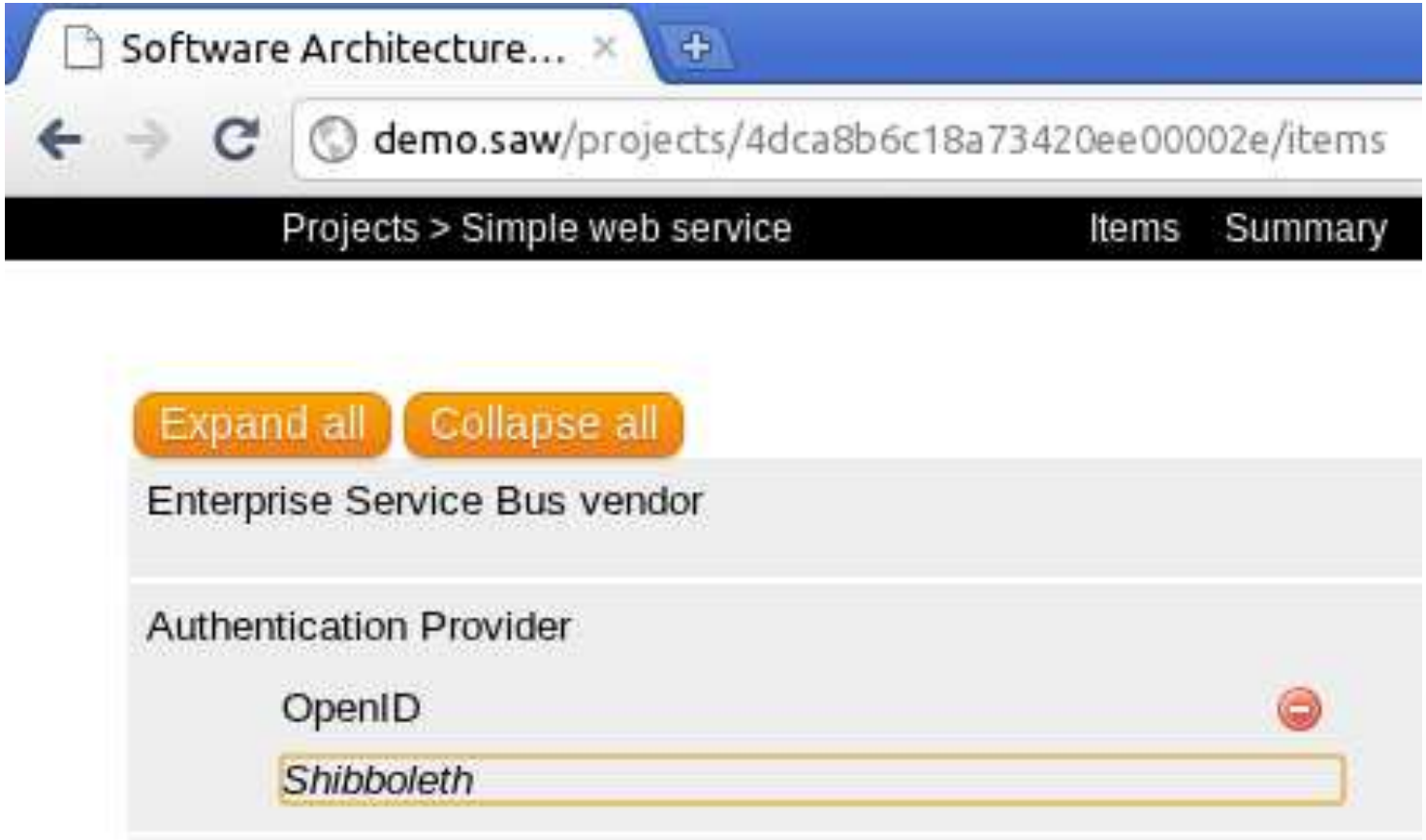
Software Architecture Warehouse

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

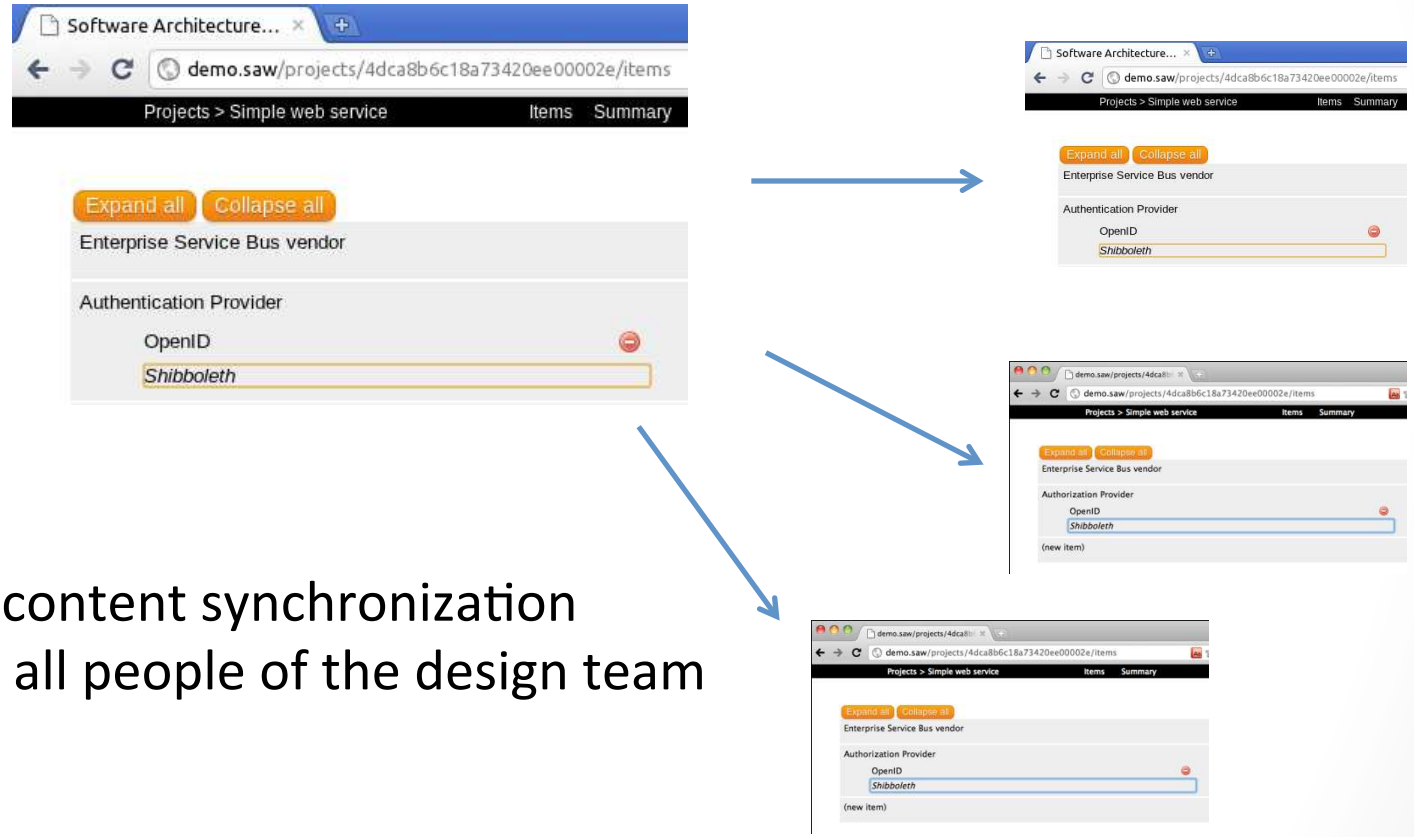
1. Capture

Immediate live in-workshop note-taking



1. Capture

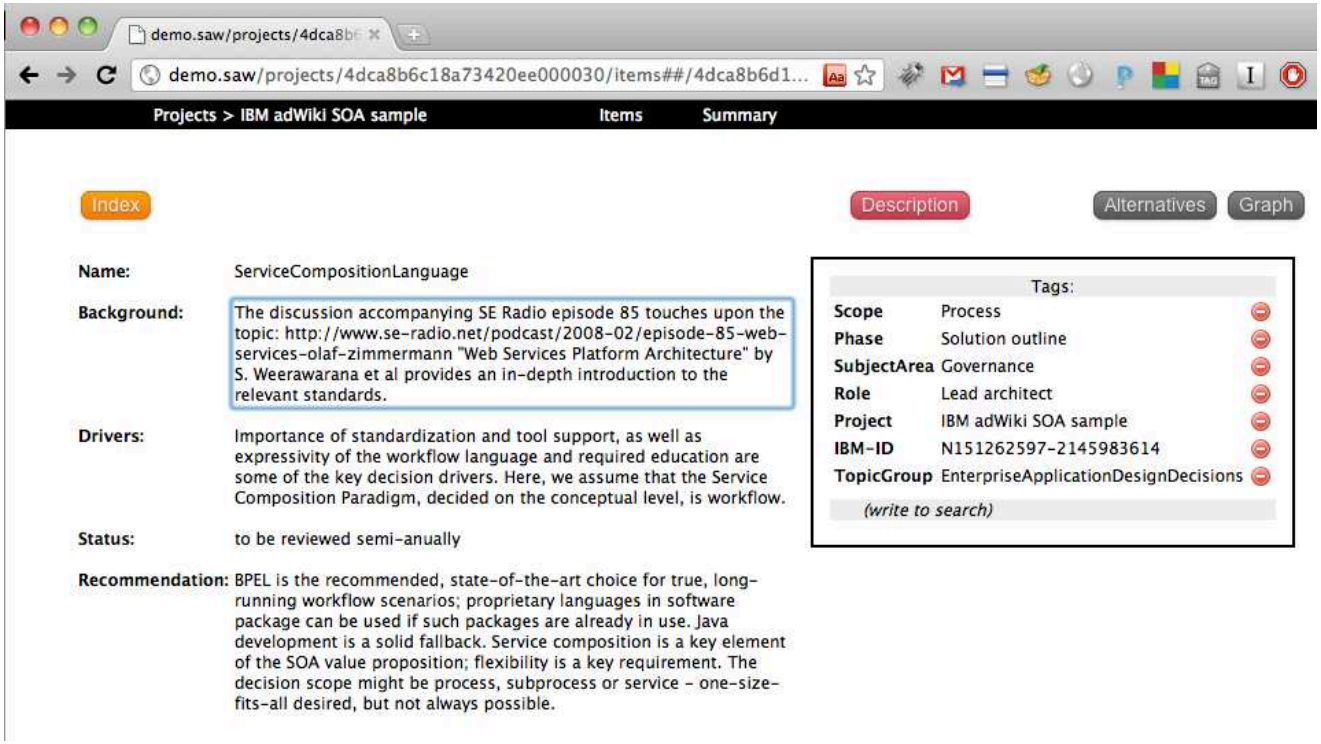
Immediate live in-workshop note-taking **and sharing**



Live content synchronization
with all people of the design team

2. Refinement

Customizable knowledge model to fit particular needs



3. Artifact linkage

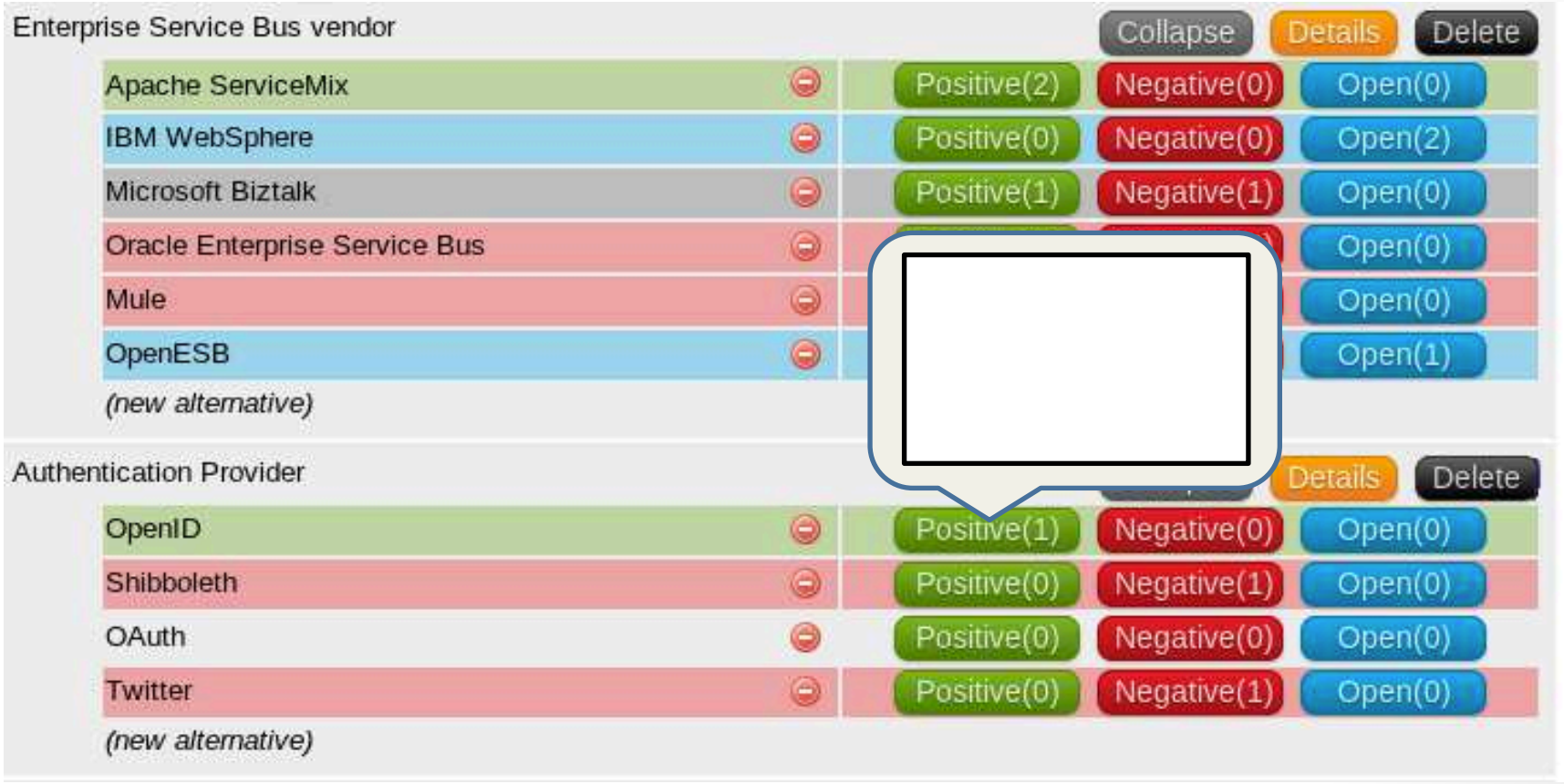
Linkage of related knowledge items within the design space

4. Collaborative Decision Making

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

5. Rationale linkage

Rationale recording



6. Collaborative Decision Making

Everyone can participate in the decision making process

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

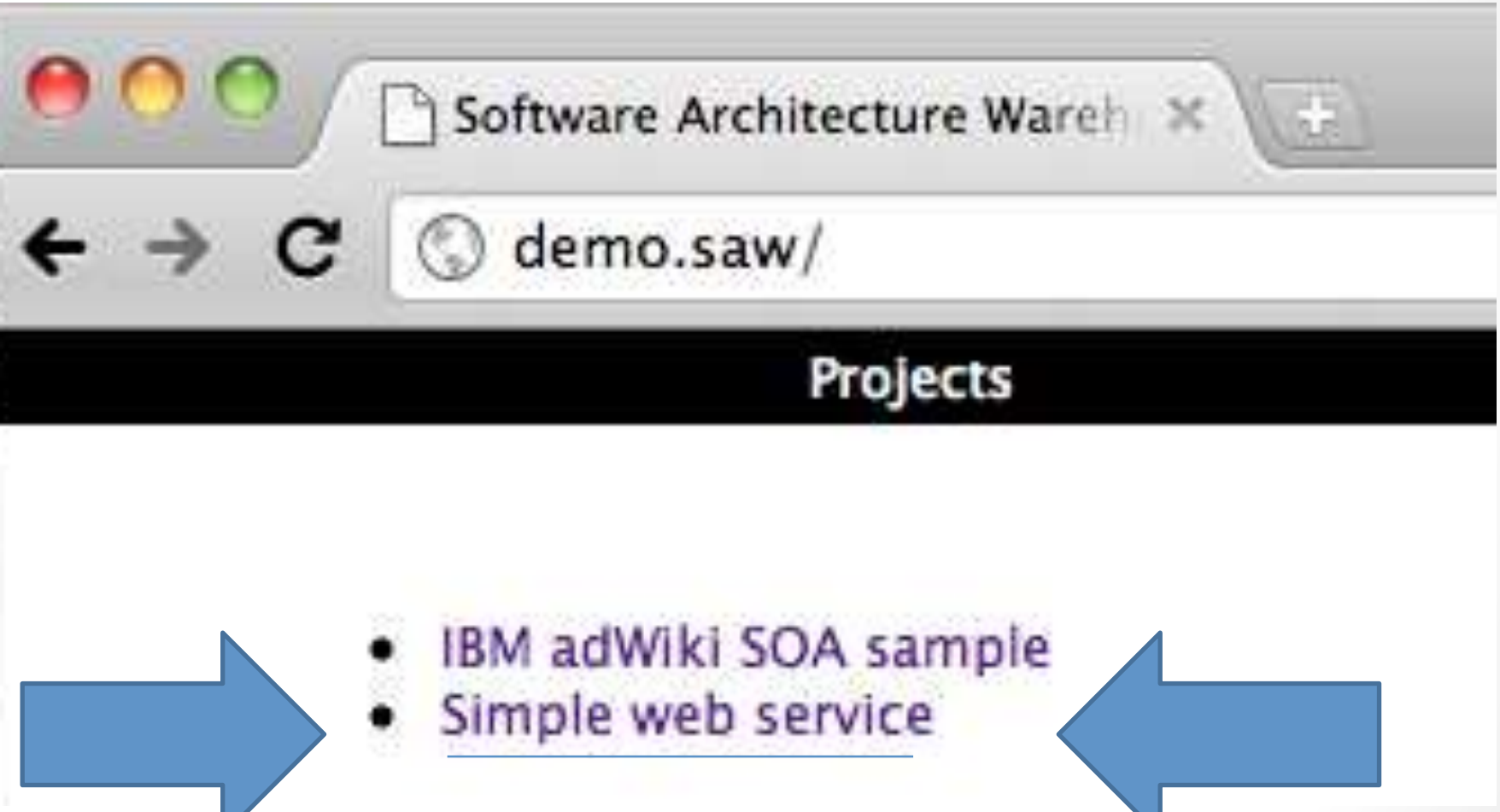
SAW Demo

WLAN SSID: **SAW**

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

Supported Browser: **Chrome**

Getting Started



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

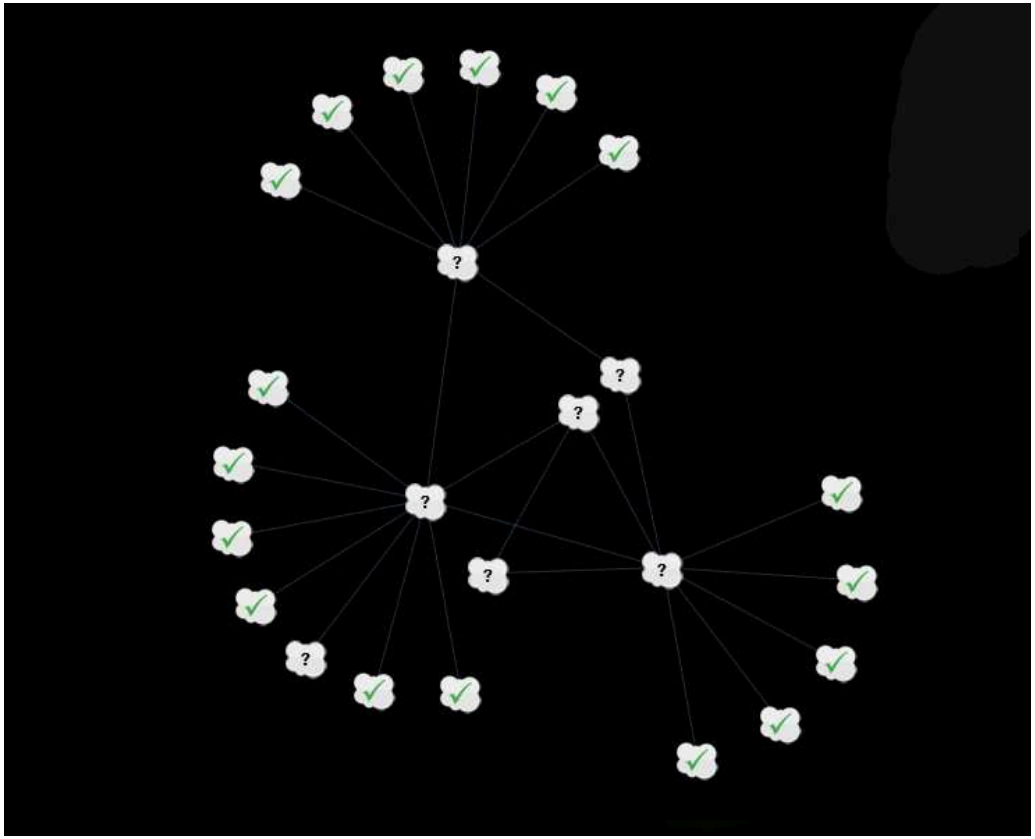
- We are looking for partners to evaluate our tool in their design environment

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