



Metadata requirements in telecommunications cloud computing

15th International Open Forum on Metadata

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Telecommunication in the past and now

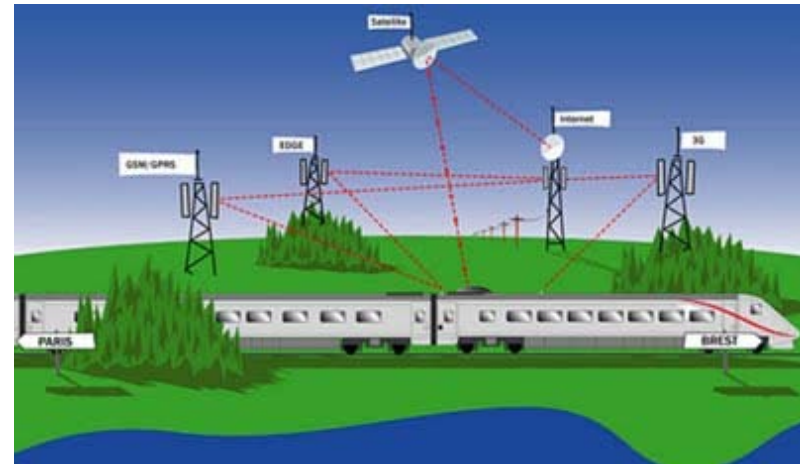
Past

- + Voice fixed line services



Now

- + Mobile services
- + Applications to be used with different devices (smartphones, tablets, mobile phones...)
- +



Examples of interest for a modern telecom

- + Mobile communication services
 - + Context-aware services (e.g. localisation-based, mood, availability)
 - + Social networking (user profiles, interests...)
- + Mashups
- + **Cloud Computing**
 - + **Service catalogues** (SaaS) – search, discovery and composition of services
 - + Different services (Desktop as a Service, Service Delivery Platform as a Service, Unified Communication as a Service, ...)
- + Content-services (internet TV, streaming, Video on demand, ...)

Going to Cloud....

+ Telecom strong sides

- + Network (communication with IT functionalities)
- + Measured services (BSS/OSS – assurance, provisioning, billing...)
- + Using standards to achieve conformance (ITU-T, TMF, ISO/IEC...)

+ Challenges

- + Willing to be not only a communication medium („pipe“) supplier but Cloud Service Provider
- + Investigating and inventing new kind of services, based on telecom strong sides

+ Benefits

- + Offering a wide range of services that are „trendy“ (easy to use, easy to measure, cheap) according to cloud computing paradigm (any time, anywhere, on-demand self-service...)

Telecom major requirements (Metadata, semantics)

- + They are concerned with the customers and partners (companies, developers community, Internet community)
- + Requirements on services (to satisfy our customers)
 - + Easy service search
 - + Easy service discovery and composition
 - + Easy mashup composition
- + Requirements on the cloud computing functionalities (to easy cooperate with partners, to strengthen results and extend offers)
 - + Interoperability
 - + Interchange
- + Requirements on business processes (to operate smoothly)
 - + Enable an automate implementation of business processes (flows)

Semantics and metadata for services and business processes - examples

- + Semantics and metadata – opportunity to facilitate service search, discovery, composition through an unambiguous description (annotations)
- + Semantics and metadata – an opportunity to enable and automatise interoperability of systems and interchange of data among different Clouds
- + Examples
 - + Service catalogues (SaaS) – search of services
 - + Context-aware (CA) services – localisation based CA service
 - + Business processes – automation of implementation

Semantics and metadata for services

Today without semantics and metadata

- + Search of services not effective
- + Lack of automation of service composition
- + Meaning of services not accessible for machines

Semantics and metadata – promising technology to solve those problems

- + Give a meaning of information on services to machines
- + Simplicity of composing for users
- + Productivity for service designers
- + Interoperability between providers

 Stimulating of boosting service consumption

Search in service catalogues - prototype

- + Prototyping

- + Use of semantics for service catalogue implementation (ontology) and search (SPARQL, NL)
- + Use of reasoners as alternative of SPARQL for search – Use Case examples, ontology model and reasoning

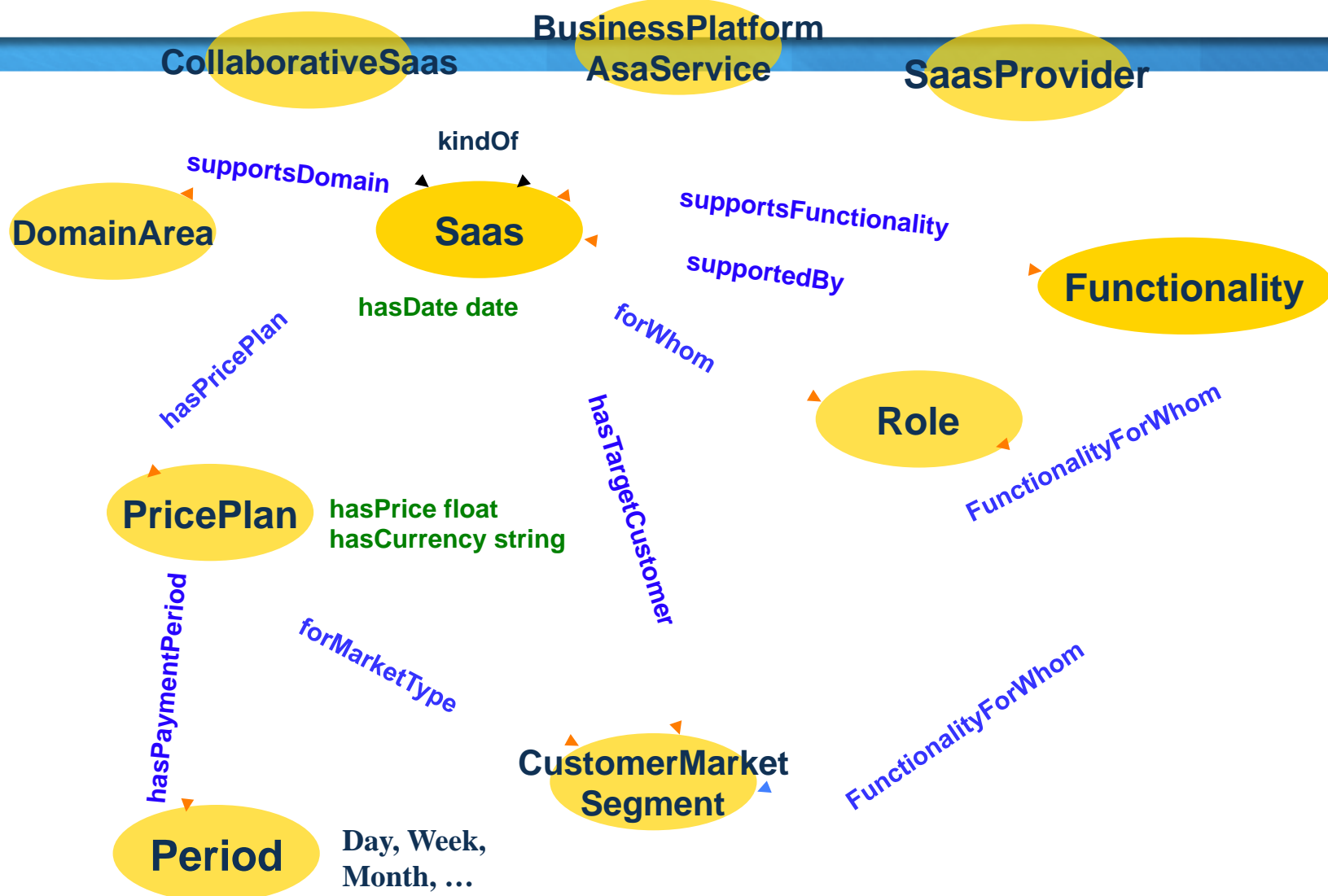
Search in service catalogues – Use Cases

Price is less than average price for a category

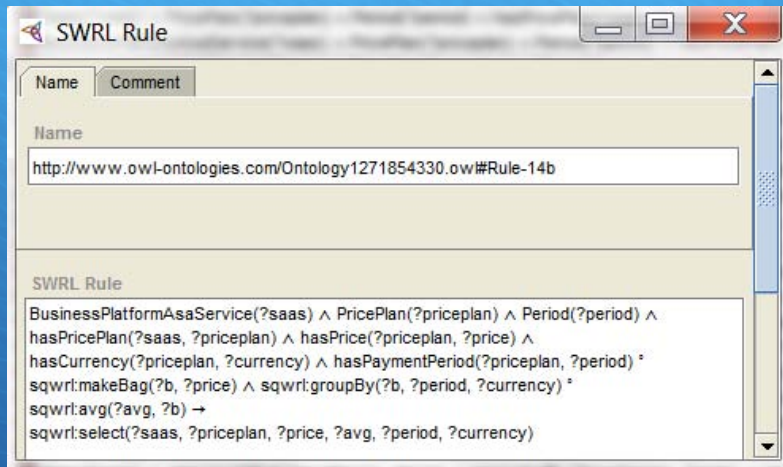
We assume that for **small office** we use product (SaaS) that allows using 3-5 licences

Use case ID	UC description / Natural language query	Comments	Implementation aspects
UC_11	<i>"I want to find inexpensive text editor to modify documents"</i>	The user wants a service, which is inexpensive. The output can be services which have functionality of modify documents.	Use of reasoner: interpretation of „inexpensive“ – running a rule - calculating the mean price from a given group of services/ products and checking if the price is lower of the mean price.
UC_22	<i>"I want to modify documents and share it with my colleagues in our small office"</i>	The user wants a text editor suitable for small office/ home office. Recent – we assume that is a date not later than last 3 days	“Small office” rule can be based by a number of licenses in the service licensing model. Analysing this parameter, one can classify the service as for the “home use” (single license), “small office” (3-5 stations), “business” (more).
UC_13	<i>"I want to find most recent software for edition of my photos"</i>	User is looking for a new software (maybe with some newly introduced features).	Recent rule can choose the 3 services from the given category having the youngest date of launch to the SaaS product catalogue.

Search in service catalogues – service ontology



Search in service catalogues – exemplary result



SWRL Rule

Name Comment

Name
http://www.owl-ontologies.com/Ontology1271854330.owl#Rule-14b

SWRL Rule

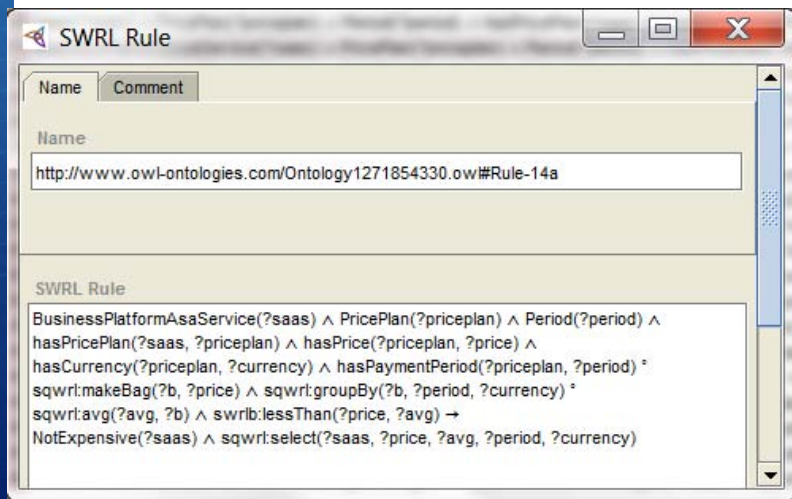
```
BusinessPlatformAsaService(?saas) ^ PricePlan(?priceplan) ^ Period(?period) ^  
hasPricePlan(?saas, ?priceplan) ^ hasPrice(?priceplan, ?price) ^  
hasCurrency(?priceplan, ?currency) ^ hasPaymentPeriod(?priceplan, ?period) ^  
sqwrl:makeBag(?b, ?price) ^ sqwrl:groupBy(?b, ?period, ?currency) ^  
sqwrl:avg(?avg, ?b) ^  
sqwrl:select(?saas, ?priceplan, ?price, ?avg, ?period, ?currency)
```

results: UC11 – inexpensive product

Results Rule: select all products for the selected category



?saas	?priceplan	?price	?avg	?period	?currency
CyscomCrm	CyscomCrmPricePl...	10	22.0	Day	EUR
MyErpCom	MyErpPricePlan	50	22.0	Day	EUR
SugarCrm	SugarCrmPricePlan	6	22.0	Day	EUR



SWRL Rule

Name Comment

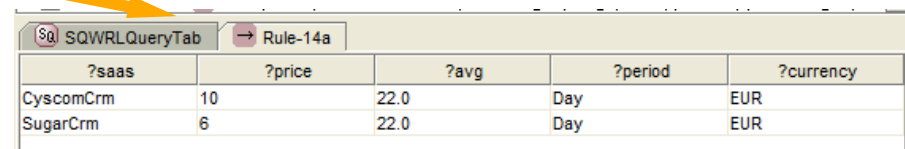
Name
http://www.owl-ontologies.com/Ontology1271854330.owl#Rule-14a

SWRL Rule

```
BusinessPlatformAsaService(?saas) ^ PricePlan(?priceplan) ^ Period(?period) ^  
hasPricePlan(?saas, ?priceplan) ^ hasPrice(?priceplan, ?price) ^  
hasCurrency(?priceplan, ?currency) ^ hasPaymentPeriod(?priceplan, ?period) ^  
sqwrl:makeBag(?b, ?price) ^ sqwrl:groupBy(?b, ?period, ?currency) ^  
sqwrl:avg(?avg, ?b) ^ swrlb:lessThan(?price, ?avg) ^  
NotExpensive(?saas) ^ sqwrl:select(?saas, ?price, ?avg, ?period, ?currency)
```

Rule: select **inexpensive** products for the chosen by user category

Results



?saas	?price	?avg	?period	?currency
CyscomCrm	10	22.0	Day	EUR
SugarCrm	6	22.0	Day	EUR

Assigning a product to the class: **NotExpensive** that we can reuse for next search

Context-aware services - example

- + Contextual information – information that is understandable in a user context (e.g. location based on user knowledge on places, people)
- + HLC (High level context) – building a meaningful context (high level context_ based on raw data (e.g. GPS coordinates, identification of places, knowledge on people...))
- + Prototype: Contextual engine – as „black box“ and HLC messages possible to display in a mobile applications
- + Ontology was build as a context model of information (knowledge on people and places, the hierarchisation of places, relations among people) and reasoning was used (Jena GPRS)
- + Instead of **GPS coordinates (x, y)** -> „*My son Etienne is at school*“

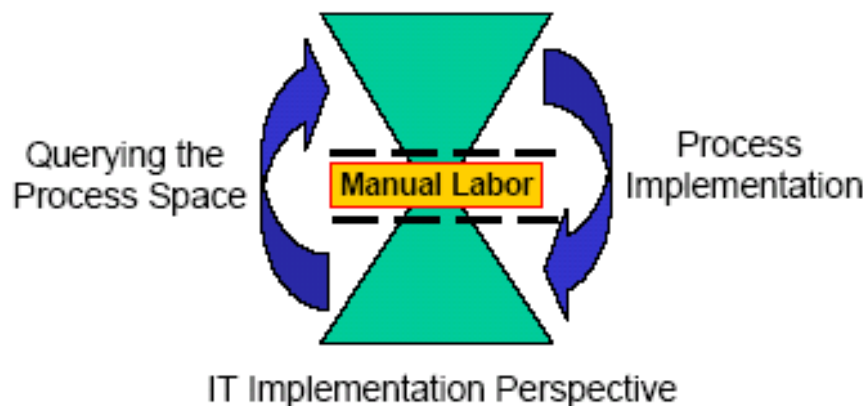
Business processes – SUPER example

+ SUPER project – EU FP6 project, 2006-2009

The major objective of **S**emantics **U**sed for **P**rocess management within and between **E**nte**R**prises (**SUPER**) is to raise Business Process Management to the business level, where it belongs, from the IT level where it mostly resides now

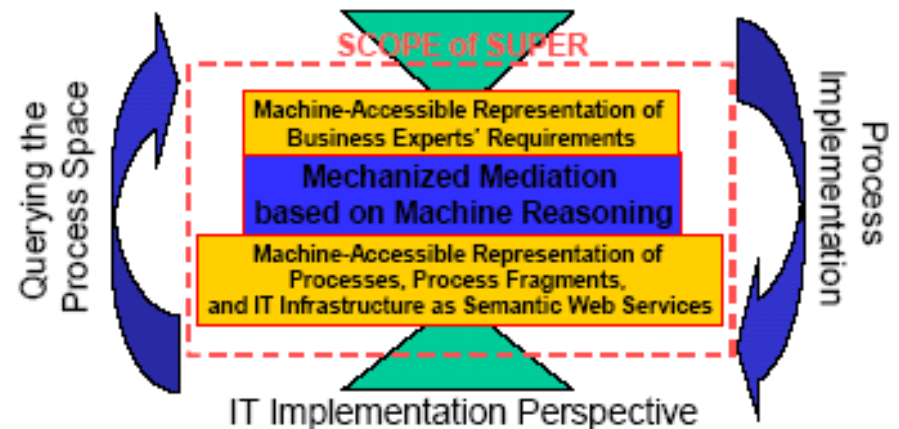
The Critical IT / Process Divide

Business Experts' Perspective: Processes



Semantic Business Process Management

Business Experts' Perspective: Processes



Business processes – SUPER example

- + **enhanced Telecom Operations Map - eTOM**
 - + delivers business process framework, as generically as possible, organizationally, technology and service independent
- + **Shared Information/Data model – SID**
 - + representation of business concepts, their characteristics and relationships, described in an implementation independent manner
- + **eTOM and SID -> outcome: set of telecom ontologies**

„Cloud computing“ standardisation activities

- + ISO/IEC JTC1/SC38:
 - + WD 17788 Cloud Computing Vocabulary
 - + WD 17789 Cloud Computing Reference Architecture

- + ITU-T SG13/WP6
 - + FG Cloud Technical Report

Cloud computing and cloud services

+ CC definition (ITU-T)

+ A model of enabling service users to have ubiquitous, convenient and on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services), that can be rapidly provisioned and released with a minimal management effort or service provider interaction. **Cloud computing enables cloud services.**

+ Cloud service – service **enabled** by Cloud Computing

Cloud service models

+ According to NIST, ISO/IEC JTC1 SC38

- + **IaaS** – Infrastructure as a Service – capability provided by the cloud service provider to a cloud service user is to provision processing, storage, intra-cloud network (between Data Centres), connectivity services (e.g. VLAN, firewall, load balancer etc) and other fundamental computing resources of the cloud infrastructure, where a user is able to deploy and run application.
- + **PaaS** – Platform as a Service - capability provided to a cloud service user: deploy user-created or acquired applications onto the cloud infrastructure using platform tools supported by the cloud service provider (e.g. programming languages, frameworks for development of applications)
- + **SaaS** – Software as a Service – capability provided to a cloud service user : use cloud service provider's applications running on cloud infrastructure

+ According to ITU-T – additional **two** models

- + **NaaS** Network as a Service – capability provided to a cloud service user: use transport connectivity services an/or inter-cloud network connectivity services
- + **CaaS** – Communication as a Service - capability provided to a cloud service user: use of real-time communication and collaboration services (e.g. VoIP, instant messaging, video conferencing for different user devices)

Telecom - summary

- + Telecoms focus on implementing different services using potential of their resources (ICT-specific services), like:
 - + UCaaS – unified communication (CaaS)
 - + SDPaaS – Service Delivery Platform (PaaS, SaaS, CaaS)
 - + Bandwidth on demand (NaaS)
 - + Desktop as a Service (IaaS)
- + Cloud services need to be managed and monitored by business processes. They can include SLAs by which the service is measured – in addition to normal IT processes

Metadata for Telecom Cloud Computing

- + Metadata are necessary:
 - + to describe telecom specific elements for interchange
 - + to achieve interoperability
- + Metadata standards taking into account (ISO/IEC JTC1 SC32):
 - + MDR – Metadata Registries
 - + MFI – Metadata for Interoperability