

IWEI 2011 WORKSHOP REPORT

The IWEI 2011 Third International IFIP Working Conference, “Interoperability and Future Internet for Next-Generation Enterprises.” was held on March 22-24, 2011, in Stockholm, Sweden, The conference highlighted developments in the areas of scientific foundations for specifying, analyzing and validating interoperability solutions, architectural frameworks for addressing interoperability challenges from different view points as well as working sets of practical solutions and tools that can be applied to interoperability problems today, <http://www.ics.kth.se/iwei/> .

A number of workshops complemented the topics of the IWEI Conference and explored new issues and solutions in enterprise interoperability. The program was organized in four separate workshops:

1. Enterprise 2.0 – Using Internet 2.0 Technologies in Enterprise Management
2. Semantic Interoperability in the Scope of Future Energy Smart Grids
3. Advanced Results in MDI/SOA Innovation
4. Standards Ensuring Enterprise Interoperability and Collaboration – State of the Art and Perspectives.

The Workshops offered opportunities to discuss issues raised during the paper presentations and to brainstorm about possible solution directions. A particular goal was to understand the different views on enterprise interoperability presented, to follow the discussions and the derived research needs .

The workshop proceedings with the papers will be printed by ISTE Publication, London, UK. The book will appear in July 2011.

Below you will find the minutes of the four workshops at a different level of detail, including discussions.

Martin Zelm, IWEI 2011 Workshop Chair

WORKSHOP W1: USING INTERNET 2.0 TECHNOLOGIES IN THE ENTERPRISE **MANAGEMENT**

Ricardo Chalmeta, Verónica Pazos, University Jaume, Spain

The workshop was held as the kick off meeting for the new thematic group in InterOP-Vlab, *TG12: Interoperability in Enterprise 2.0*. The meeting was devised in three parts described below

- 1) An Introduction, providing an overview of previous work presented by Verónica Pazos (University Jaume)
- 2) A Discussion to identify issues, requirements and conclusions

The **concept** of Enterprise 2.0 must be defined. This means to identify the changes needed to make an enterprise become an Enterprise 2.0. The change must be defined at strategic, tactical and operational level. Further, it is necessary to identify the benefits that an Enterprise may have when becoming an Enterprise 2.0.

Methodologies, methods and techniques: It is necessary to develop guidelines and maturity models of social networking in enterprise. Namely, to define goals at all levels of the enterprise using a top-down approach complemented with a bottom-up one. 2.0 technologies seem to be oriented to operational information and hence it maybe necessary to define methods to extract automatically strategic information from operational level. In addition, it is necessary to develop ROI methods to prove benefits and show enterprises quantifiable benefits of Enterprise 2.0 approach. Finally, the structure, architecture, processes and specific rules of Enterprise 2.0 must be developed.

Regarding **corporate culture**, it is necessary to change enterprise mentality in a way that all the users of 2.0 technologies trust eachother and develop privacy policies that facilitate the access to information. It is necessary to motivate users to use these technologies conclusions:

3) Proposed actions for TG12

- Establish a common baseline on Enterprise 2.0
 - Whitepaper from Wolfgang Prinz (Fraunhofer FIT)
 - Write a whitepaper on Grai Model (David Chen and Yves Ducq) when in 2011?
 - Document from USA: The Dawn of Emergent Collaboration, McAfee A., 2006
 - FInES position paper (2011 – 2009)
- ENTERPRISE 2.0 DEFINITION
 - Analyze various definitions
 - Propose TG12 definition
- ORGANIZATION CHALLENGES FOR ENTERPRISE 2.0
 - Define what type of organizations (segmentation of the target, legal aspects, human resources, ...)
 - What are they?
 - Are they new?
- NEW TECHNOLOGY AND ENTERPRISE 2.0
 - What is the influence of the technologies in Enterprise 2.0? (Future Internet, social network, service web, SaaS, mash ups,.. Disruption or evolution?)
 - What are the needs of Enterprise 2.0?
 - Tangible and intangible benefits analysis

WORKSHOP W2: SEMANTIC INTEROPERABILITY IN THE SCOPE OF FUTURE ENERGY SMART GRIDS.

Mathias Uslar, OFFIS Oldenburg, Germany

The goal of the workshop was to bring together stakeholders from academia and practice to identify challenges in the future integration of ICT into the existing electricity transmission and distribution system.

The workshop was organized by OFFIS – Institute for Information Technology from Oldenburg, Germany by two groups in the Energy division, Software technology group led by Dr. Ulrike Steffens and the Interoperability and Standardisation group led by Dr.-Ing. Mathias Uslar.

European researchers have shown that there is a strong need for semantic and syntactic data integration from the various new sensors or from distributed energy generation. Further, there is a need for an Enterprise Architecture for utilities taking into account new requirements of communication and data management.

The workshop explored two slots of Enterprise Architecture Management of utilities focusing on smart grids and the semantic integration of smart grids layers with regard to data models and transport technologies. With the upcoming mandate M/490 by CEN/CENELEC and ETSI by the EC to the Smart Grid Coordination group SG CG, the technical challenges and problems for system integration will have to be addressed by the end of 2012. For the workshop, five contributions providing different viewpoints were presented

The first talk by Lars Nordström from the KTH Stockholm addressed the topic of having different **layers of needed interoperability in the smart grid** context. One interface to the power system is a fail-safe layer of automation and protection which is below other layers with the task of optimizing the power systems. Therefore, different requirements exist which were presented to the audience in a layered model of the problem domain from an interoperability standpoint.

The second talk by Rafael Santodomingo from the University Comillas Pontificas Madrid addressed **interoperability problems at the level of system integration** at electric utilities. Within electric utilities, two emerging standards have been ruled out to be at the very core of future smart grid standardisation and technology. The presented approach deals with the semantic and syntactic integration of those two standards at configuration level using description logics.

Sabine Buckl from the Technical University of Munich introduced within her talk the challenges arising for the topic of **Enterprise Architecture**. Different characteristics for the electric utility sector were presented and the challenges with respect to the enterprise and sectoral transformation based on the smart grid requirements. EA being one of the solutions to those problems has been presented.

Sebastian Rohjans, from OFFIS, Oldenburg outlined the need of bridging the gap between **Enterprise Architecture** as one of the challenges and **standardisation** on the other hand and how those two ideas together form a meaningful reference architecture method for creating smart grid ICT system landscapes.

In the concluding talk, Mathias Uslar from OFFIS, Oldenburg outlined the need of a seamless information security concept along the new ICT systems in the electric utility. With focus on end-to-end security and on vulnerabilities arising from using internet technologies with automation systems.

The support from the staff from the **International Journal of Interoperability in Business Information Systems (IBIS)** is gratefully acknowledged

WORKSHOP W3: ADVANCED RESULTS IN MDI/SOA INNOVATION

Guy Doumeingts, INTEROP-VLab, Belgium

The workshop objective was to present the latest results in the domain of MDI/SOA concerning research projects and the transfer towards industry. The workshop is the following after I-ESA 10 in Coventry (April 2010)

Topics covered: MDI, SOA, Enterprise Modelling, Model Transformation, Interoperability Service Utility (ISU), Orchestration and Mediation between services, Business-IT alignment, Reference Ontology and Mapping mechanism , Semantic annotations for information interoperability, Case studies and experience reports in MDI-SOA

MDI for SOA management of crisis

Anne-Marie Barthe, Frédérick Bénaben, Sébastien Truptil, Jean-Pierre Lorré, Hervé Pingaud

Summary: This article presents a theoretical overview of a model-driven approach dedicated to build an Service Oriented Architecture (SOA) Mediation Information System (MIS) dedicated to support the crisis management. The MIS, based on SOA principles, is a third-part system in charge of the coordination of the partners' activities by imposing a control structure dictated by collaborative processes, that must be run with compliance.

The Mediation Information System Engineering (MISE) 1.0 project (2004-2008) was launched in the Industrial Engineering Center of Ecole des Mines d'Albi-Carmaux and has been successfully developed. Its aim was to design and develop a MIS, which is based on model-driven engineering and on the associated model transformation concepts, i.e. a dive across several abstractions levels (business, logical and technological layers). This MIS was used in the French funded project (ANR-2006-SECU-006) ISyCri Project (ISyCri stands for Interoperability of Systems in Crisis situation), whose one objective was to design an IS for several partners who have to solve, or at least to reduce, a crisis into which they are involved. However, MISE 1.0 was predicated on several assumptions that the second step of the project (MISE 2.0, started in September 2009) aims to solve.

The approach allows the crisis cell to reactively deduce this MIS and to keep it flexibly adapted to the evolving crisis situation. The SOA structure of the deduction tools allow to remove the frontier between design-time and run-time. However, two main features are currently being implemented concerning (i) the deduction of a process cartography (instead of a single collaborative process), (ii) the semantic reconciliation between business and technical levels (instead of assuming a one-to-one matching between activities and web services) and (iii) the automated detection of significant evolutions through event-based cloud architecture (instead of manual filling of the control panel). Furthermore, another point concerning non-functional aspects (quality of services, governance, monitoring) is also studied in order to bring robustness and credibility to the MIS.

All this research work is supported by several national projects ANR/IsyCri, FUI/ISTA3, ANR/SocEDA, a European project (PLAY), seven PhD students (J. Touzi, V. Rajsiri, S. Truptil, N. Boissel-Dallier, W. Mu, A.-M. Barthe and S. Zribi) and three post-doctoral positions (J. Touzi, A. Charles and S. Truptil).

Questions during the discussion

Q1: What is the time required to perform changes in the system during a crisis ?

Answer: During a crisis situation, we consider that the time to react is really short. So, the time to perform the changes is short too. The proposed approach supports agility of the system through the following principle: at any time, if the responsables decide that it is time to change anything in the system, then that change can be performed depedning on the nature of the evolution. If it concerns actors (ex: incoming or leaving of an actor) then the process should

restart at the really beginning, if it concerns a new fact in the crisis (ex: tsunami after an earthquake) then the process should restart at the deduction step, if it concerns any dysfunction (ex: an activity did not succeed in solving the problem it has been executed for) then the process should restart at the orchestration step, etc. Finally, the required time is mainly depending on the nature of the agility : is it concerning the whole business process (or process cartography)? Or is it concerning the crisis cell and involving a new definition of the response workflow (new actors, new services?).

Q2: Does SOA/MDA lead to the most efficient code for use during a crisis situation ?

Answer: The main interest in using a MDA approach in a SOA context (furthermore based on an ESB technology) is in the allowed fusion of design-time and run-time. Actually, MDA web-services (dedicated, at design-time, to build the run-time workflows) are embedded into the same SOA environment (ESB) as the crisis web-services themselves (dedicated to run these deduced workflows). The gap between run-time and design-time, which is the main obstacle in agility of systems, is so considerably reduced: the run-time orchestration might invoke the design-time orchestration in order to perform adequate design-time actions (in order to define new coordinated behaviors). These design-time actions might then provide the run-time orchestration with these new coordinated behaviors that can be orchestrated to fit more closely to the evolution of the crisis.

Q3: Why do you need web services/SOA in a crisis situation ?

Answer: Considering the fact that the visible part of an organisation is its information system, and considering the definition of interoperability (as defined by INTEROP and Pr. Pingaud), we can say that the interoperability between the organisations' information systems should be managed without deep changes in the structure of the stakeholders' information systems.

One possible and realistic solution is the creation of a mediation system, in charge of this interoperability.

The SOA is mainly characterised by the low coupling between applications (viewed as services). The use of a mediation system, based on the SOA principles will meet our requirements about interoperability.

Then, in a crisis situation, the crisis cell may change due to the leaving of a stakeholder (for example) : the services of this stakeholder are no longer available for the response workflow. We need to use new services from another organization. Here, low coupling is an essential point to avoid a long and difficult technical evolution of our mediation system. SOA answers this need.

Reference ontologies for manufacturing based ecosystems

R Young, N Chungoora, Z Usman, N Anjum, G. Gunendran, C. Palmer, J Harding, K Case and A-F Cutting-Decelle

Summary: This paper is targeted at methods to improve the semantic communication between engineering groups and systems in manufacturing industry. This paper presents progress towards the development of reference ontology for a manufacturing eco-system, focusing particularly on the design and manufacture of aerospace parts, explained in the context of MDA. A concept is presented which illustrates how knowledge, captured from a manufacturing engineer's perspective, can be shared back into the product design process through the use of reference ontologies and appropriate mapping mechanisms. An experimental test case is used to illustrate the success of the approach

Q1. In the presentation you work with only one CIM and multiple PIMs and PSMs whereas in the case of 2 systems being developed independently there would also be 2 CIMs. Why have you not included this?

Answer: It would be possible to have multiple CIMs. However, even with a common CIM the problem of how to share meaning across multiple PIMs is complex and is the focus of our work. It could be extended to consider multiple CIMs also.

Q2. How do you ensure semantic consistency into the systems which are using the reference ontology?

Answer: At this stage this relies on the application of a method where the system developer is required to use only concepts which have been developed within the ontology. There is an issue for the future here though, as the constraining axioms are lost when the concepts are transferred and so there is the possibility for systems to be developed incorrectly unless some form of checks are put in place.

Knowledge-based System for Semantics Adaptability of Enterprises Information Systems

J. Sarraipa and R. Jardim-Goncalves

Abstract: This paper proposes a knowledge-based system to endorse the semantics adaptability capability of enterprises information systems from a technical perspective. Its main objective is to contribute to make other systems interoperable by defining how semantics adaptability could be accomplished. The Semantics Interoperability Enhancer System is rooted by a function based on the knowledge life cycle, which authors correlated it to the Nonaka and Takeuchi's Knowledge Spiral Conversion Model. This helped to organize the way such system handles with the knowledge to provide formal semantics inconsistencies' resolutions.

Presentation by Miguel Beça

Discussion

Q1. Does the proposed system allow for mappings between concepts which are to be subjected to further processing?

Answer: the answer is yes, as the system enables subsequent mappings of the same concept, while keeping traceability for previous versions of the concepts. Therefore, a mapping between concepts can be made multiple times.

Q2. Does the proposed system allow for mapping between multiple concepts simultaneously?

Answer: the system's capability regarding the mapping of multiple concepts is limited. The tuples support mapping expressions between concepts of 1-to-1 relationships and n-to-1 relationships. Mappings of the type n-to-m may be supported through the creation of multiple tuple expressions, as the tuples are not designed to handle this sort of relationships.

Q3. Can you provide us with further information regarding the machine learning mechanisms which have been implemented to enable the knowledge maintenance functionalities of the system?

Answer: the answer is yes, the approach followed is related to the insertion of some statistical information represented as a weight in the domain ontology concepts, thus together with some machine learning techniques available it is possible to update the list of the concepts used. This is done by finding some patterns from the systems' users, whose is the main trigger to propose changes on the list of the reference concepts, thus enabling the system knowledge maintenance.

A Model-driven Approach to Interoperability in B2B Data Exchange

Dumitru Roman, Brice Morin, Sixuan Wang, Arne J. Berre

Abstract: With the B2B data exchange becoming ubiquitous nowadays, automating as much as possible the exchange of data between collaborative enterprise systems is a key requirement for ensuring agile interoperability and scalability in B2B collaborations. Semantic differences and inconsistencies between conceptual models of the exchanged B2B data hinder agility, and ultimately the interoperability in B2B collaborations. In this paper we introduce a model-driven technique and prototype that support humans in reconciling the differences between the data models of the parties involved in a data exchange, and enable a high degree of automation in the end-to-end data exchange process. Our approach is based on the use of OMG Model-Driven Architecture (MDA) for abstracting platform-specific schemas and instances to platform-independent metamodels and models, specification of transformations at the platform-independent level, and generation of executable mappings for run-time data exchange. This paper presents the MDA-based data exchange framework we have developed, and focuses on the mapping metamodel and the generation of executable mappings from platform-independent transformations. Benefits of the proposed framework include the possibility of the mappings creator to focus on the semantic, object-oriented model behind the different platform-specific schemas and specify the mappings at a more abstract, semantic level, with both specification and execution of data mappings (i.e. design- and run-time mapping) provided in a single, unifying framework.

Discussion

Q1. Are you familiar with transformation language ATL?

Answer: We try to provide a more easy to use method than ATL.

Comment from questioner: You are using a very similar approach to ATL and the differences need to be explained. The ideas in your presentation are very interesting but they need to be more clearly set into context to gain the full benefit of what you are doing.

WORKSHOP W4 “STANDARDS INSURING THE ENTERPRISE INTEROPERABILITY AND COLLABORATION, THE STATUS OF ART AND THE PERSPECTIVES”

Piero De Sabbata, ENEA, Italy

The objective of the workshop was to increase awareness of interoperability standards enabling real life collaboration of enterprises and, in parallel, to identify elements of the potential evolution of standards in the Future Internet perspective. The workshop was organised jointly by InterOP-VLab and the European project COIN. The co-ordinators were Piero De Sabbata,, and Martin Zelm.

The workshop was opened with a speech from Sergio Gusmeroli (TXT e-Solutions, Italy), coordinator of the COIN IP project, with the aim to present the COIN vision about the services for enterprise interoperability and collaboration. The focus of such a vision is that by 2020 enterprise interoperability and collaboration will be supported by self adaptive, knowledge based, commoditized services that enterprise will see as business utilities (and thus being accessible at low costs and under non discriminatory and non exclusive policies) on the Future Internet. (More details of this contribution can be found in the attachment)

The implications of such a vision for researches in the Future Internet Enterprise Interoperability Systems area and the business aspects related to the distinction between utility and value added services were discussed. It was stressed the lack of business models assuring the economical sustainability of such models that presently are object of research in IT. In particular the role of public authorities and standardisation appeared to be relevant in some of the possible scenarios. Further, the discussion put in evidence that the enterprises’ ‘agility’ have to be sustained by low cost interoperability services that allow to build ‘on the fly’ collaborations but this might conflict in the short range with the economical sustainability of the services.

Four papers were presented and discussed.

The first paper was presented by Dumitru Roman (SINTEF, Norway) and focused on SoaML, as a case of standards and initiatives for service modelling. Service modelling is an enabler for their discovering or composition that is key of the service based vision for the Internet. The speech offered an overview of what is going on in service modelling, generally in OASIS RM and specifically on semantic annotation for services (SAWSDL), on geospatial referencing (OGC). Furthermore it was highlighted a very large number of RESTful services exists in the Internet that poorly tackled by standardisation activities. Finally the case of SoaML was presented in detail. The discussion highlighted the problem of the management of service versioning as one of the challenges for simple and easy-to-use service modelling languages.

The second paper, presented by David Chen (University of Bordeaux, France), discussed the advancements in CEN/ISO 11354, the **Framework and Maturity Model for Enterprise Interoperability**. The presentation detailed the progress in the standardisation activity that, after defining the first layer (the Framework for Enterprise Interoperability) tackled the second layer (the Maturity Model for Enterprise Interoperability) which will be followed by the third layer (ICT requirements). The debate about its potential applications evidenced the difference between the use of the model to express and measure the potential of an organisation towards interoperability and the real achievements in a collaboration between several organisations.

The third paper was presented by Martin Forsberg (ECRU Consulting, Sweden) and focused on **standards ensuring enterprise interoperability** and collaboration, and how standards for electronic business address different levels of interoperability when translated into real applications and introduced the concept of contextualisation.

Beyond the problem of different standards regulating overlapped domains, the interoperability between different implementations of the same standard is crucial. The running initiative from UN/CEFACT about the contextualisation methodology was considered as potentially relevant in this perspective. The discussion evidenced that application level standards for business are still thought according to the traditional document based EDI paradigm. A transition towards an approach more fitting the service based paradigm is expected, even if, presently, at the end the legal point of view, for example for invoices or orders, will continue to be strongly document based.

Finally Arianna Brutti (ENEA, Italy) presented a paper about the increasing **role of customisation rules and conformance testing tools** to achieve interoperability reporting two experiences related to eBusiness standards for SMEs networks. Starting from the recognition that conformance to standard specification is not enough to guarantee interoperability between different implementations, the paper analysed how two different experiences (PEPPOL, project for public e-procurement and eBIZ-TCF, industry led sectorial initiative for eBusiness harmonisation) performed the customisation of the standards. The discussion highlighted the quantitative relevance of the rules that have to be managed on this purpose and the need for some metrics about the ‘uncertainty’ or degree freedoms that customisation can obtain.

Attachment

Enterprise Interoperability & Standards: the COIN IP perspective

Sergio Gusmeroli , TXT e-Solutions

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.”

The COIN Vision implies that in 10 years time, Enterprise Interoperability and Enterprise Collaboration services will be commoditized and factorized in the Internet of the Future as a set of Utility Services, available to all enterprises at a very low or zero cost and under non-discrimination and non-exclusivity policies: Interoperability and Collaboration as Public Services.

Firstly, from an architectural viewpoint, the COIN Vision implies that commercial Enterprise Systems of the future (FInES) should focus on the most added value services they could provide (e.g. supporting supply chains, customer relationships, product life cycle, financial and HR issues, in one word supporting Business Innovation) and leave the most commoditized IT services to the Future Internet open platforms federation or, in the current FI PPP (Public Private Partnership) interpretation, to generic APIs and enablers provided by the FI Core Platform and implementing utilities like service search, composition, security, privacy, collaboration and interoperability. This is going to inspire new research in the field of FInES Architectures, as demonstrated by the latest developments in the FInES cluster task forces.

Secondly, the COIN Vision is in agreement with the most recent EC policies and in particular with the Digital Agenda for Europe (DAE) which identifies 7 key themes to be solved in order to build the European Digital society. One of these key themes (number 5) is: Interoperability and Standards: a digital society can only take off if its different parts and applications are interoperable and based on open platforms and standards.

Thirdly, from a business viewpoint, the distinction between Value Added (pay-as-you-go) and Utility (free) services is stimulating the development of innovative business models bundling VAs and USs in a very similar way the Media industry is bundling Free and Premium services. The latest outcomes of COIN business research show however that the full adoption of so called SaaS-U business models (merging SaaS and Utility models) will be effective for EI/EC services just starting from 2020, when Value Added services could be on-the-fly and dynamically

selected in the private clouds by Enterprises and therefore the need of standardized EI/EC services available in the open clouds will become essential.

On the other side, the present perception in COIN is that in the current business and market landscape for providing enterprises with just EI/EC Utility Services is not guaranteeing the IT providers with the necessary economical returns from the needed huge investments in ICT, according to the current costs of Cloud Computing and similar infrastructures.

Two solutions are envisaged to provide now EI/EC services as commodities: bundling Utility services with Value Added services similarly to what Telecom-Broadband operators currently do, or looking for more intangible returns like achieving service neutrality, reducing digital divide between SMEs and Large Enterprises, supporting enterprise collaboration as a strategic asset, encouraging the development of start-ups and innovation initiatives, developing and providing public services for enterprises. In this last scenario, next generation, innovation-oriented Public Authorities need to play a very important role in providing the enterprises growing in their territory with such basic IT commodities to develop their business.

The above themes will be discussed in the present IWEI 2011 COIN workshop entitled "Standards ensuring Enterprise Interoperability and Collaboration, the state of art and the perspectives". Such a workshop belongs to the COIN Angels dissemination initiative, involving authoritative external experts in discussing and disproving so-called Capital Sins which negatively impact the adoption of EI/EC standard services by Industry and SMEs in particular.