Metadata requirements in telecommunications cloud computing

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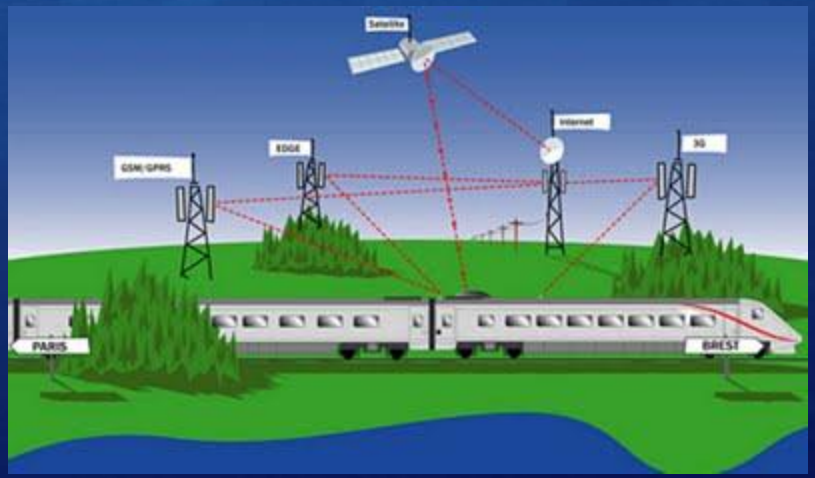
Telecommunication in the past and now

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

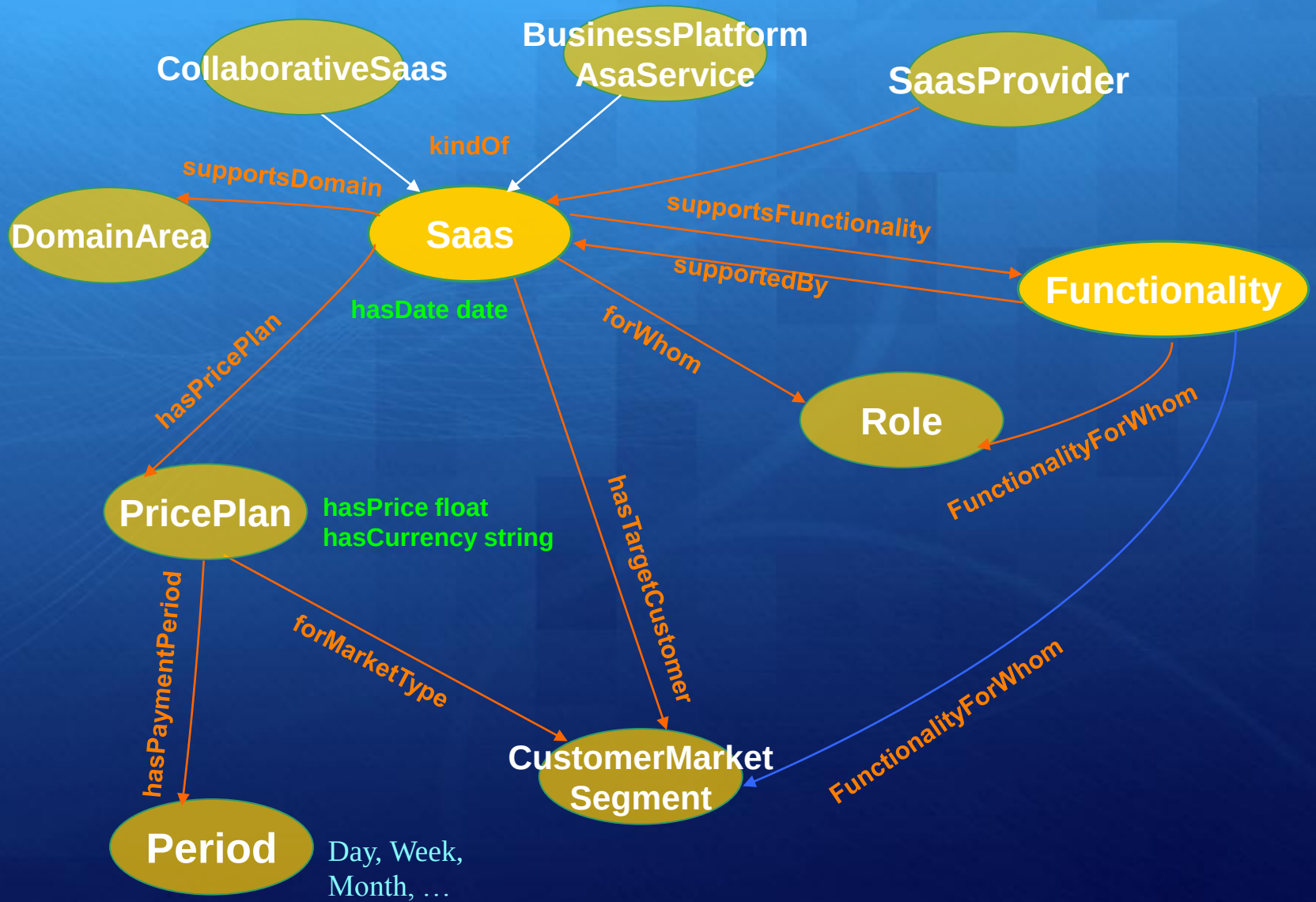
Price is less than average price for a category

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 want to find inexpensive text editor to modify documents"*	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 want to modify documents and share it with my colleagues in our small office"*	The user wants a text editor suitable for small office/ home office.	"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 want to find most recent software for edition of my photos"*	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.

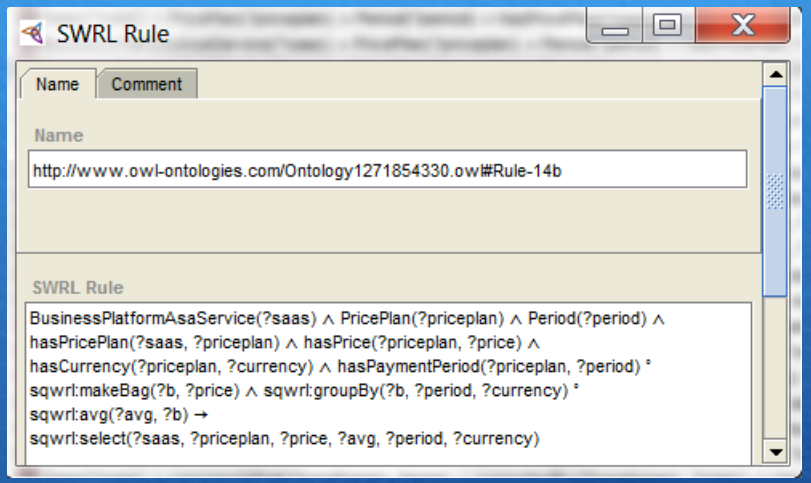
Recent – we assume that is a date not later that last 3 days

Search in service catalogues – service ontology



Search in service catalogues – exemplary result

results: UC11 – inexpensive product

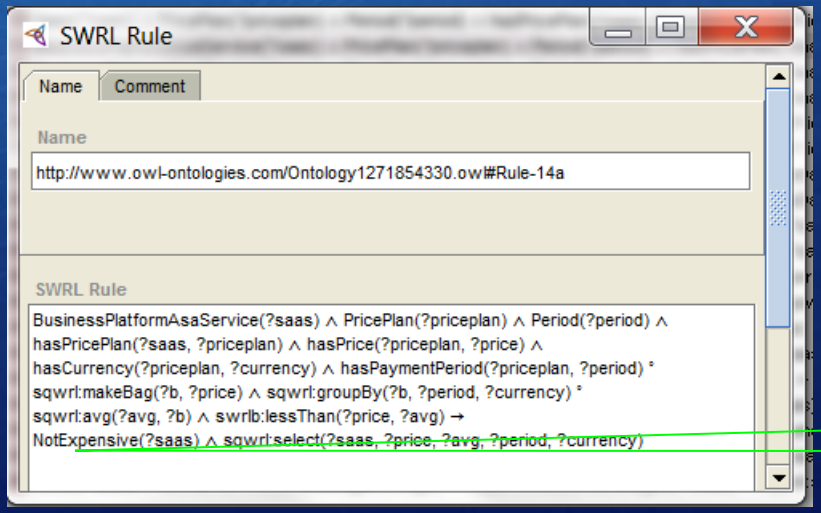


Rule: select all products for the selected category

Results

SQWRLQueryTab | Rule-14b

?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



Rule: select inexpensive products for the chosen by user category

Results

SQWRLQueryTab | Rule-14a

?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

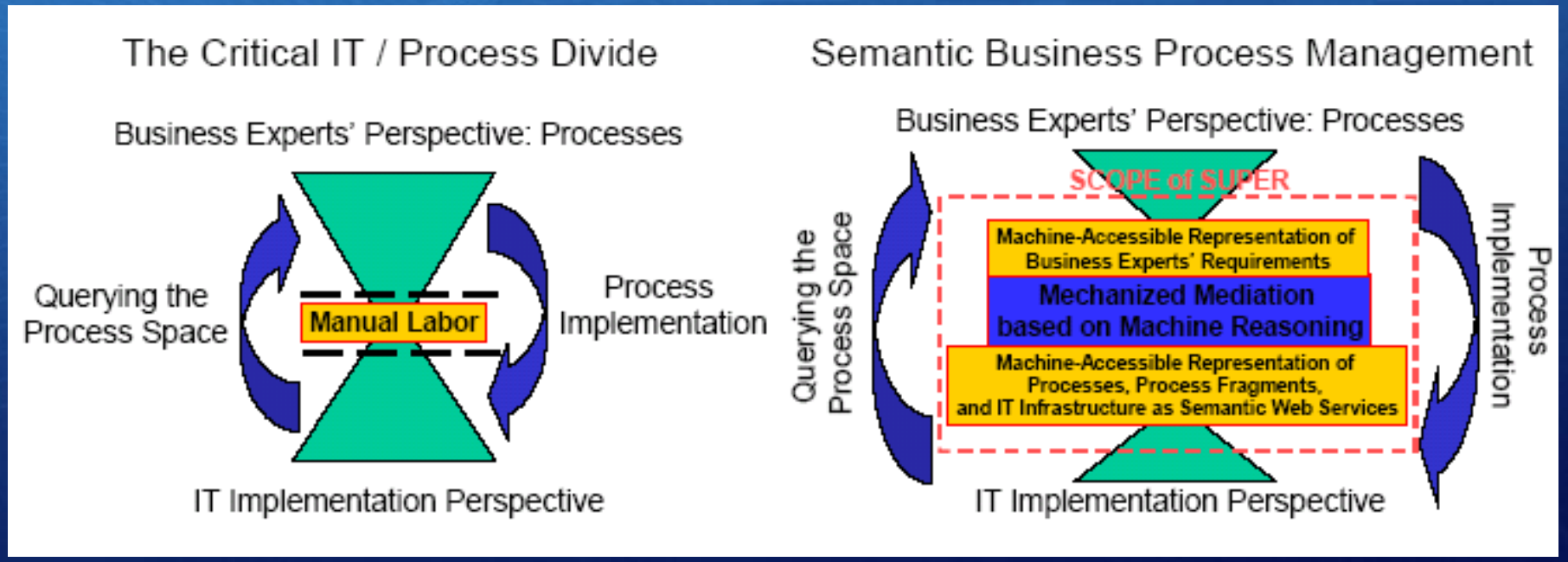
Context-aware services - example

- 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 Semantics Used for Process management within and between EnteRprises (SUPER) is to raise Business Process Management to the business level, where it belongs, from the IT level where it mostly resides now



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 Centers), 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, interfaces, database, storage and tools for testing)
  - **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 additional 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