ICT Current Solutions and Future Trends for Collaborative Clusters

Workshop 1: Best in class solutions for Governance, Business models and enabling ICT in collaborative clusters

Sergio Gusmeroli
TXT e-solutions, Italy
• ICT solutions for Human Collaboration
• ICT solutions for Enterprise Collaboration
• ICT solutions for Enterprise Interoperability
• ICT Trends and Future Initiatives
  – The Software as a Service concept
  – The Interoperability Service Utility concept
  – The COIN ICT Integrated Project
• Conclusions
The EC 2020 Vision for NWE

Collaboration systems offering technologies and services to empower and motivate people to work together with anyone, at any place, at any time.

- Integrated Collaboration
- Mobile Collaboration
  - Ongoing

- Integrated group-oriented Collaboration
- Collective Intelligence
- Contextual Collaboration
  - Future

- Ubiquitous Collaboration
  - Goal

- Security & Control
  - Ongoing
CWE Challenges from ICT

- **COllaboration UPperware**: support to user/group interaction, re-use of components, mash-up of HCI primitives, desktops and dashboards

- **Service composition & integration**: keep user-centric approach, open to new paradigms and standards (BPEL4PEOPLE)

- **Context management**: novel models and primitives for decisional collaborative processes mgmt beyond traditional BPM

- **Distributed reasoning**: a wise mix between centralised-distributed features always respecting privacy and IPR

- **Reference architecture**: best-of-breed approach, without neglecting Agents, P2P and GRID technologies

- **Heterogeneous devices**: browsers and players specifically devoted to collaboration (c-POD), support to collaborative multi-modal interaction modes
COUP: ECOSPACE Gadgets

Navigation tabs (logical different sections of Ecospace?)

iGoogle Memos/Notes Gadget

JayTown/Marte Presence

HTML Gadget

iGoogle Public Utilities Gadgets

TXT-WF ToDo List

URL gadget

Ecospace News

HTML Gadget

TXT-WF Recent Messages

URL Gadget

TXT-WF Links

HTML gadget
The OCA Working Group
(http://www.oca-wg.org/)

• The mission of the Open Collaboration Architecture (OCA) Working Group is to define the foundational architecture to enable a world-wide interoperable collaboration infrastructure ”

• The OCA Working Group is a joint activity of the following EU IST Integrated Projects:
  • Collaboration@Rural
  • CoSpaces
  • EcoSpace
  • Laboranova
  • NEPOMUK
  • WearIT@Work

• The projects represent a total investment in Collaborative Technology in excess of 50 Mio
The ECOSPACE architecture

Semantic Infrastructure

- User Model
- Context Rules
- User Profile
- Semantic Markup
- CWE Ontology
- Semantic CoCoS Orchestrator

Applications

- UI
- Non-SOA
  - Plugin
  - WWS
- SOA

ecoSpace Desktop

Directory Infrastructure

- Directory Infrastructure
- Service Dir.
- CoCoS Dir.
- Application Dir.

Basic Services

- System A
  - e.g. BSCW
- System B
  - e.g. Netweaver

CoCoS

- orchestrates
- annotates

References

- references
- is used by
- publishes
- communicates
- enables
• **Co-operativity:** participation in the decisions, modelling, assessment of collaboration in business-decisional processes; stimulating and rewarding

• **Context-oriented data mapping:** intelligent active content (rules in metadata, user profiling, semantic search)

• **Context switching:** adaptive/proactive context mgmt, planned-mediated-adhoc, the self-collaboration syndrome (Dr. Jekill, Mr. Hide)

• **Life cycle of artifacts:** ownership and access rights dynamic mgmt, active artifacts, Artifact & Knowledge IPR mgmt

• **Pervasive collaboration:** wearable computing, multi-modal interaction (voice, tactile, gesture, face, phicons), Ambient Intelligence

• **(A)synchronous collaboration:** integrating diverse interaction patterns with task mgmt (decisional-business process) to create model-generated workspaces in collaborative applications

• **Web 2.0 & Communities:** nimble teams and ecosystems of professionals, as an integrated, synergic WE for individuals, communities, organisations devoted to creativity and innovation.
The Professional of the Future

Professional Of the Present

Professional Of the Future?

Share!

Protect!

The KBS chromo-framework
© A. Bifulco R. Santoro PRO-VE 2005

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Before you ever begin, understand your goal simply.

The link is the fundamental unit of thought.

Data belongs to those that create it.

It's about data first, experiences and functionality second.

Be prepared to share everything with enthusiasm.

The Web is the platform; make it grow.

Understand and embrace the "capability gradient".

Everything is editable.

Identity on the Web is sacrosanct.

Know thy popular standards and use them.

Obey the law of unintended uses.

Granulate your data and services.

Provide data and services that are for user's individual benefit.

User-driven organization and filtering are not just nice to have.

Offer/use rich user experiences.

Embrace and enable rapid change and feedback.
Human Collaboration Challenges

- Individuals’ Benefit vs. Enterprises’ Benefit
- Entertainment vs. Work/Business
- Knowledge sharing vs. Knowledge exchange
- Search&Discovery vs. Automate&Optimise
- **Decisional Processes vs. Business Processes**
  - Human-oriented vs. Application-oriented interoperability
  - Workflow Mgmt vs. BPM (e.g. xPDL vs. BPMN vs. BPEL)
  - Usability (Co-operativity) Vs. Performance
  - Free&Open Source vs. Open Standards
  - IPR Ownership Vs. IPR Protection
  - Web is the platform vs. Certification&Reliability&Liability
  - Rich individual experiences vs. Company Brand, Mission
- **Serendipity vs. Research Strategy and Plan**
- **Virtual Communities vs. Communities of Practice**
  - Personal IS (productivity) vs. Enterprise IS (integration)
OUTLINE OF THE TALK

• ICT solutions for Human Collaboration

• ICT solutions for Enterprise Collaboration

• ICT solutions for Enterprise Interoperability

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Collaborative Networks

Business Opportunity

Market turbulence

Short window of opportunity

Fast configuration of a temporary consortium well suited to the needs

Preparedness

Breeding Environments

VBE

PVC

CNO

Management / Governance

CNO creation

Metamorphosis

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ECOLEAD ICT Infrastructure

ICT-I

Horizontal Services

- Human Collaboration services
- Knowledge Sharing services
- BP Interconnection services
- Systems Interoperability services

Basic Services

Platform Independent Basic Services

- Security services
- Billing services
- Composition services
- Serv. Repository Manag. & Discov. services
- Reporting services

Platform Specific Basic Services
ECOLEAD VBE ICT Support

VBE vertical services

- Registration Services
- Data Mgmt Services
- CO Identification Services
- CO Planning Services
- VBE Management System
- Decision Support Services
- Partners' Search Services
- Negotiation Wizard

ICT-I Basic & Horizontal Services

Access to VBE Members' Legacy Assets

- VBE Ontology
- PVC Ontology
- Legacy Company DB
**VO Management** vertical services

- **VO Model VOMod**
- **kPI Mgmt SID**
- **Distr. Info Mgmt DI3**
- **Monitor & DSS MAF**

**ICT-I Basic & Horizontal Services**

- Access to VO Members' Legacy Assets

**VO Ontology**

**Legacy Company DB**
ECOLEAD PVC ICT Support

PVC vertical services

User Mgmt Services
Contract Assist Services
Governance Services
Rewarding Services

Social Services

Social Netw. Services
CSCW & Co-Work Services

Knowledge Services

Ontology Services
K IPR Mgmt Services

Business Services

Ad-Hoc VT Services
Mediated VT Services (PS)
Planned VT Services

ICT-I Basic & Horizontal Services

Access to PVC Members' Personal Info Systems

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ECOLEAD Workshop, Rome, Dec 2007
• An economic community supported by a foundation of interacting organizations and individuals, the ‘organisms of the business world’. This economic community produces goods and services of value to customers, who themselves are members of the ecosystem” (Moore, 1996)
ICT Challenges for EC

1. DESIGN: “Remove software bottleneck”, from coding to modelling
2. IMPLEMENT: “Adaptation without IT experts”, from technical configuration to business adaptation, to speak the business language
3. USE: “innovation vs. productivity”, interweaving BP automation and people-driven decisional workflows
4. OPERATE: “IT follows user needs”, utility computing, embedded support/training, self* systems, evolution
5. CHANGE: “Enable agility and flexibility”, successful and continuous business innovation

* Adapted from SAP Intervention to European Grid Technology Days 2006

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ATHENA IP Railroad for EI

Provided

Enterprise Models

Processes

Services

Information / Data

Collaborative Enterprise Modelling

Cross-Organisational Business Processes

Flexible Execution and Composition of Services

Model-Driven Interoperability

Information Interoperability

Ontologies and Semantics

Required

Enterprise Models

Processes

Services

Information / Data

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ECOLEAD Workshop, Rome, Dec 2007
**Interoperability Service Bus**

- Static Orchestration / Composition Model
- Static Discovery / Selection of Services

**FOCUS on ABILITIES Interoperability Bus**

- **Repositories**
  - Negotiation Rules
  - Reconciliation Rules
  - Multimedia
  - Messages
  - Users

- **Enterprise Service Bus**
  - Synchronization Module
  - Reconciliation Engine
  - Negotiation Engine
  - Collaboration Module
  - Messages Event Handler
  - BPEL Engine
  - Task Manager

**Repositories**

- Negotiation Rules
- Reconciliation Rules
- Multimedia
- Messages
- Users
Semantically enabled SOA

- Static Orchestration / Composition Model
- On-the-Fly Discovery / Selection of Services
• On-the-Fly Orchestration / Composition Model
• On-the-Fly Discovery / Selection of Services

✓ Separation between Business Process and Service Orchestration / Composition
✓ Automatic semantic reconciliation of goals (demand)
✓ Service self- and peer- advertising (offer)
✓ Intelligent engine for service discovery and composition
✓ On-the-fly derivation (inference) of the Composition Model
Interoperability Grand Challenges

Roadmap: Grand Challenges

Knowledge-Oriented Collaboration

Web Technologies for EI

Interoperability Service Utility

Science Base
Knowledge Oriented Collaboration

**Collaboration Knowledge Sources**
- Enterprise internal experience from formal & informal sources
- Enterprise experience of current & previous collaborations
- Knowledge of potential & actual partners, from previous collaborations and from ISUs
- Knowledge of collaboration practices in industrial sector and region from previous collaborations and from ISUs
- Knowledge of Collaboration best practice from ISUs
- ISU reliability knowledge from ISU accreditation

**Knowledge for Collaboration**
- Enterprise Core Competence
- VO Formation Knowledge
- Partner Selection Knowledge
- VO Operations Management Knowledge

**Key Enterprise Benefits**
- Rapid and reliable formation of collaborative consortia to exploit product opportunities
- Enhanced operational & strategic decision making in VOs, for enhanced competitiveness and profitability
Web Technologies for EI

- **EI Operating System enhancements to client-side applications**
  - To develop solutions that raise the value of services offered by enterprises on the web platform, through more powerful technological capability of the software applications that they use.

- **Mash-up technology solutions for EI**
  - To develop solutions characterised by the use of data and content available on the web, allowing enterprises to enhance existing services or offer new services where a part of the value added results from the use of this diverse data and content available on the web.

- **Web Service Logic Execution Environment (SLEE) for EI**
  - To develop solutions enabling enterprises to request the execution of functions by remote web platform resources.

- **Web community solutions for EI**
  - To develop solutions enabling enterprises to operate with others in subnets by using the web as a platform, while being assured that their intellectual property, knowledge, and the value that is created can be fully appropriated by the transacting entities.
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What is Software as a Service

Software as a Service is the delivery of application functionality via a subscription model. The customer does not take ownership of the software but rather ‘rents’ a total solution that is delivered remotely.

Software as Services is a different business model from end to end relative to the traditional ISV model.
## ASP vs. SaaS

<table>
<thead>
<tr>
<th>Application Hosting Model</th>
<th>Software as a Service Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer pays on delivery of software</td>
<td>Customer pays for delivery of functional services</td>
</tr>
<tr>
<td>Customer responsible for software performance</td>
<td>Provider responsible for software performance</td>
</tr>
<tr>
<td>Customer responsible to customize software to business requirements</td>
<td>Customer responsible to configure software to business requirements</td>
</tr>
<tr>
<td>Customer pays maintenance to fix software</td>
<td>Provider fixes software or pays penalty for failure to meet service levels</td>
</tr>
<tr>
<td>Customer buys upgrades to keep current</td>
<td>Provider ensures currency of solution</td>
</tr>
</tbody>
</table>

Source: Summit Strategies, Inc  “Software Powered Services: Net-native SaaS Transforms the ISV Business Model” Feb, 2005
Interoperability Service Utility (ISU)

- Interoperability as a
  - utility-like capability for enterprises
  - a public good
- ISU as a basic infrastructure that supports
  - information exchange between knowledge sources, software applications and Web services
  - a new generation of self-* services and e-business services
  - connection between islands of interoperability
  - especially SMEs and start-up companies
- ISU is independent of, rather than an extension to, EI solutions on the market
The COIN IP Metaphore

**COIN VISION:** “By 2020 enterprise collaboration and interoperability services will become an invisible, pervasive and self-adaptive knowledge and business utility at disposal of the European networked enterprises from any industrial sector and domain in order to rapidly set-up, efficiently manage and effectively operate different forms of business collaborations, from the most traditional supply chains to the most advanced and dynamic business ecosystems.”

**COIN MOTTO:** “Enterprise Interoperability and Enterprise Collaboration are the two sides of the same COIN”
• A field of activity with the aim to support Networked Enterprises to do business together through ICT
  ■ Focus on core competencies
  ■ Expose proper views of internal competencies
  ■ Discover collaborative business opportunities
  ■ Look for complementary competencies by accessing others’ views

• First Issue: competencies
  ■ Ability to apply skills/capabilities to a business situation
  ■ Human vs. Enterprise Competencies
  ■ Networked Enterprise Competencies
  ■ Competencies assessment, management and governance
  ■ Competencies alignment and semantic reconciliation

• Second Issue: business opportunity
  ■ Generation and/or Discovery
  ■ Modelling and Characterisation (demand modelling)
  ■ Structuring and planning
  ■ Matching with competencies
  ■ Scheduling, enactment, BO management
• **First Issue: competencies**
  - OEM determines the SC competencies
  - Almost Static H/E Models
  - Identification OEM-Network
  - Human periodical assessments
  - Aligned by construction

• **Second Issue: business opportunity**
  - OEM generates BOs for the SC
  - Top-down modelling
  - Top-down structuring and planning
  - Full scale competencies visibility
  - Centralised enactment and management
Side A: Collaborative Networks

First Issue: competencies
- Service Center (VBE) as a competencies collector
- More dynamic H/E Models
- Specific VBE competencies
- Autonomous assessments + inheritance + trust mgmt
- Manual Alignment process

Second Issue: business opportunity
- Crawlers to discover market BOs
- Top-down modelling
- Top-down structuring and planning
- Negotiation for scheduling (different views and visibility rights)
- Centralised enactment and management

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**First Issue: competencies**
- P2P competencies system
- Fully dynamic H/E Models
- Specific BE competencies
- Peer assessment, Web 2.0
- Intelligent Alignment process (Agents)

**Second Issue: business opportunity**
- BO Miners to discover internally-generated BOs
- Top-down bottom-up modelling
- Participative and collaborative structuring and planning
- Semantic spaces for demand-offer
- P2P enactment and management

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Side B: Interoperability

- The ability of two or more systems or components to exchange information and to use the information that has been exchanged

  - Enterprise Interoperability is a relatively recent term that describes a field of activity with the aim to improve the manner in which enterprises, by means of Information and Communications Technologies (ICT), interoperate with other enterprises, organisations, or with other business units of the same enterprise, in order to conduct their business.
  - In contrast, “enterprise interoperability” (without capitals) is – analogous to the IEEE definition of interoperability – the ability of an enterprise to interact with other organisations, to exchange information and to use the information that has been exchanged.
### Side B: Federated Interoperability

<table>
<thead>
<tr>
<th>Message</th>
<th>Publishing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>Web</td>
</tr>
<tr>
<td>So-called Web Services</td>
<td>Triple Space</td>
</tr>
</tbody>
</table>

- **Sharing vs. exchange**
- **User-centric Interoperability**
- **Global/permanent publishing**
- **P2P nets of semantic profiles**
- **Business Cases**
  - 1:1 negotiations
  - 1:n calls for quotations
  - n:m shared procurement

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**Figure 2** The two major footpaths in developing the Web.

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© Prof. Dieter Fensel (Uni Innsbruck)
The Metal: generic service platform

**Problem Solving Layer**
- Ontologies
- Applications
- Developer Tools

**Broker Layer**
- Discovery
- Adaptation
- Composition
- Choreography
- Mediation
- Grounding
- Fault Handling
- Monitoring

**Base Layer**
- Formal Languages
- Reasoning
- Storage and Communication

**Execution Management**
- Security (authorization, encryption, trust, certification)
<table>
<thead>
<tr>
<th>EI Research Roadmap ISU General Principles</th>
<th>COIN GSP Guideline for Metrics / Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available at (very) low cost</td>
<td>• Open access and free availability of COIN GSP specs and code</td>
</tr>
<tr>
<td>Accessible by all enterprises (universal access)</td>
<td>• COIN GSP specs permanently available from the public domain</td>
</tr>
<tr>
<td>“Guaranteed” to a certain extent and at a certain level in accordance with a set of common rules</td>
<td>• IPR arrangement to ensure the above</td>
</tr>
<tr>
<td>Not controlled or owned by any single private entity.</td>
<td>• Utility properties of GSP</td>
</tr>
<tr>
<td>Independence of particular IT solution deployment</td>
<td>• QoS of GSP</td>
</tr>
<tr>
<td></td>
<td>• Specific properties of Value-Added Services (i.e. SP4 &amp; SP5 services)</td>
</tr>
<tr>
<td></td>
<td>• Common rules for GSP &amp; VAS service management</td>
</tr>
<tr>
<td></td>
<td>• Common rules for governance and operational management</td>
</tr>
</tbody>
</table>

**Enterprise Interoperability and Collaboration services will be delivered as **utilities**, like water, electricity, gas supply and telephony services.**

<table>
<thead>
<tr>
<th>EI Research Roadmap ISU Design Principles</th>
<th>COIN GSP VAS Design Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principle 1: Functionalities will be delivered as services that may reside anywhere and be invoked anytime</td>
<td>Compliance with the “End-to-End Argument” of Salzer, Reed and Clark for end-to-end system design</td>
</tr>
<tr>
<td>Principle 2: Open standards and specifications, and modular software building blocks</td>
<td>Semantic-enabled exchange of information and knowledge</td>
</tr>
<tr>
<td>Principle 3: Transparency – what goes in is what comes out</td>
<td>Information and knowledge integrity in exchange; service neutrality; transparent semantic reconciliation</td>
</tr>
<tr>
<td>Principle 4: A clearly defined set of minimum circumstances for message transactions</td>
<td>Provision of a predictable and uniform environment for GSP services and VAS</td>
</tr>
<tr>
<td>Principle 5: Scalability</td>
<td>Issues:</td>
</tr>
</tbody>
</table>

- Stable and reliable information propagation across multiple systems
- Explosion of end-points / applications
- Inter-working of systems in a multi-provider environment
- Backward compatibility and transitioning from existing systems

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COIN IP: Objectives

1. To design and develop a pervasive, adaptive service platform to host Baseline and Innovative COIN services for EI and EC and make them available under innovative on-demand, utility-oriented business models (i.e. the SaaS-U model) to European enterprises (and SMEs in particular) for running their business in a secure, reliable and efficient way.

2. To consolidate and stabilize the ICT results of both EC and EI FP6 research into some Baseline Services which constitute the service foundations for COIN.

3. To further enlarge, extend and improve the Baseline Services, by developing other more Innovative Services in the EC and EI fields, which could take into account the most recent and promising technology challenges (in the field of Web 2.0, semantic web, space computing) and put them at service of EC and EI purposes.

4. To represent a pathway to convergence for these two fundamental research streams: EI and EC, by integrating in the same project the most prominent stakeholders of the two research fields coming both from industry and from universities and research centers.

5. To demonstrate, experiment, trial and assess the project results into realistic industrial scenarios offered by our 6 test cases in Aeronautics (Aeronautic Cluster of Andalusia, Spain), Automotive (the Automotive Cluster of Slovenia), Aerospace (the Lazio Connect virtual enterprise network Italy), Pulp & Paper (the Poyry consultancy service providers), Healthcare (the VEN network in U.K.) and ICT (the Hungarian Association of ICT companies).
CONCLUSIONS

• **Human collaboration**, CWE projects (IPs and STREPs), Users and ICT Challenges (COUP, architecture, context switching, Web 2.0)

• **Enterprise collaboration**, CNO-DBE projects, the 5 Challenges for next generation SOA (design, implement, use, operate, change)

• **Enterprise interoperability**, ATHENA-INTEROP projects, the 4 Grand Challenges of EI roadmap

• The **COIN IP**: an open research opportunity in the field of ICT for Human-Enterprise collaboration and Enterprise Interoperability

THANK YOU for your ATTENTION!!!!

sergio.gusmeroli@txt.it