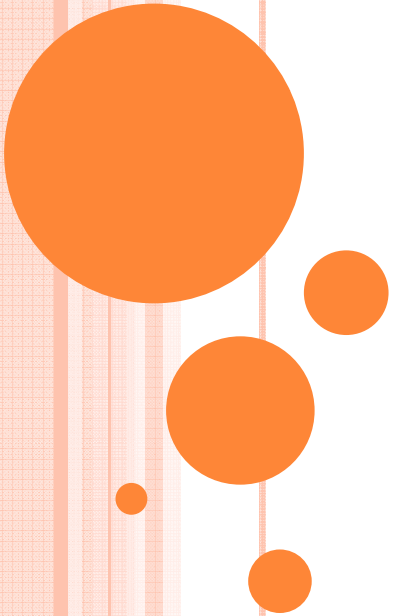

METADATA MANAGEMENT

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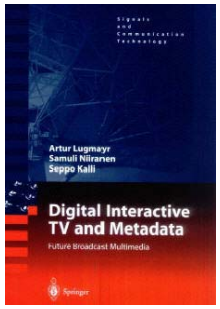
http://namu.cs.tut.fi

NAMU Lab., Tampere Univ. of Technology, FINLAND

Agenda

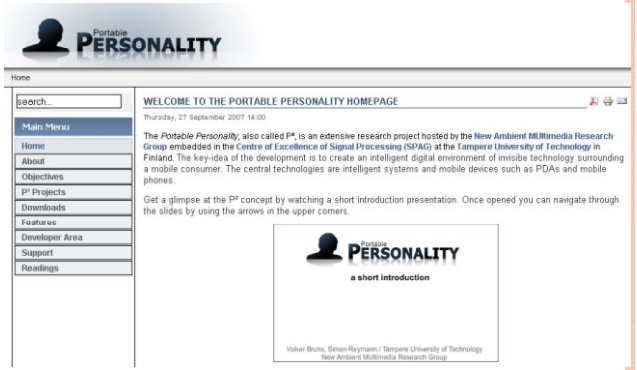
- About… *this & that*
- Introduction… *why?*
- Challenges… *the obstacles*
- The Starting Point… *Digital Broadcast Item Model (DBIM)*
- E2E QoS Metadata… *the data types*
- MATool… *the implementation*
- Scenarios… *e.g. service provider workflow*
- Conclusions

About…



- **Artur Lugmayr**
  - *creating entertainment experience technology*
  - *www.cs.tut.fi/~lartur, lartur@acm.org*
- **NAMU – New AMbient MUltimedia research lab**
  - founder & head
  - Tampere Univ. of Technology / Dept. of Signal Proc. / Finland
  - focusing on ambient media & production technology
  - >3 projects (EU, nat., industry), >10 people, 12 MSc/year, 1-2 PhD/year, > 5 lectures
  - Centre of Excellence (CoE) Signal Processing, NOKIA Innovation Centre
  - http://namu.cs.tut.fi
- **Dept. of Signal Proc. / Tampere Univ. of Technology (TUT)**
  - 200 people, 13 Professors, 50 M Euro budget
  - DVB-H/C/T testbed, High-Def. Prod. Lab, Audio Lab., …
- **School of Motion Picture, TV and Production Design (ELO), Helsinki, Finland**
  - student & 'freelance researcher
- **News:**
  - **www.portable-personality.org**
  - **www.mindtrek.org**
  - **www.uxtv2008.org**
  - **www.euroitv2008.org**
  - **Suominator**

My vision is to create technologies for future entertainment experience systems



Introduction

- consumer is hungry for digital interactive content
- industry promises anytime, anyhow, anywhere
- entertainment as experience in **highest & paid quality**
- size, formats, protocols, and processing technology is exploding
- myriads of too complex standards are available

only a well designed data model is able to cope with the challenge of distributing content in highest possible quality, in any format, over any protocol, over manifold processing technology to the content hungry consumer

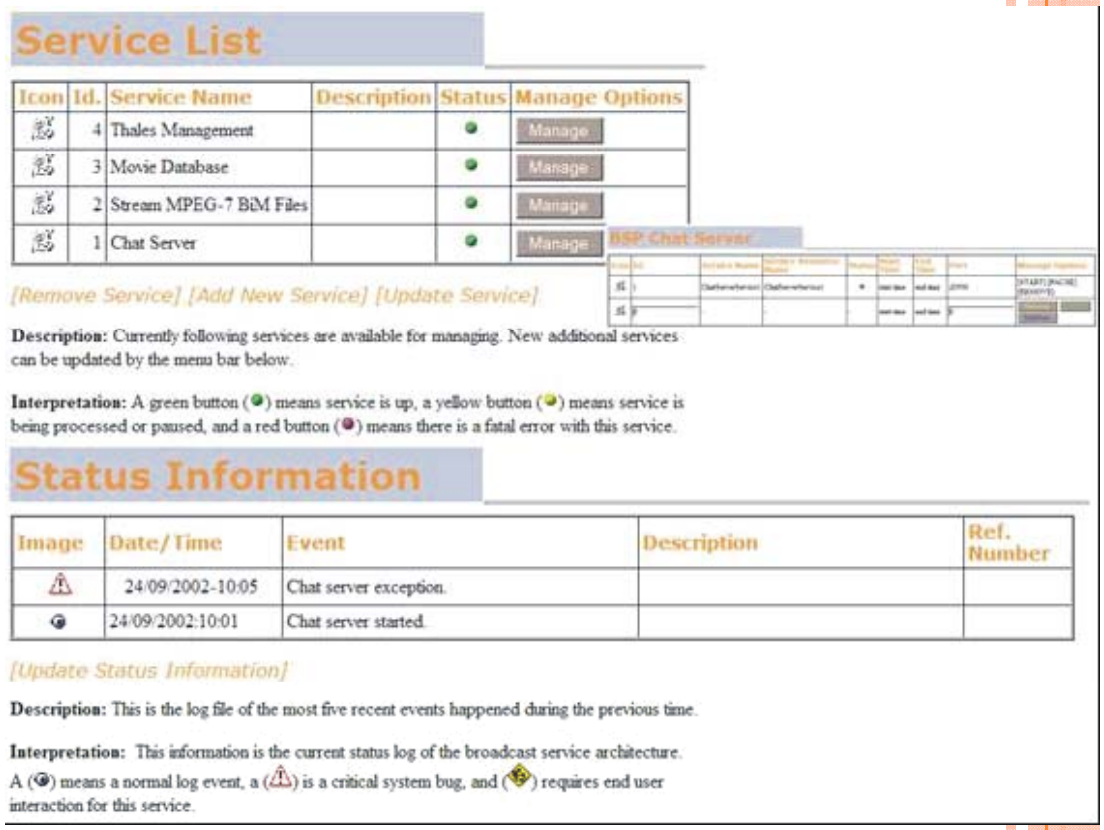
→ metadata – 'data about data' is the glue for providing a solution…

Challenges

- network layer protocols vs. service layer protocols
- service layer protocol overhead
- metadata annotations
- conversion of metadata format
- preservation of integrity of QoS metadata through the life-cycle
- re-pursuing and aggregation of metadata from different source
- system wide uniform format (MPEG-21
- open and common interfaces between systems
- control flow management
- data validity and quality
- real-time constraints
- automating metadata handling, processing, and QoS handling
- collaborative facilities within an EU project

Digital Broadcast Item Model (DBIM)

- System analysis approach
- Abstract service architecture
- Unified work-flow model for broadcasting
- Metadata building blocks
- Multimedia broadcast profiles
- Behaviour & functionality description



Service List

Icon	Id.	Service Name	Description	Status	Manage Options
	4	Thales Management			Manage
	3	Movie Database			Manage
	2	Stream MPEG-7 BiM Files			Manage
	1	Chat Server			Manage

[Remove Service] [Add New Service] [Update Service]

Description: Currently following services are available for managing. New additional services can be updated by the menu bar below.

Interpretation: A green button ( ) means service is up, a yellow button ( ) means service is being processed or paused, and a red button ( ) means there is a fatal error with this service.

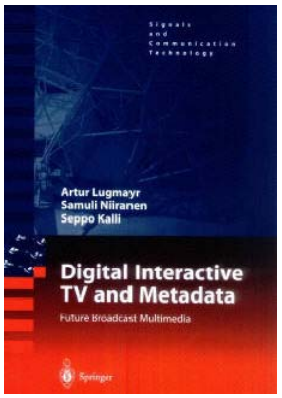
Status Information

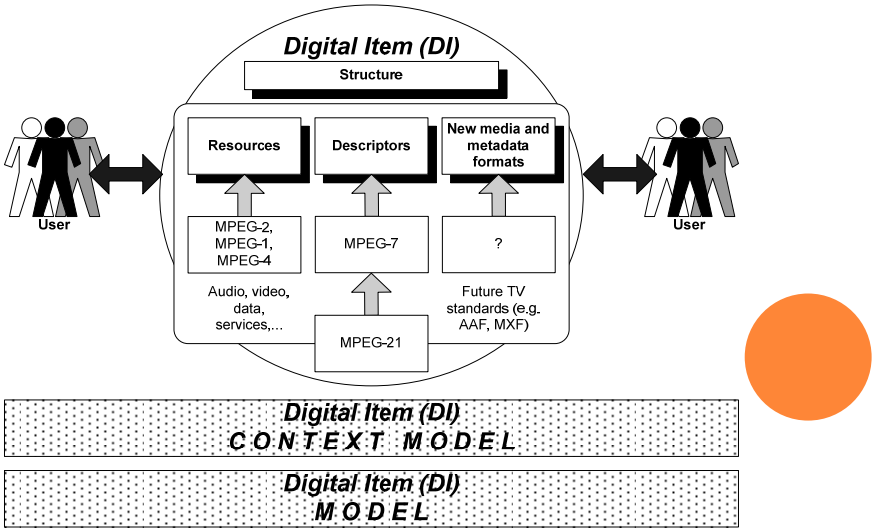
Image	Date/Time	Event	Description	Ref. Number
	24/09/2002-10:05	Chat server exception.		
	24/09/2002:10:01	Chat server started.		

[Update Status Information]

Description: This is the log file of the most five recent events happened during the previous time.

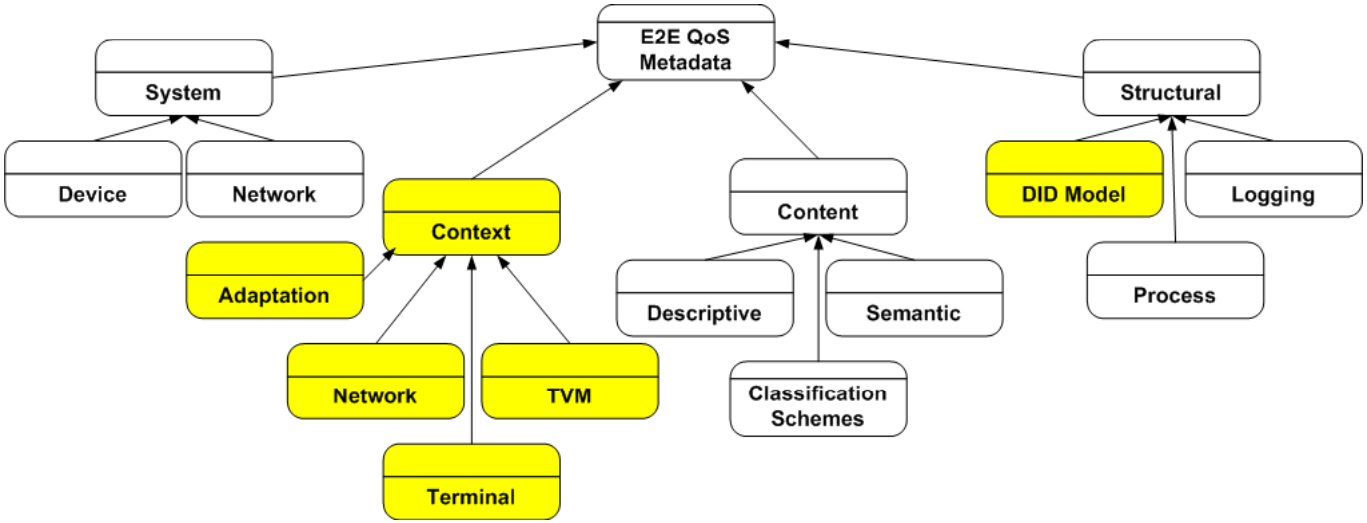
Interpretation: This information is the current status log of the broadcast service architecture. A ( ) means a normal log event, a ( ) is a critical system bug, and ( ) requires end user interaction for this service.



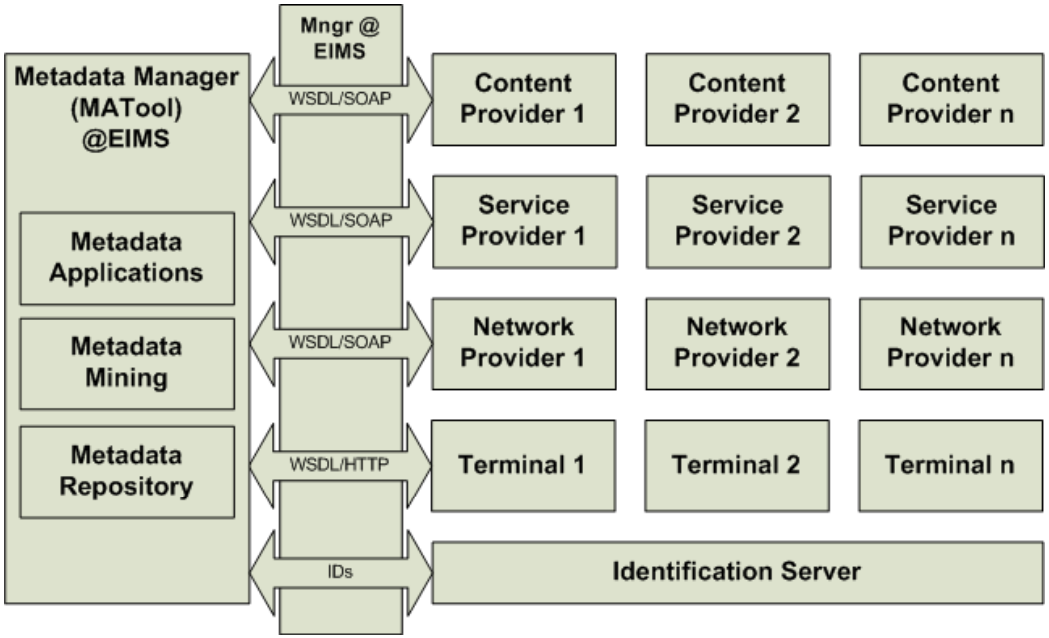


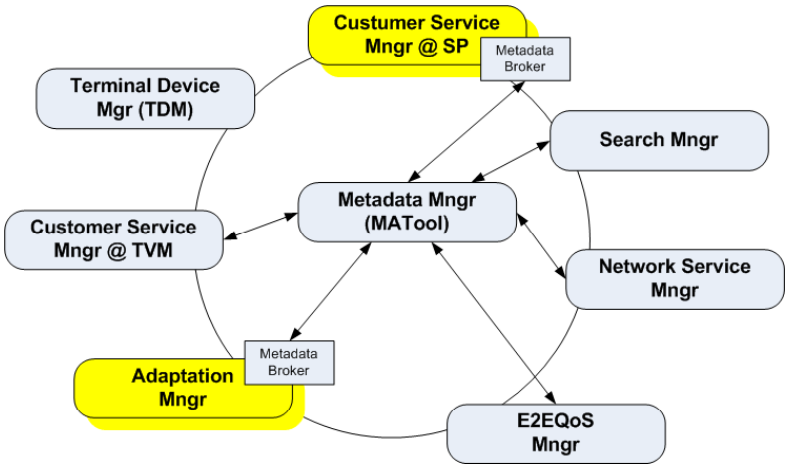
E2E QoS Metadata Types

- *content metadata*
  instantiated at the content provider or service provider side (e.g. content descriptions, TV-Anytime metadata of program descriptions);
- *context metadata*
  instantiated at the consumer side. Examples are terminal information (MPEG-21 UED), consumer information, or perceivable QoS (PQoS) metadata;
- *network metadata*
  is instantiated at the network provider side and includes information to be capable of coping with content adaptation and network capabilities;
- *service metadata*
  instantiated at the service provider side. Often consumer metadata is collected by the service provider, as the service provider is the first access portal for the consumer (e.g. PQoS is forwarded by the terminal);
- *process metadata*
  instantiated by processes within the system. Examples are adaptation decisions as output from the ADTE, network monitoring information, TV-Anytime personalization decisions, or adaptation node monitoring.

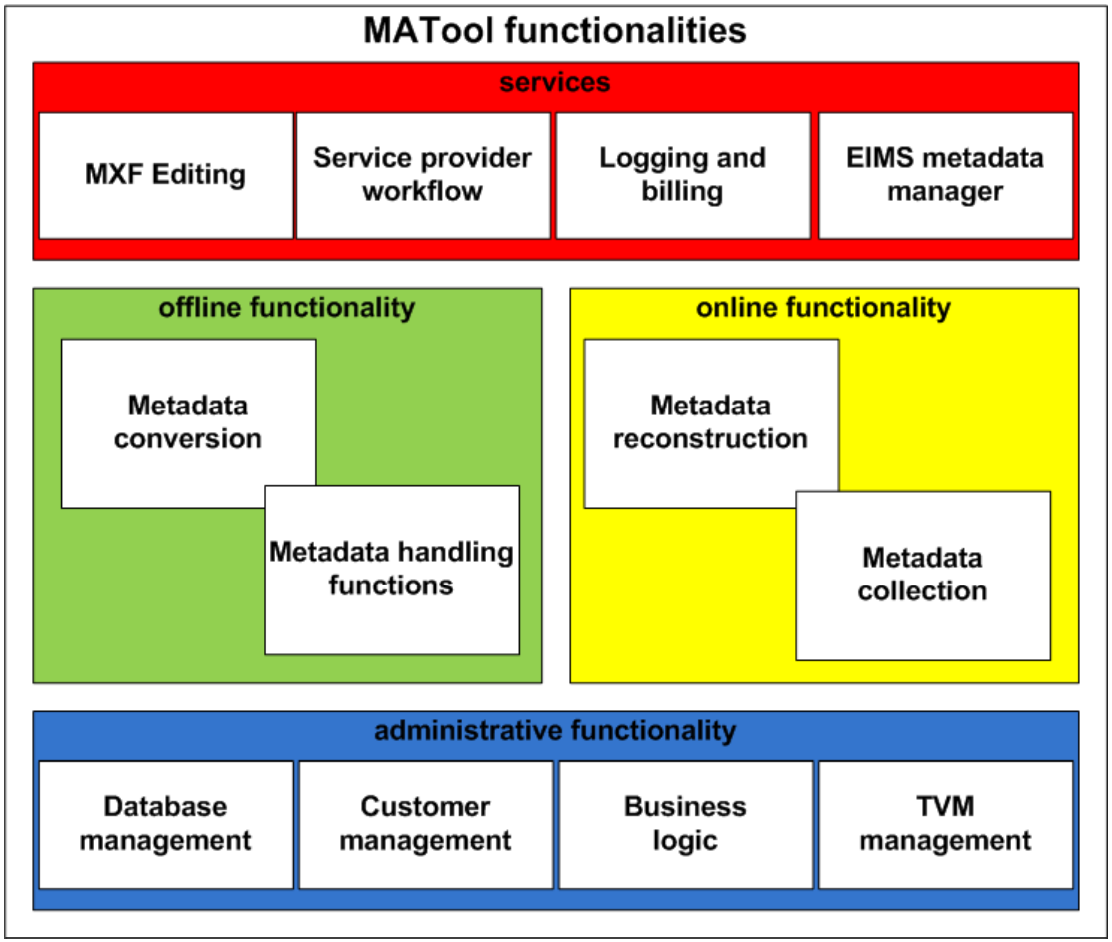


MATool – within the EIMS
Metadata Management Tool for QoS Metadata



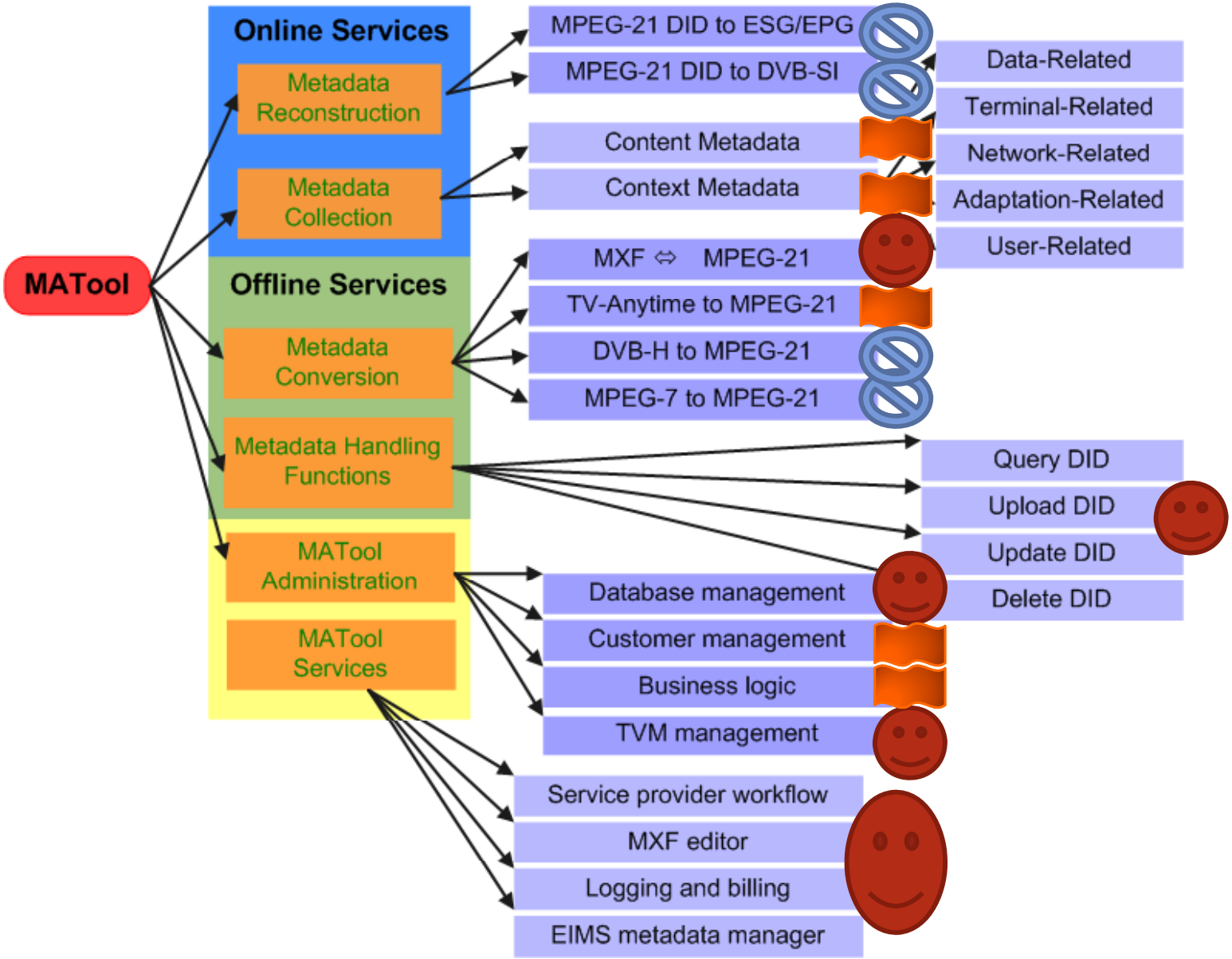


MATool – Functional Entities
Metadata Management Tool for QoS Metadata

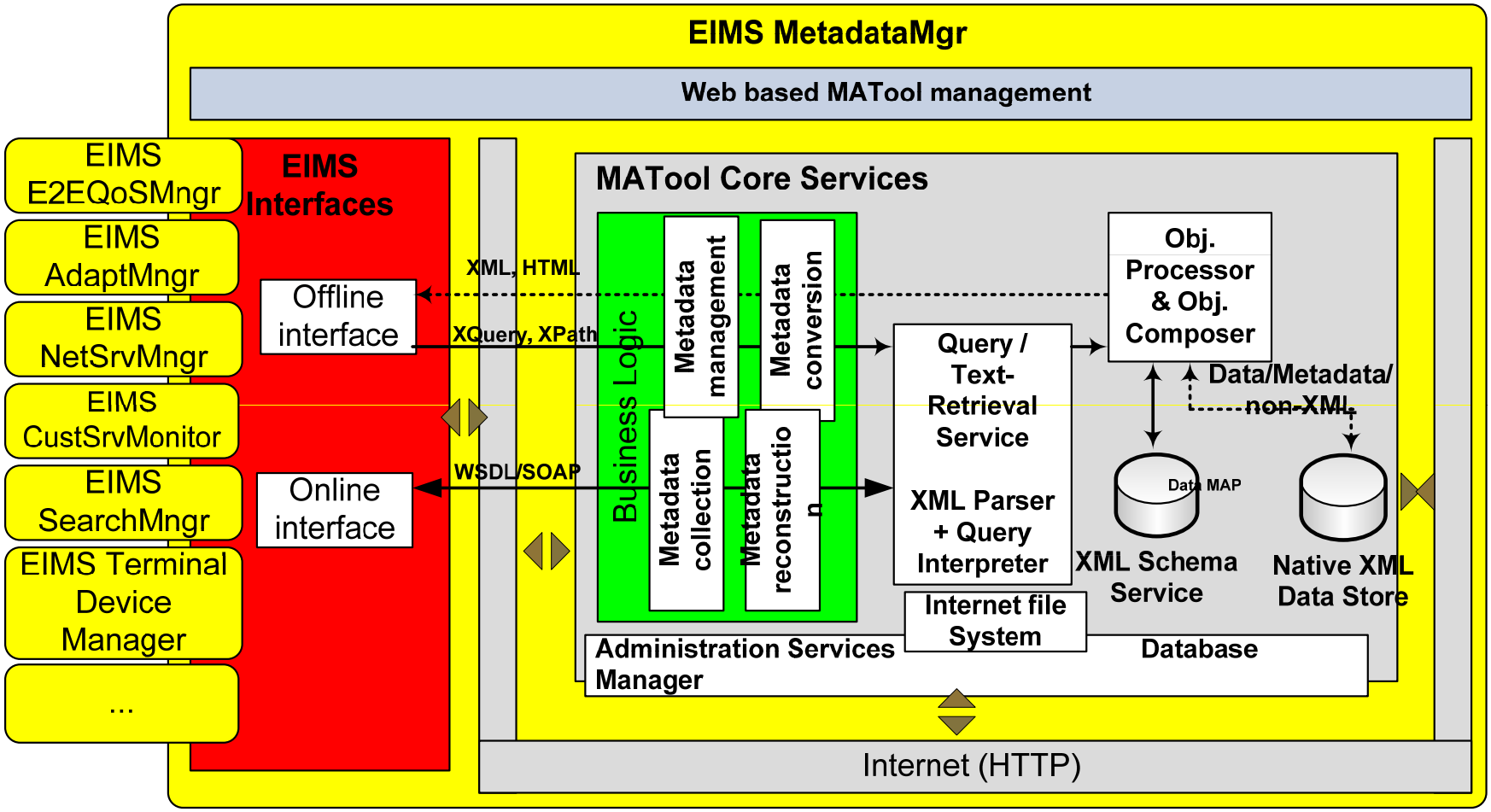


- 4 services available
- Administrative
  - basic database functions
- Offline
  - access via web-pages
  - stand alone services
- Online
  - embedded in real-time
  - SOAP interface
- EIMS metadata manager is part of the total EIMS architecture
- Integration with other system components via WSDL/SOAP

MATool - Functionalities
Metadata Management Tool for QoS Metadata



MATool – Architecture
Metadata Management Tool for QoS Metadata

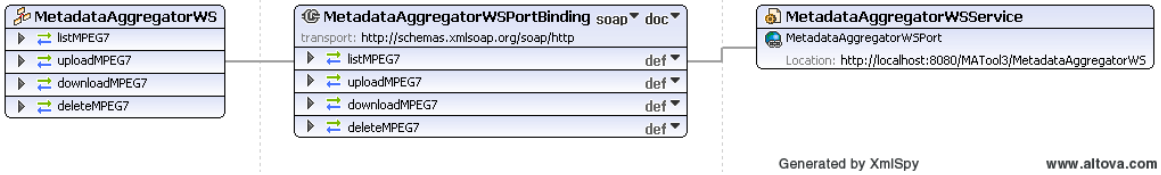


MATool Functionalities

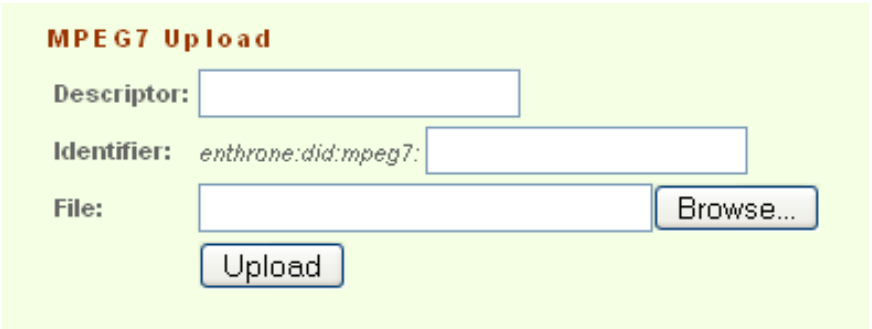
- **metadata aggregation (EIMS Metadata Aggregation Manager):**
  - aggregation and enrichment of metadata from different metadata sources, verified by the offline interface based service provider workflow demonstrator;
- **metadata collection (EIMS Metadata Collection Manager)**
  - collection of contextual metadata and providing the metadata to different components of the EIMS, verified by the online real-time interface for the collection of contextual information demonstrator;
- **metadata conversion (EIMS Metadata Conversion Manager)**
  - conversion of metadata between different metadata formats, verified by the offline interface MXF2TVA converter.

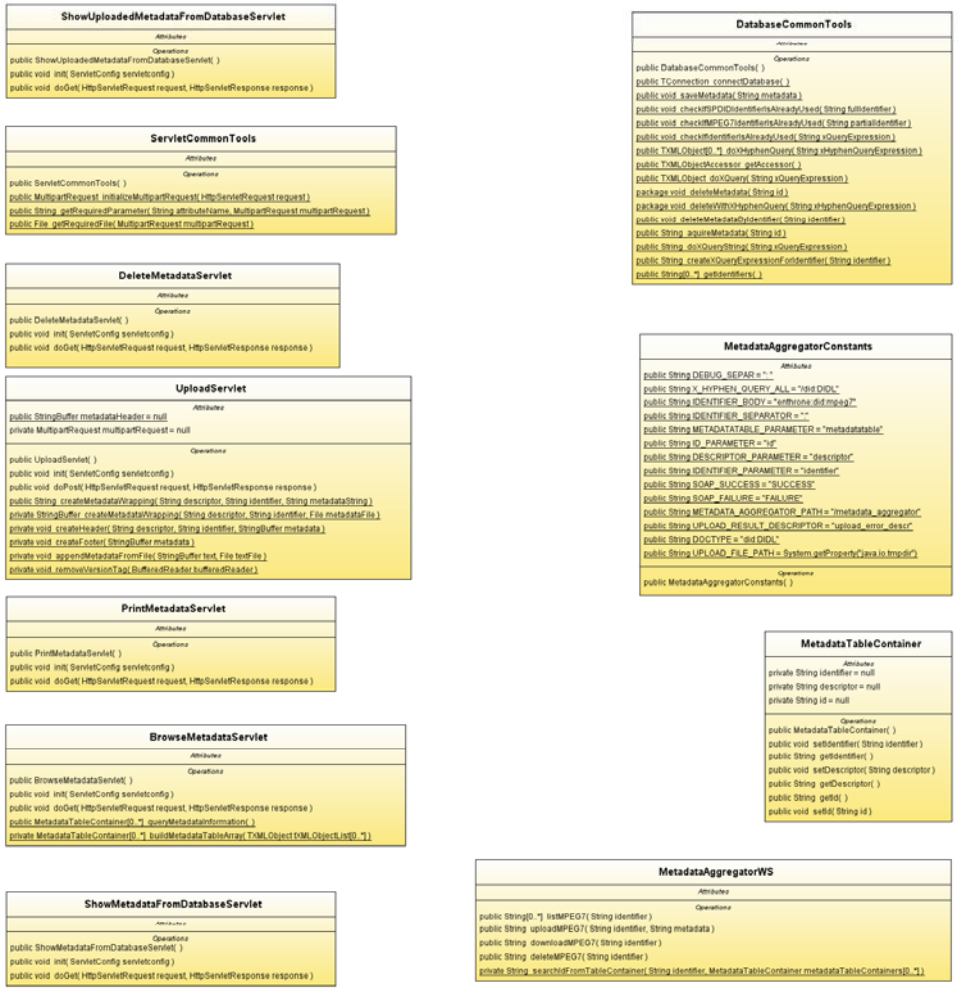
Metadata Collection

MPEG-7 Data



- Servlets and classes for..
  - Upload
  - Download
  - List
  - Delete

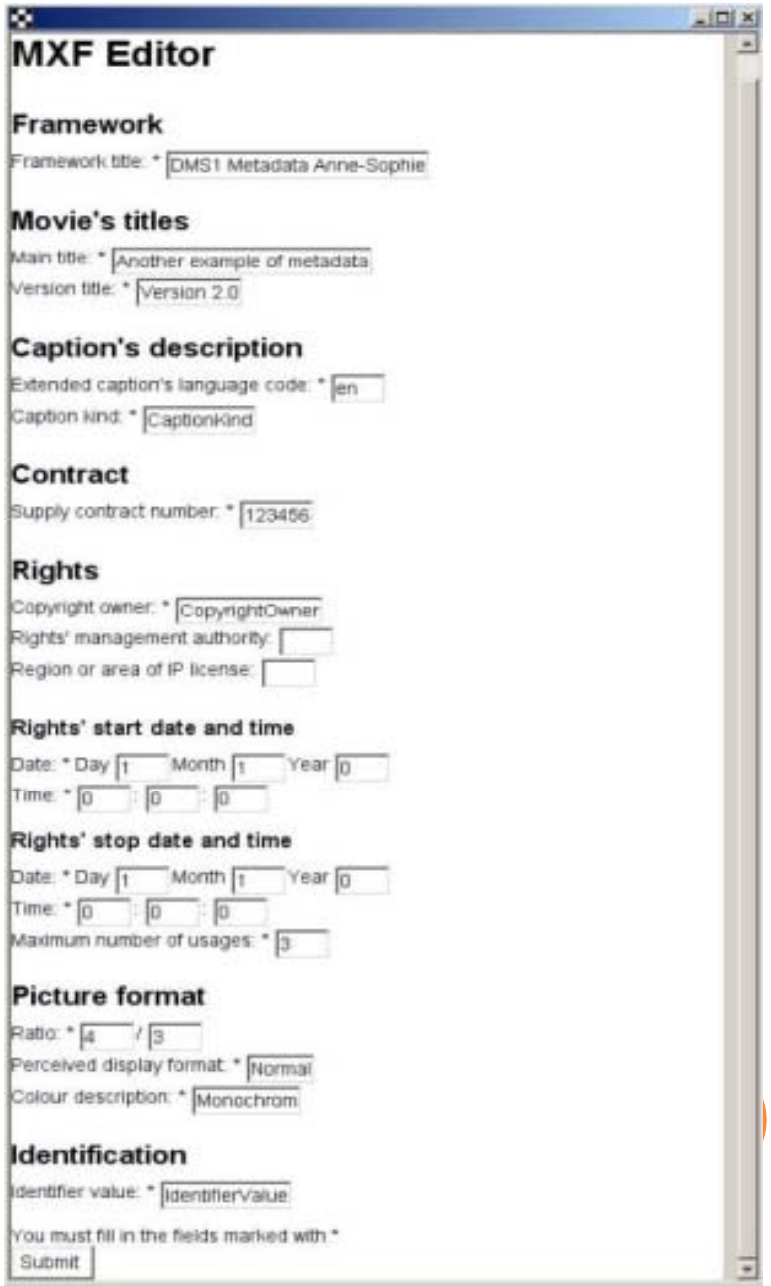




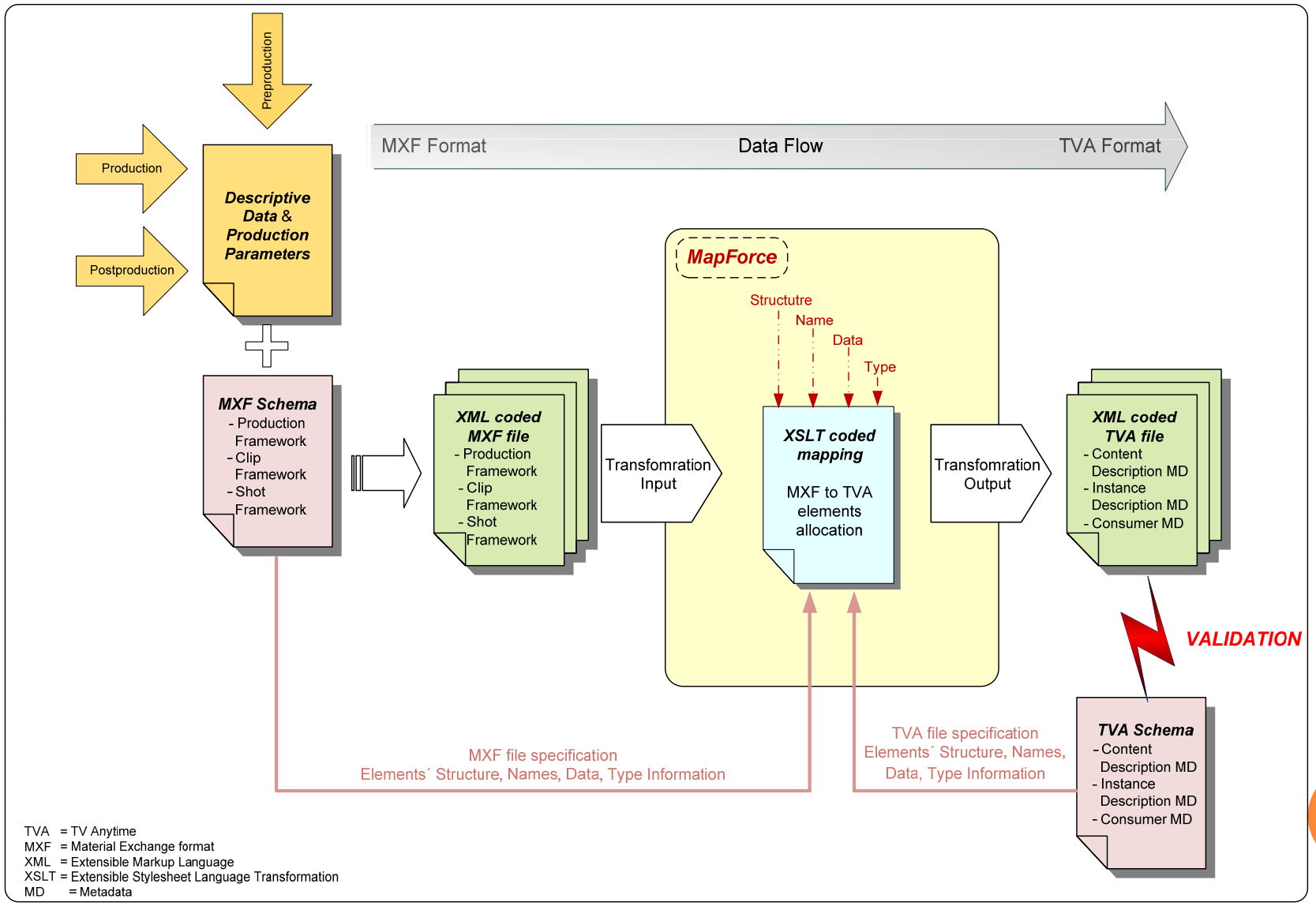
Metadata Conversion

MXF2TVA2MPEG-21

- MXF Editor
- MXF Converter



MXF TO TVA MAPPING SYSTEM OVERVIEW



MXF TO TVA MAPPING

Some exemplary mapping:

	MXF	TVA
Name	rp210:AnnotationSynopsis	tva:Synopsis
Description	Synopsis of the A/V content.	Textual Description of the program.
Type	s377mTypes:UTF16CharString	tva:SynopsisType
Function	None	

	MXF	TVA
Name	rp210Elements:FestivalDateAndTime	tva:Year
Type	s377mTypes:ISO7bitCharString	xs:gYear
Description	The beginning date and time of the festival (local time).	The year when the award was given.
Function	year-from-dateTime	
Description	Returns an xs:integer representing the year component in the localized value of *datetime*. <xsl:variable name="Vvar1_result" as="xs:decimal" select="fn:year-from dateTime(xs:dateTime(xs:string(.)))"/>	

Metadata Aggregation

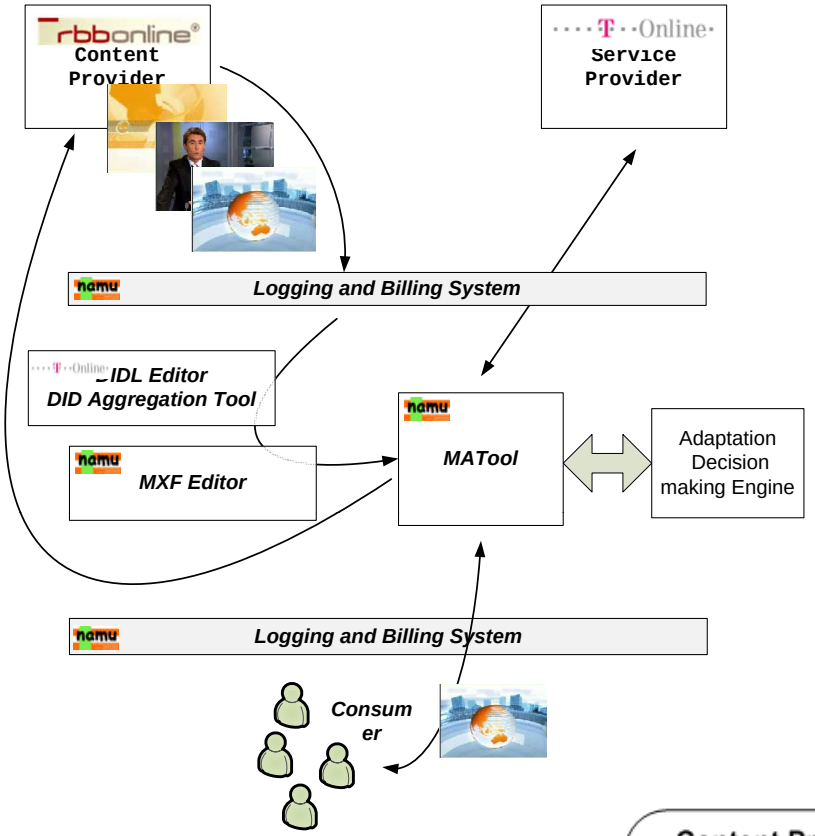
Service Provider Workflow

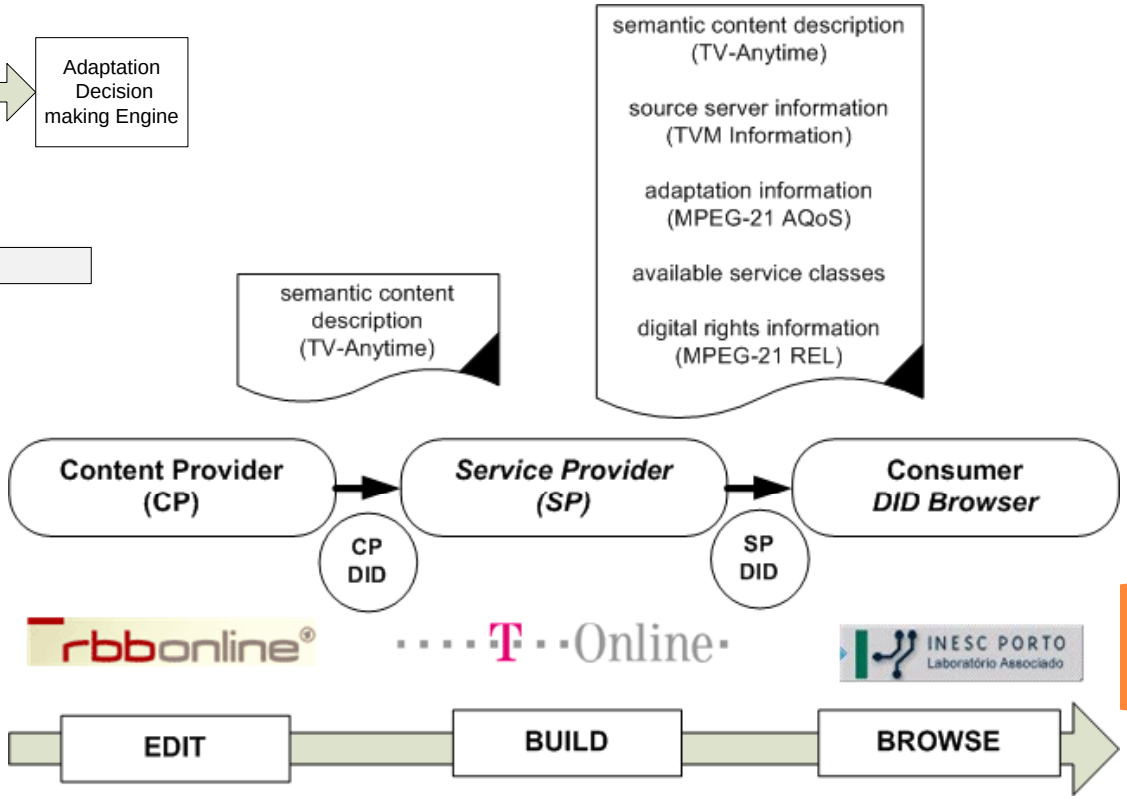
- Basic Idea

  Content provider provide their CP-DIDs to the service provider. The tool is emulating the workflow steps for the service provider to build a SP-DID, which can be forwarded to the consumer.

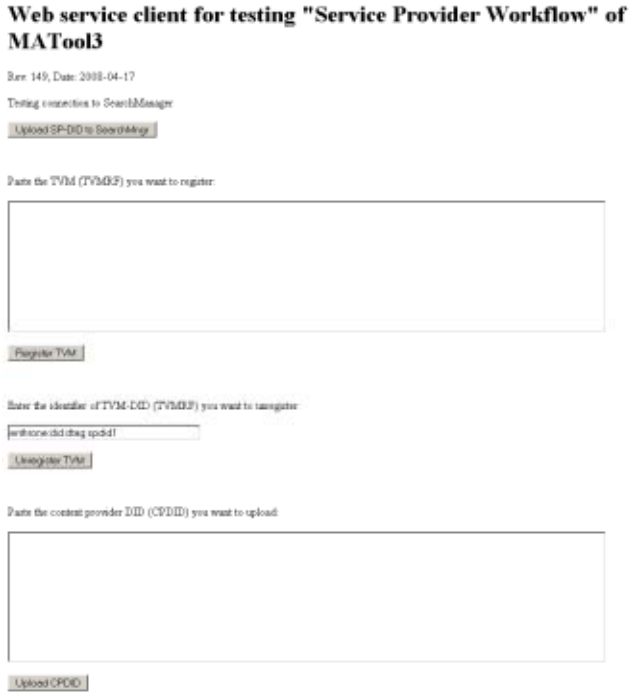
- Functionality
  - add TVM information
  - add AQoS information
  - add different service classes
  - build SP-DID
  - upload TVM, AQoS, SC template DIDs
- Setup
  - RBB: DID editor
  - TUT/NAMU: MATool / Service Provider Module
  - INESC: DID browser

Service Provider Workflow

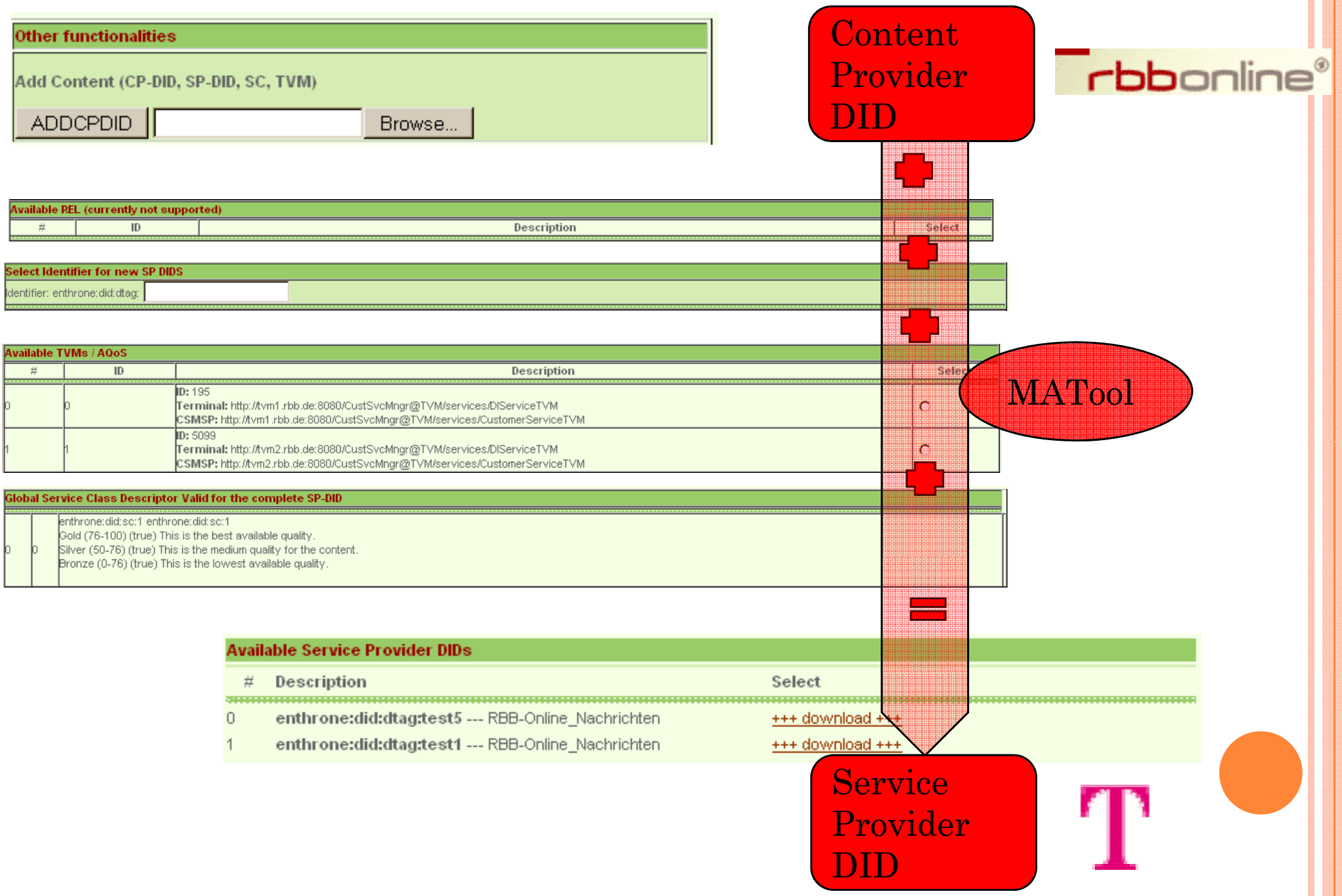




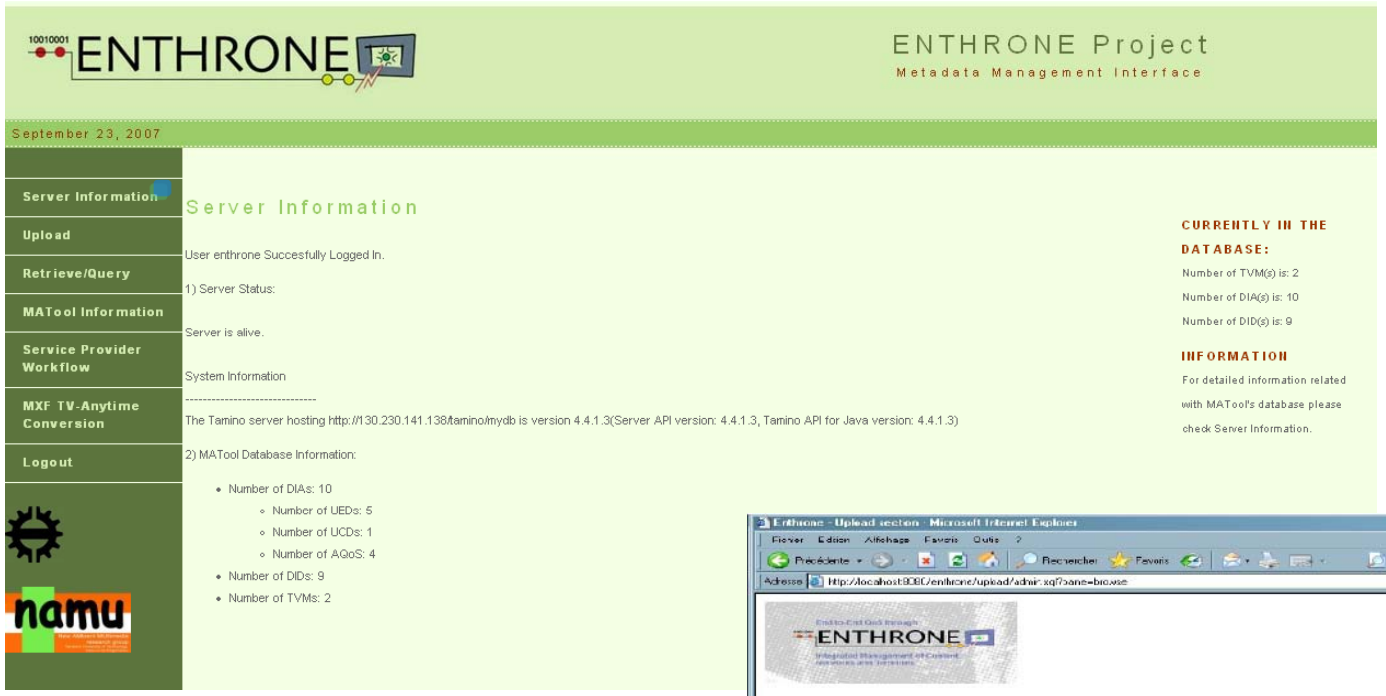
MATool Screenshots

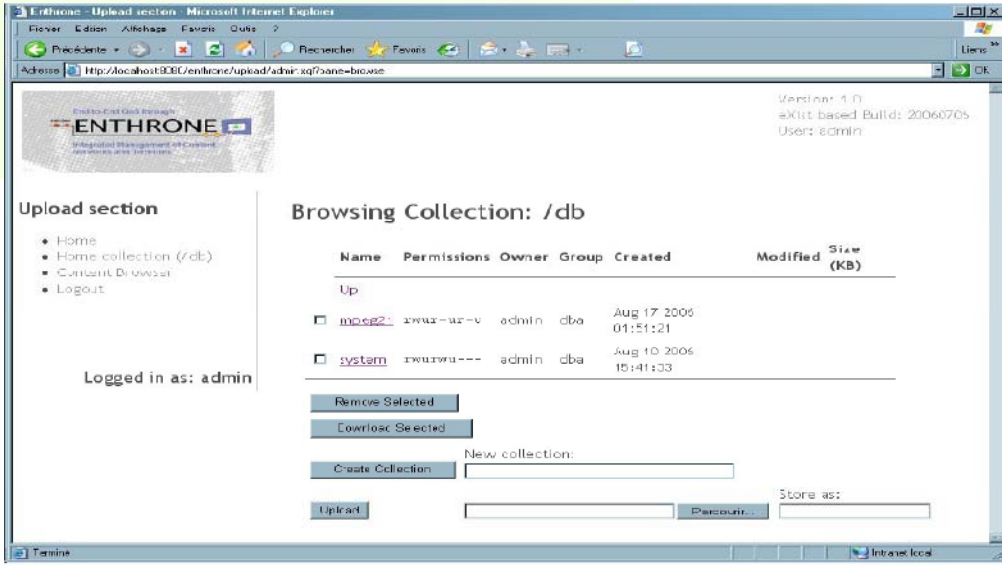


Service provider Workflow
Add different SP-DID components

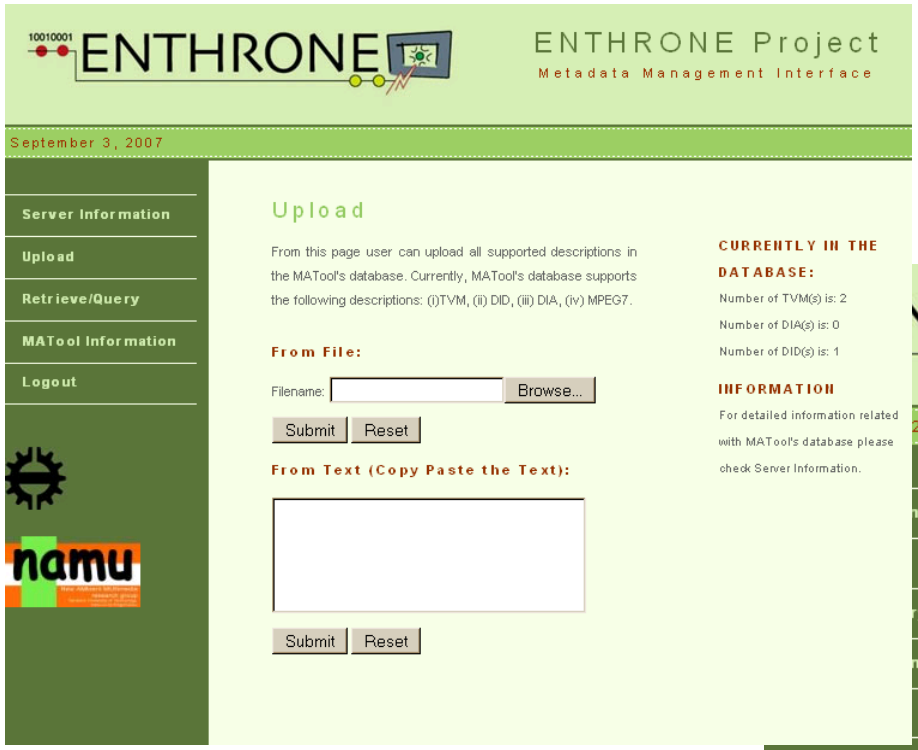


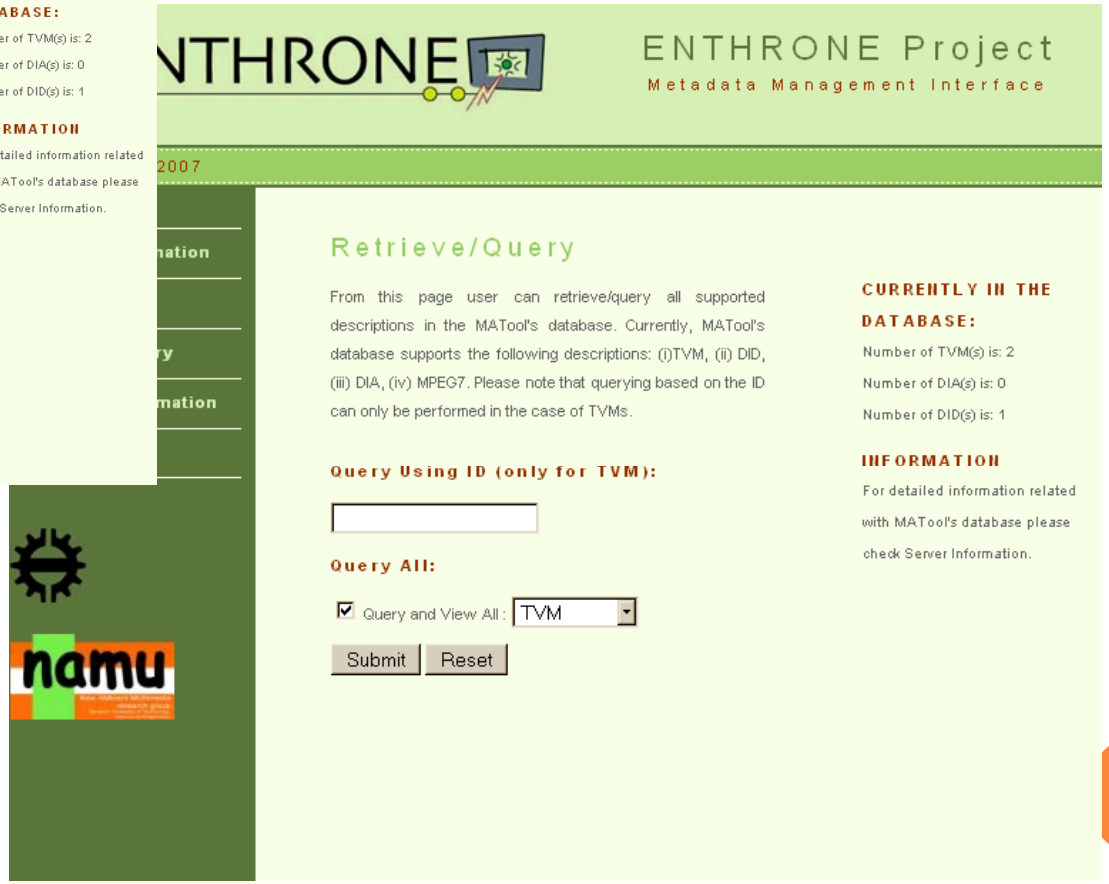
eXist & Tamino based implementation



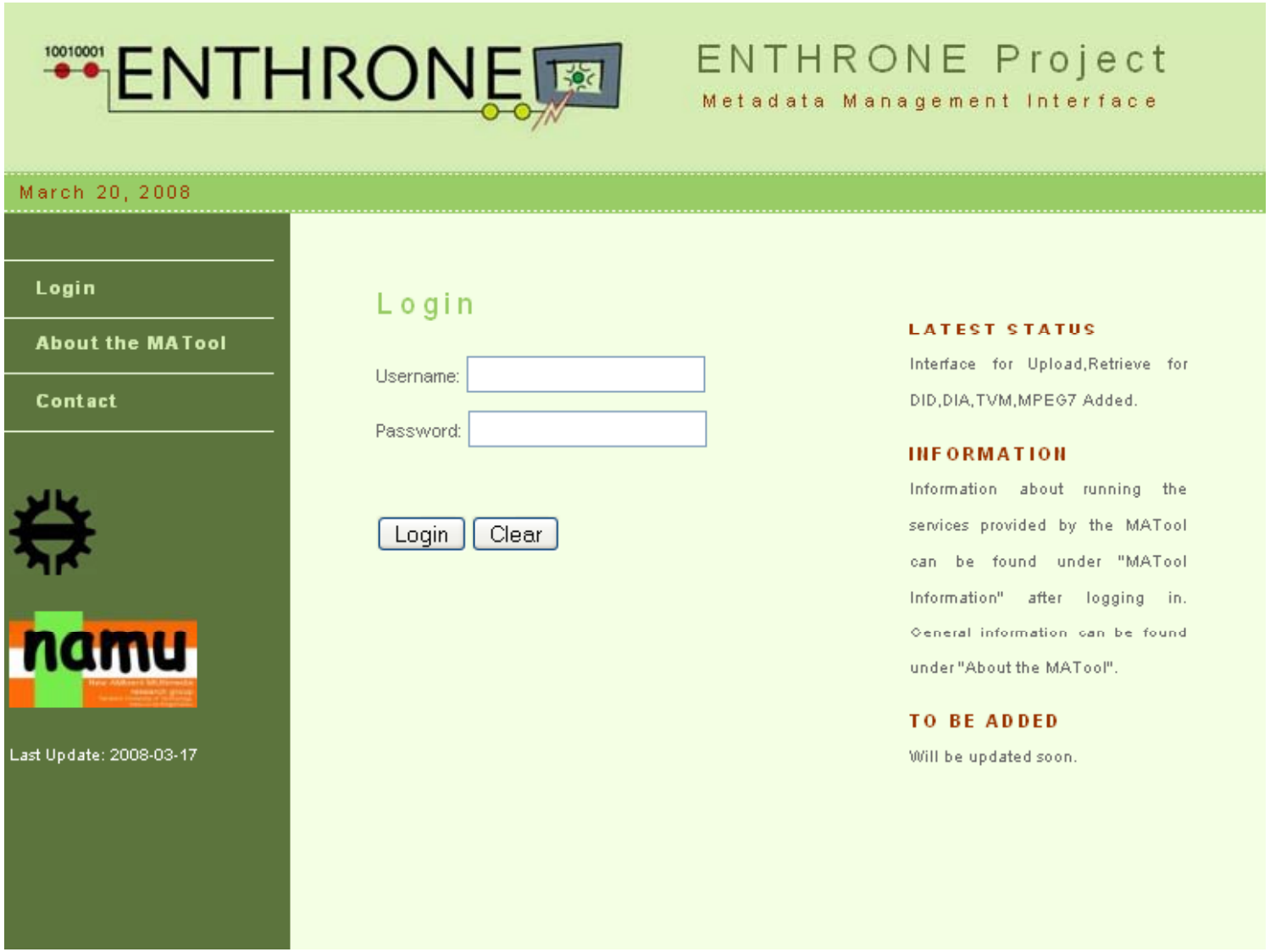


EIMS METADATA MANAGER

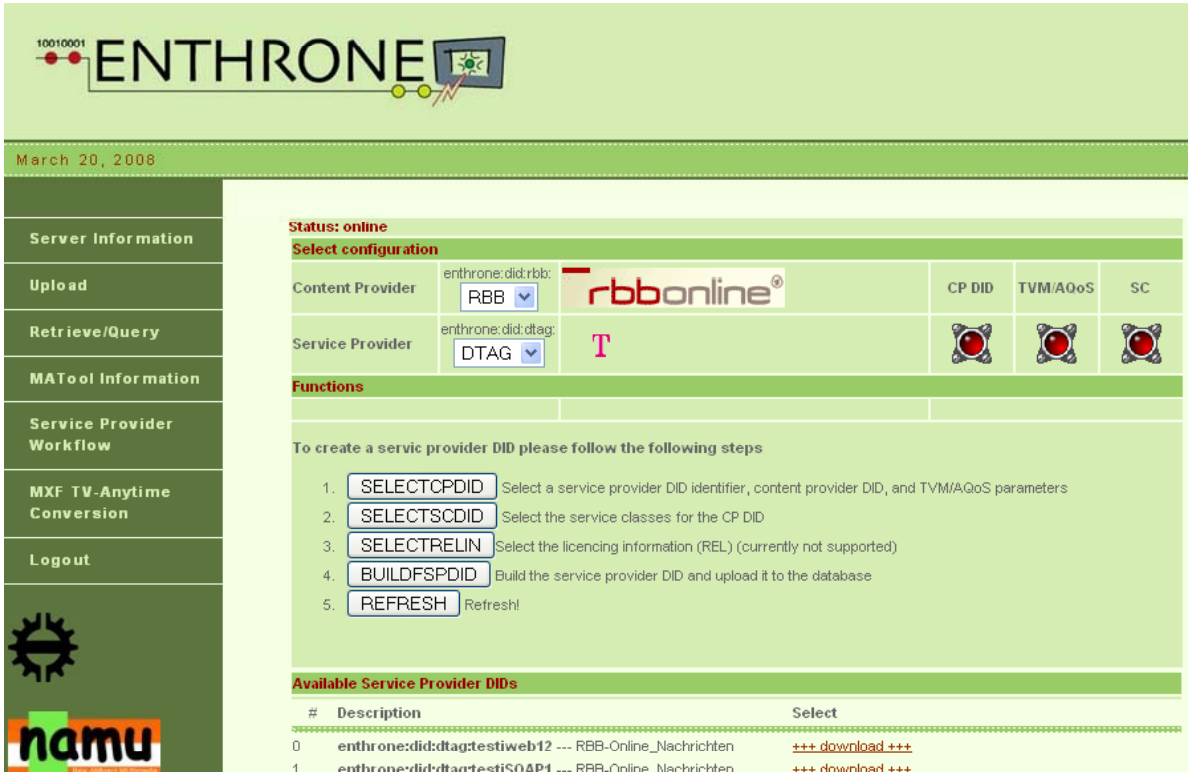




MATOOL3 WEB INTERFACE



Service Provider Workflow



Conclusions

- To provide a full MPEG-21 based QoS solution throughout the business value-chain much integration work is essential.
- ENTHRONE especially faces the challenge between the interconnection between lower-layer network protocols and higher-layer service protocols
- interconnecting both layers to provide across layer adaptation was major part within the ENTHRONE 2 project
- The MATool is designed for managing static/dynamic metadata in the context of the service provider workflow as well as it performs many metadata tasks
- **MPEG-21 is 'the' integrator of various metadata formats – especially from distribution to consumption**