



METADATA MANAGEMENT

Artur Lugmayr, Pekka Vorne

lartur@acm.org, pekka.vorne@tut.fi

<http://namu.cs.tut.fi>

NAMU Lab., Tampere Univ. of Technology, FINLAND

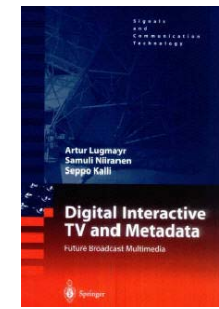
AGENDA

- 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



EuroITV.2008

6th European Interactive TV Conference - EuroITV2008
3 – 4 July 2008 in Salzburg, Austria

EuroITV brings together researchers and practitioners from diverse disciplines that include human-computer interaction, media studies, computer science, telecommunications, audiovisual design and management. The organizing committee invites you to submit original high quality papers addressing the theme „changing TV environments“.

Important Dates:
Tutorial and Workshop Proposals **December 7th, 2007**
Full Papers **January 11th, 2008**
Short Papers, Posters, Doctoral consortium, Demos **February 29th, 2008**
Industrial Case Studies **April 25th, 2008**

<http://www.EuroITV2008.org>

EuroITV2008 is organized by the HCI & Usability Unit, ICT85 Center of the University of Salzburg. General Chair: Manfred Tscheligi (University of Salzburg); Conference Co-Chairs: Marianna Obrist (University of Salzburg) & Artur Lugmayr (Tampere University of Technology)

Welcome to uxtv 2008!

First International Conference on Designing Interactive User Experiences for TV and Video

October 22 - 24, 2008
Silicon Valley (San Francisco Bay Area), California, USA

The uxtv 2008 conference will bring together researchers and designers of interactive user experiences for TV and Video from academia and industry. The Silicon Valley is home to top companies in new video and television technologies. Outstanding papers, demos and speakers will make uxtv 2008 the best conference for designers and researchers in this field. Join us in Silicon Valley in October 2008.

Invited Speakers



Jakob Nielsen
Principal
[Nielsen Norman Group](#)



Elissa Lee
Senior Director
Research Group
[TVU](#)



Gunthar Hartvig
Senior UX Designer
[YouTube](#)



Dale Herigstad
Chief Creative Officer
[Schemata](#)

> Second call for papers (March 3, 2008)

> Now accepting submissions for

- long papers
- short papers/posters
- tutorials
- workshops
- doctoral consortium
- demos

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 B&M 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.

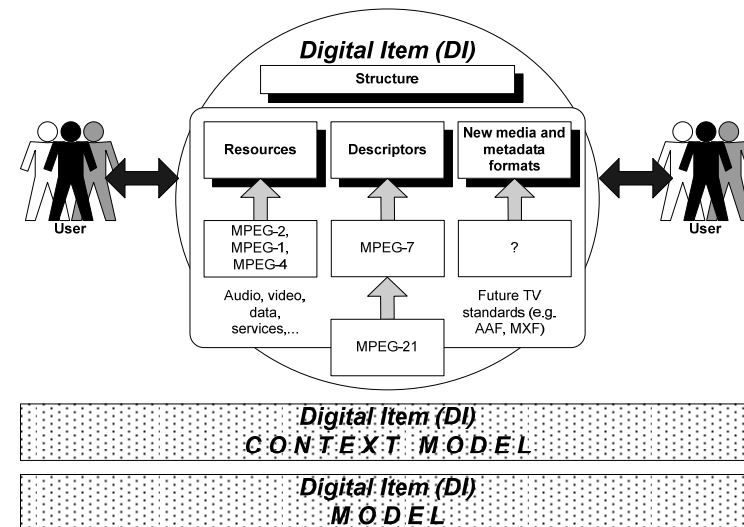
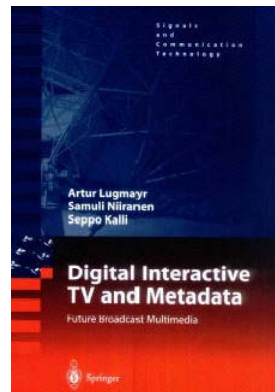
Status Information

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]

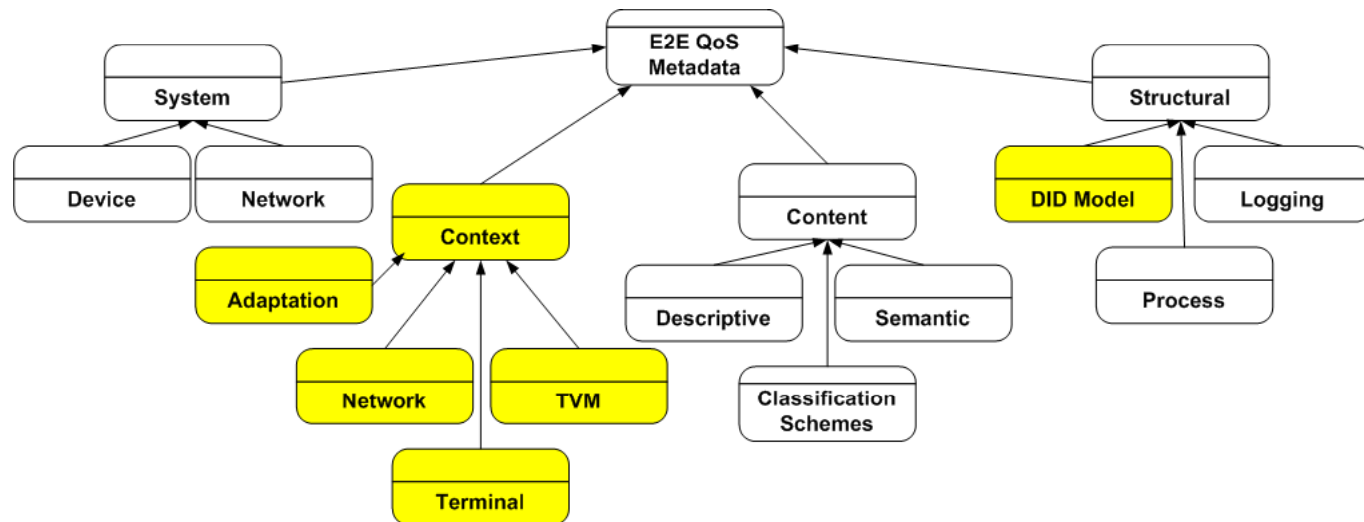
Description: This is the log file of the most five recent events happened during the previous time.

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.



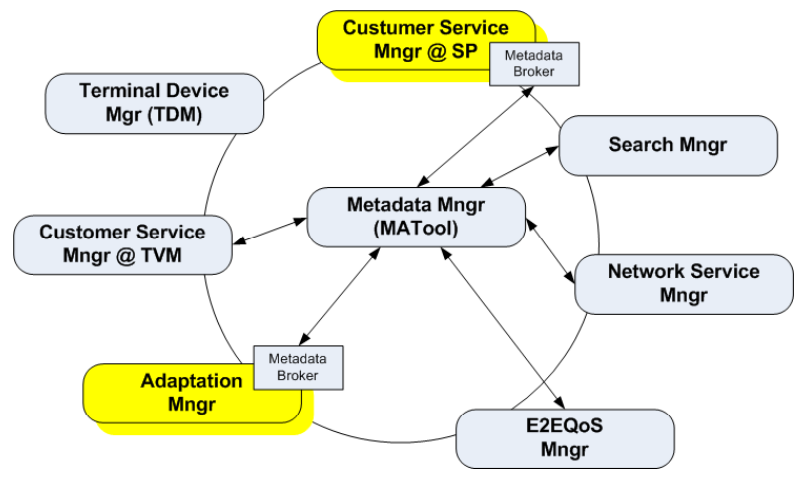
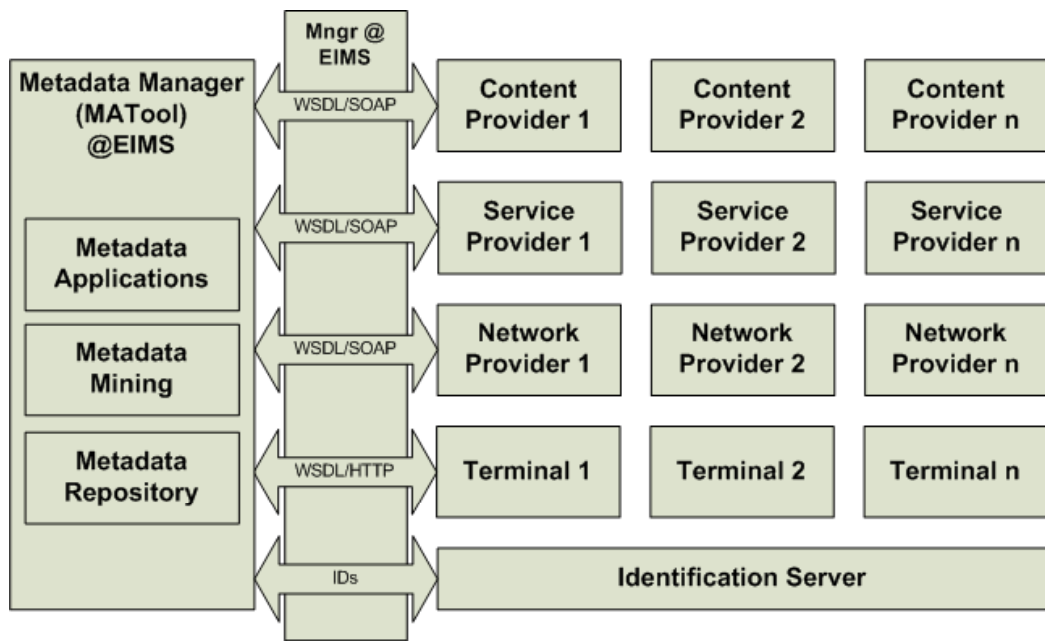
E2E QoS METADATA TYPES

- *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.



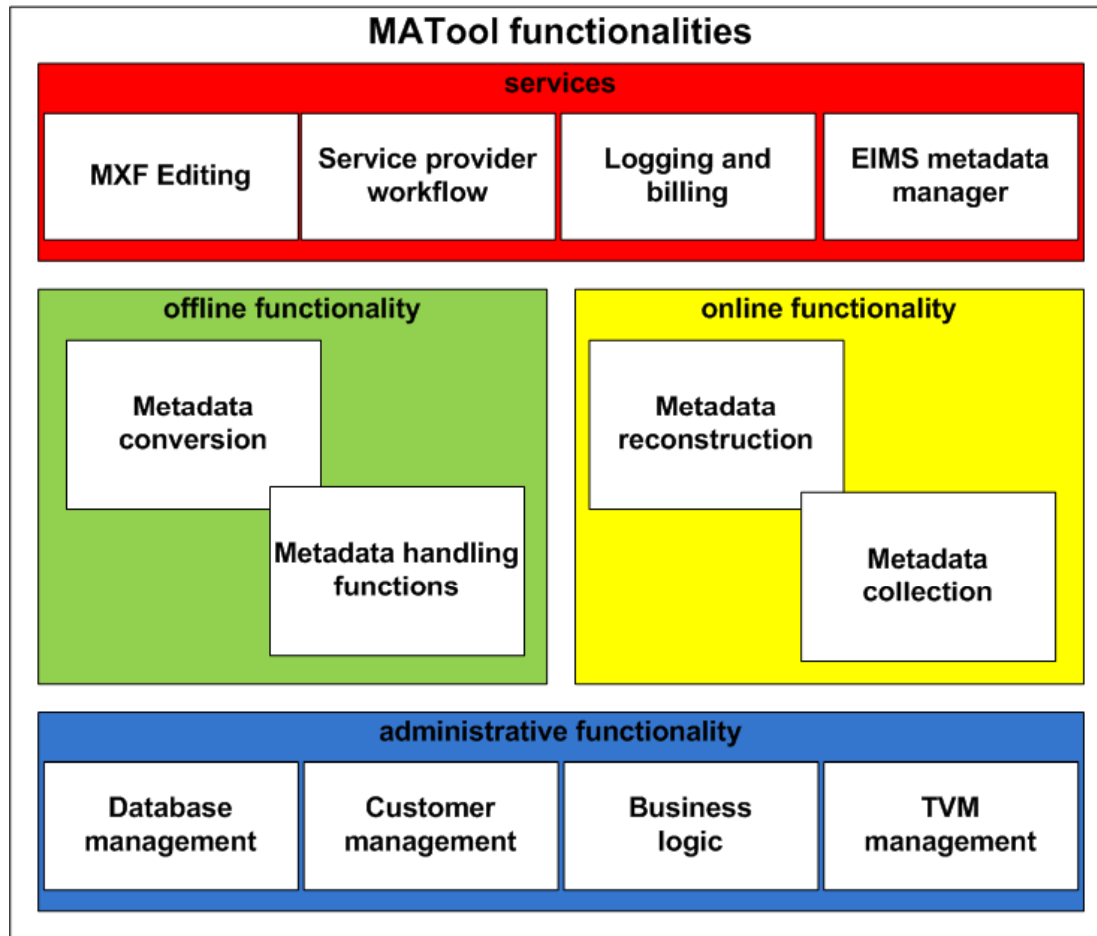
MATool – WITHIN THE EIMS

METADATA MANAGEMENT TOOL FOR QoS METADATA



MATool – FUNCTIONAL ENTITIES

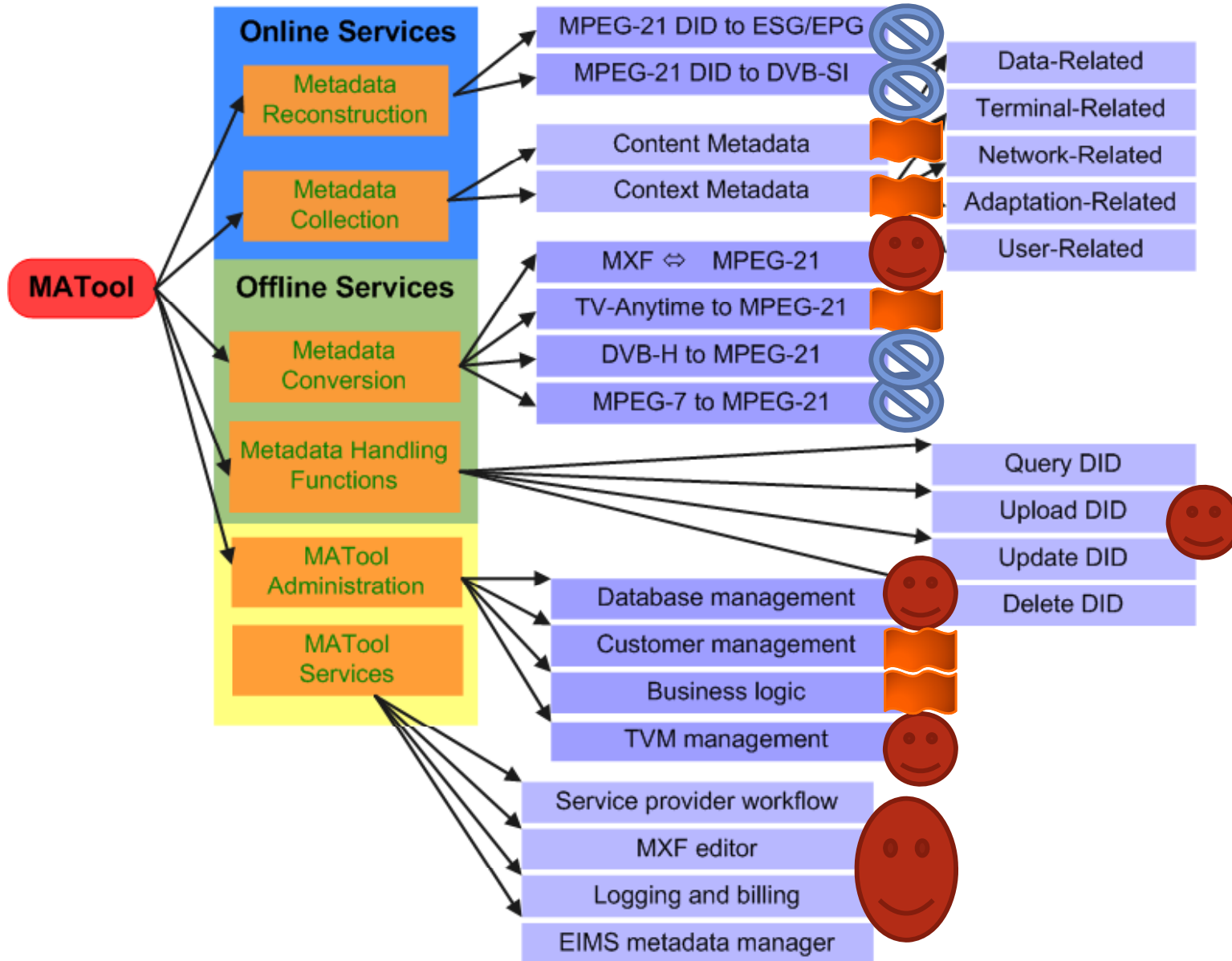
METADATA MANAGEMENT TOOL FOR QoS METADATA



- 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

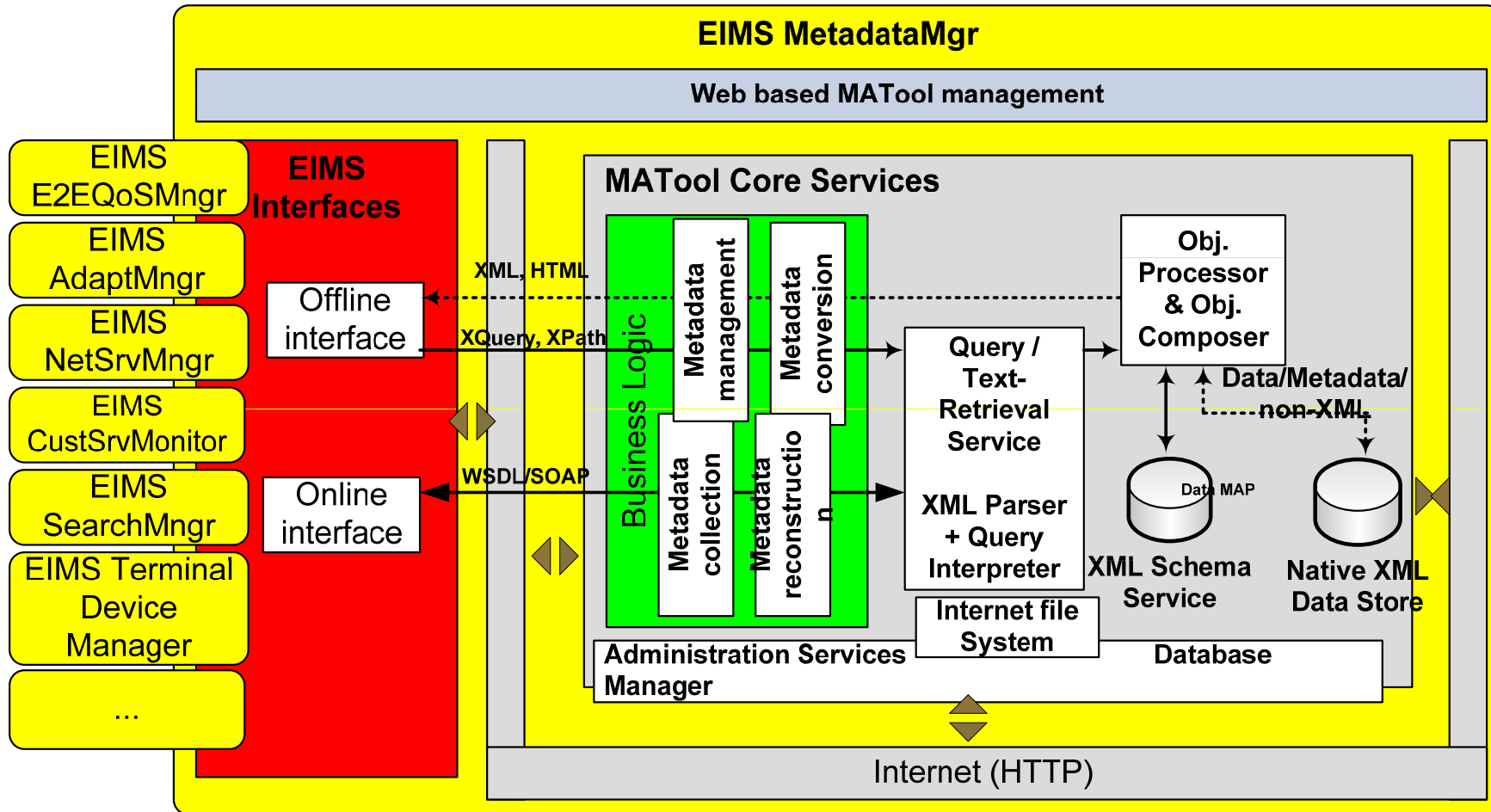
METADATA MANAGEMENT TOOL FOR QOS METADATA



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

MPEG7 Upload

Descriptor:

Identifier: *enthronedid:mpeg7:*

File:

MetadataAggregatorWS
listMPEG7
uploadMPEG7
downloadMPEG7
deleteMPEG7

MetadataAggregatorWSPortBinding soap doc
listMPEG7 def
uploadMPEG7 def
downloadMPEG7 def
deleteMPEG7 def

MetadataAggregatorWSService
MetadataAggregatorWSPort
Location: http://localhost:8080/MATool3/MetadataAggregatorWS

Generated by XmlSpy

www.altova.com

ShowUploadedMetadataFromDatabaseServlet
Attributes
Operations
public ShowUploadedMetadataFromDatabaseServlet()
public void init(ServletConfig servletConfig)
public void doGet(HttpServletRequest request, HttpServletResponse response)

ServletCommonTools
Attributes
Operations
public ServletCommonTools()
public MultiPartRequest initializeMultiPartRequest(HttpServletRequest request)
public String getRequiredParameter(String attributeName, MultiPartRequest multiPartRequest)
public File getRequiredFile(MultiPartRequest multiPartRequest)

DeleteMetadataServlet
Attributes
Operations
public DeleteMetadataServlet()
public void init(ServletConfig servletConfig)
public void doGet(HttpServletRequest request, HttpServletResponse response)

UploadServlet
Attributes
Operations
public StringBuffer metadataHeader = null
private MultiPartRequest multiPartRequest = null
public UploadServlet()
public void init(ServletConfig servletConfig)
public void doPost(HttpServletRequest request, HttpServletResponse response)
public String createMetadataFromQuery(String descriptor, String identifier, String metadataId)
private StringBuffer createMetadataFromQuery(String descriptor, String identifier, File metadataFile)
private void createHeader(String descriptor, String identifier, StringBuffer metadata)
private void createFooter(StringBuffer metadata)
private void appendMetadataFromFile(StringBuffer text, File textFile)
private void removeVersionTag(BufferedReader bufferedReader)

PrintMetadataServlet
Attributes
Operations
public PrintMetadataServlet()
public void init(ServletConfig servletConfig)
public void doGet(HttpServletRequest request, HttpServletResponse response)

BrowseMetadataServlet
Attributes
Operations
public BrowseMetadataServlet()
public void init(ServletConfig servletConfig)
public void doGet(HttpServletRequest request, HttpServletResponse response)
public MetadataTableContainer[] queryMetadataInformation()
private MetadataTableContainer[] buildMetadataTableArray(TXMLObject[] objects, int[])

ShowMetadataFromDatabaseServlet
Attributes
Operations
public ShowMetadataFromDatabaseServlet()
public void init(ServletConfig servletConfig)
public void doGet(HttpServletRequest request, HttpServletResponse response)

DatabaseCommonTools
Attributes
Operations
public DatabaseCommonTools()
public TConnection connectDatabase()
public void saveMetadata(String metadata)
public void checkMPEG7IdentifiersAlreadyUsed(String fullIdentifier)
public void checkMPEG7IdentifiersAlreadyUsed(String partialIdentifier)
public TXMObject[] doMPEG7Query(String queryExpression)
public TXMObject[] doMPEG7Query(String queryExpression)
public TXMObject doQuery(String queryExpression)
package void deleteMetadata(String id)
package void deleteWithMPEG7Query(String queryExpression)
public void deleteMetadataByIdentifier(String identifier)
public String acquireMetadata(String id)
public String doQuery(String queryExpression)
public String createQueryExpressionOfIdentifier(String identifier)
public String[] getIdentifiers()

MetadataAggregatorConstants
Attributes
Operations
public String DEBUG_SEPAR = ";"
public String HTTP_METHOD_QUERY_ALL = "findAll"
public String IDENTIFIER_BODY = "enthronedid:mpeg7:"
public String IDENTIFIER_SEPARATOR = ":"
public String METADATATABLE_PARAMETER = "metadatatable"
public String ID_PARAMETER = "id"
public String DESCRIPTOR_PARAMETER = "descriptor"
public String IDENTIFIER_PARAMETER = "identifier"
public String SOAP_SUCCESS = "SUCCESS"
public String SOAP_FAILURE = "FAILURE"
public String METADATA_AGGREGATOR_PATH = "metadata_aggregator"
public String UPLOAD_RESULT_DESCRIPTOR = "upload_error_desc"
public String DOCTYPE = "did:did:"
public String UPLOAD_FILE_PATH = System.getProperty("java.io.tmpdir")
public MetadataAggregatorConstants()

MetadataTableContainer
Attributes
Operations
private String identifier = null
private String descriptor = null
private String id = null
public MetadataTableContainer()
public void setId(String identifier)
public void setDescriptor(String descriptor)
public String getDescriptor()
public String getId()
public void setId(String id)

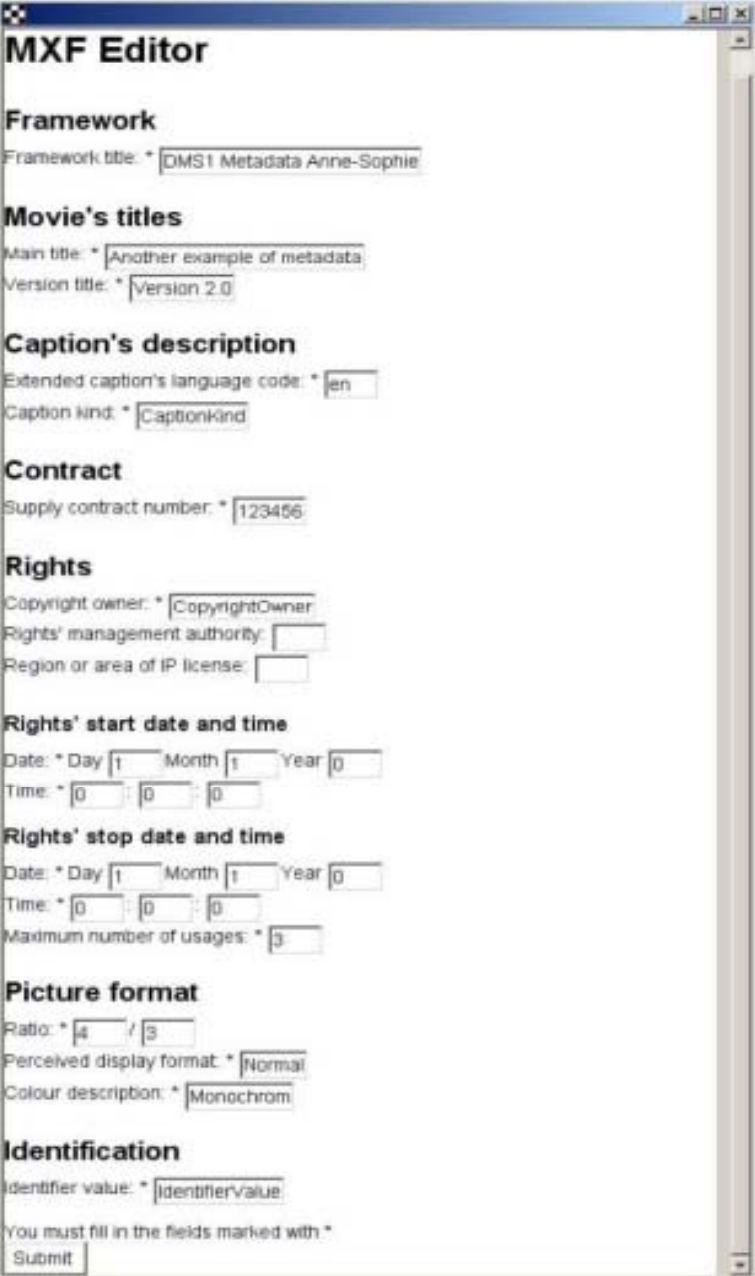
MetadataAggregatorWS
Attributes
Operations
public String[] listMPEG7(String identifier)
public String uploadMPEG7(String identifier, String metadata)
public String downloadMPEG7(String identifier)
public String deleteMPEG7(String identifier)
private String searchFromTableContainer(String identifier, MetadataTableContainer metadataTableContainers, int[])



METADATA CONVERSION

MXF2TVA2MPEG-21

- MXF Editor
- MXF Converter



MXF Editor

Framework
Framework title: *

Movie's titles
Main title: *
Version title: *

Caption's description
Extended caption's language code: *
Caption kind: *

Contract
Supply contract number: *

Rights
Copyright owner: *
Rights' management authority:
Region or area of IP license:

Rights' start date and time
Date: * Day Month Year
Time: * : :

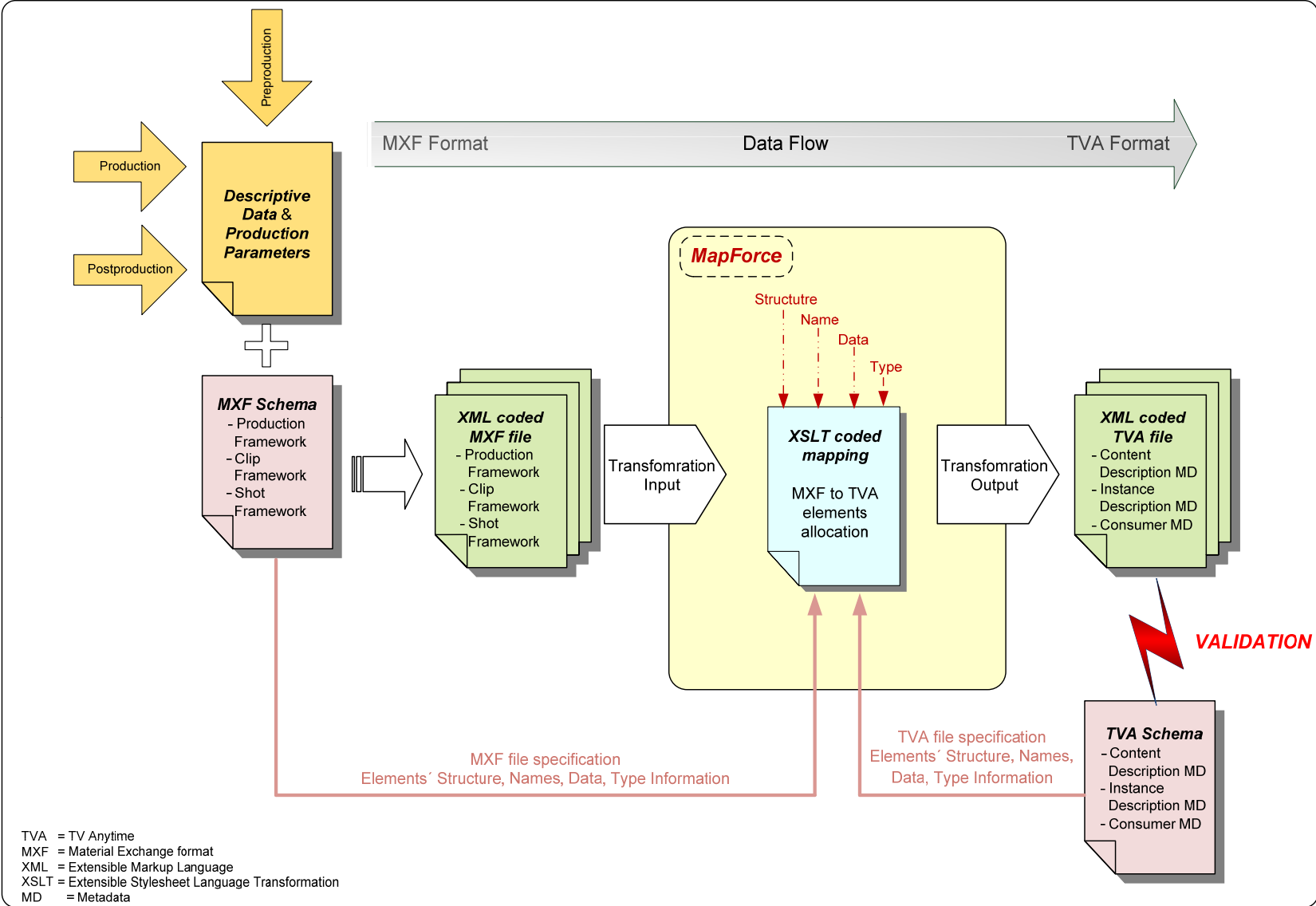
Rights' stop date and time
Date: * Day Month Year
Time: * : :
Maximum number of usages: *

Picture format
Ratio: * /
Perceived display format: *
Colour description: *

Identification
Identifier value: *

You must fill in the fields marked with *

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 <i>datetime</i> . <code><xsl:variable name="Vvar1_result" as="xs:decimal" select="fn:year-from dateTime(xs:dateTime(xs:string(.)))"/></code>	





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

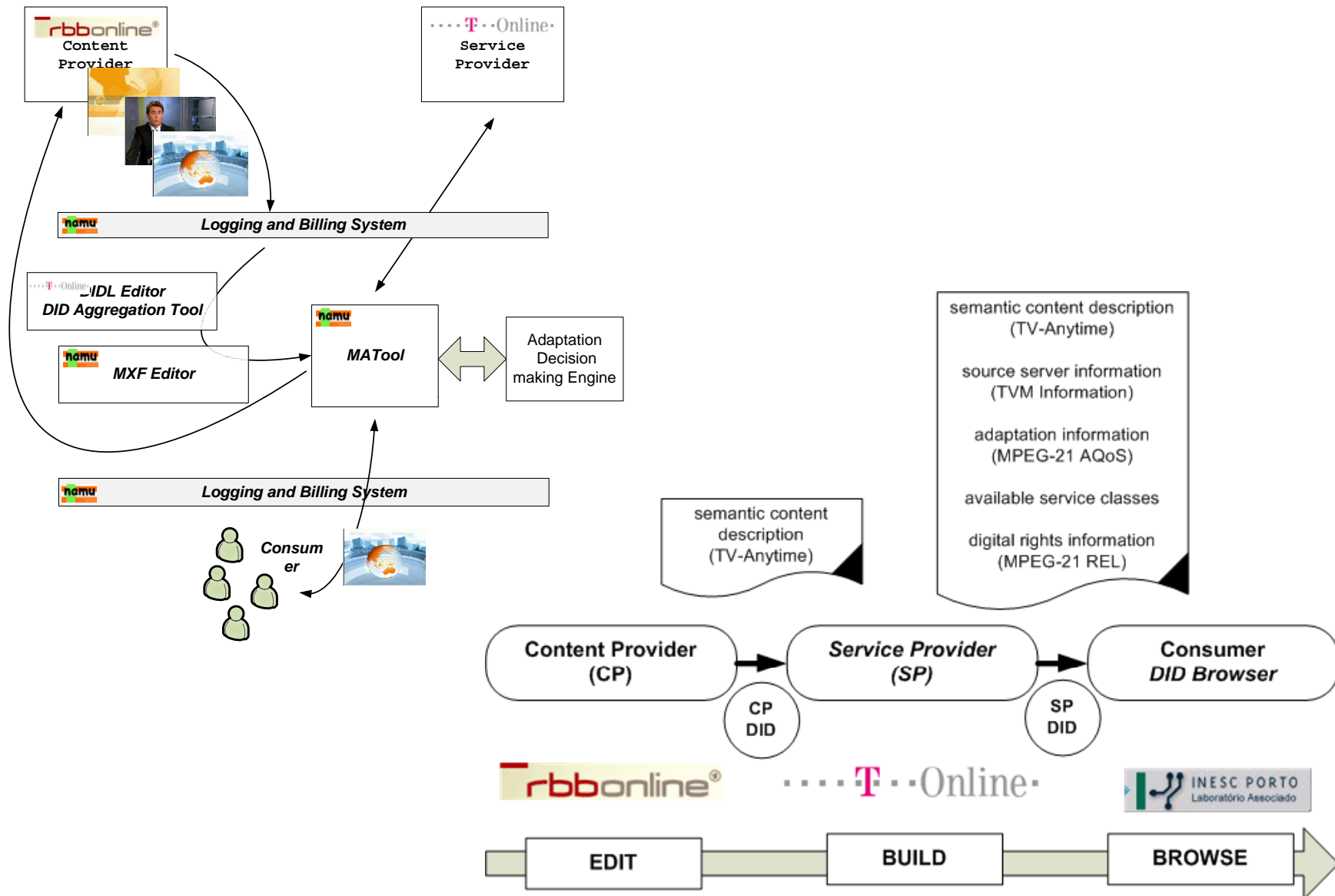
- add TVM information
- add AQoS information
- add different service classes
- build SP-DID
- upload TVM, AQoS, SC template DIDs

- Setup

- RBB: DID editor
- TUT/NAMU: MATool / Service Provider Module
- INESC: DID browser



SERVICE PROVIDER WORKFLOW



MATool SCREENSHOTS

Web service client for testing "Service Provider Workflow" of MATool3

Rev: 149, Date: 2008-04-17

Trying connection to SearchManager

Enter the TVM (TVMID) you want to register:

Enter the identifier of TVM-DOI (TVMDOI) you want to register:

Enter the content provider DOI (CPDOI) you want to upload:



SERVICE PROVIDER WORKFLOW

ADD DIFFERENT SP-DID COMPONENTS

Other functionalities

Add Content (CP-DID, SP-DID, SC, TVM)

ADDCPDID Browse...

Available REL (currently not supported)

#	ID	Description	Select

Select Identifier for new SP DIDS

Identifier: enthrone:did:dtag:

Available TVMs / AOoS

#	ID	Description	Select
0	0	ID: 195 Terminal: http://tvm1.rbb.de:8080/CustSvcMgr@TVM/services/DIServiceTVM CSMSP: http://tvm1.rbb.de:8080/CustSvcMgr@TVM/services/CustomerServiceTVM	<input type="radio"/>
1	1	ID: 5099 Terminal: http://tvm2.rbb.de:8080/CustSvcMgr@TVM/services/DIServiceTVM CSMSP: http://tvm2.rbb.de:8080/CustSvcMgr@TVM/services/CustomerServiceTVM	<input type="radio"/>

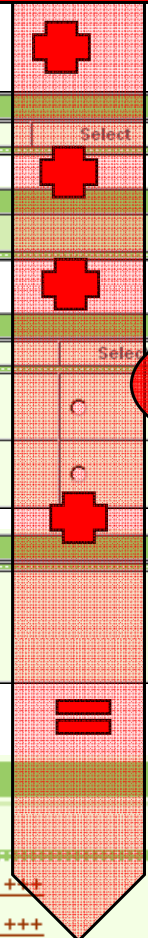
Global Service Class Descriptor Valid for the complete SP-DID

#	Description	Select
0	enthrone:did:sc:1 enthrone:did:sc:1 Gold (76-100) (true) This is the best available quality. Silver (50-76) (true) This is the medium quality for the content. Bronze (0-76) (true) This is the lowest available quality.	<input type="checkbox"/>

Available Service Provider DIDs

#	Description	Select
0	enthrone:did:dtag:test5 --- RBB-Online_Nachrichten	+++ download ++
1	enthrone:did:dtag:test1 --- RBB-Online_Nachrichten	+++ download +++

Content Provider DID



MATool

Service Provider DID



EXIST & TAMINO BASED IMPLEMENTATION



10010001

ENTHRONE Project
Metadata Management Interface

September 23, 2007

Server Information

Upload

Retrieve/Query

MATool Information

Service Provider Workflow

MXF TV-Anytime Conversion

Logout

Server Information

User enthrone Successfully Logged In.

1) Server Status:

Server is alive.

System Information

The Tamino server hosting http://130.230.141.138/tamino/mydb is version 4.4.1.3(Server API version: 4.4.1.3, Tamino API for Java version: 4.4.1.3)

2) MATool Database Information:

- Number of DIAs: 10
 - Number of UEDs: 5
 - Number of UCDS: 1
 - Number of AGOs: 4
- Number of DIDs: 9
- Number of TVMs: 2

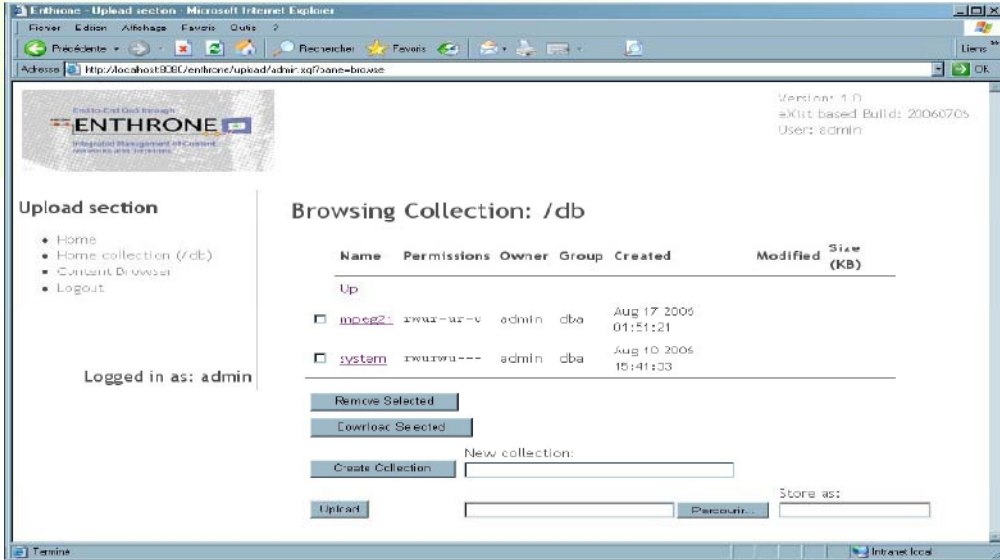
CURRENTLY IN THE DATABASE:

Number of TVM(s) is: 2
 Number of DIA(s) is: 10
 Number of DID(s) is: 9

INFORMATION

For detailed information related with MATool's database please check Server Information.





Enthron - Upload section - Microsoft Internet Explorer

Address: http://localhost:8080/enthrone/upload/admin:sg?zone=browse

Version: 1.0
 exist-based Build: 20060705
 User: admin

Upload section

- Home
- Home collection (/db)
- Content Display
- Logout

Logged in as: admin

Browsing Collection: /db

Name	Permissions	Owner	Group	Created	Modified	Size (KB)
Up						
<input type="checkbox"/> mpeg2	rwxr-xr-v	admin	dba	Aug 17 2006 01:51:21		
<input type="checkbox"/> system	rwxrwxr--	admin	dba	Aug 10 2006 15:41:33		

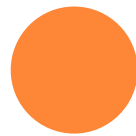
Remove Selected

Download Selected

Create Collection

New collection:


Upload Store as:



EIMS METADATA MANAGER

September 3, 2007

- Server Information
- Upload
- Retrieve/Query
- MATool Information
- Logout



Upload

From this page user can upload all supported descriptions in the MATool's database. Currently, MATool's database supports the following descriptions: (i)TVM, (ii) DID, (iii) DIA, (iv) MPEG7.

From File:

Filename:

From Text (Copy Paste the Text):

CURRENTLY IN THE DATABASE:

Number of TVM(s) is: 2
Number of DIA(s) is: 0
Number of DID(s) is: 1

INFORMATION

For detailed information related with MATool's database please check Server Information.

2007

- Server Information
- Upload
- Retrieve/Query
- MATool Information
- Logout



Retrieve/Query

From this page user can retrieve/query all supported descriptions in the MATool's database. Currently, MATool's database supports the following descriptions: (i)TVM, (ii) DID, (iii) DIA, (iv) MPEG7. Please note that querying based on the ID can only be performed in the case of TVMs.

Query Using ID (only for TVM):

Query All:

Query and View All:

CURRENTLY IN THE DATABASE:

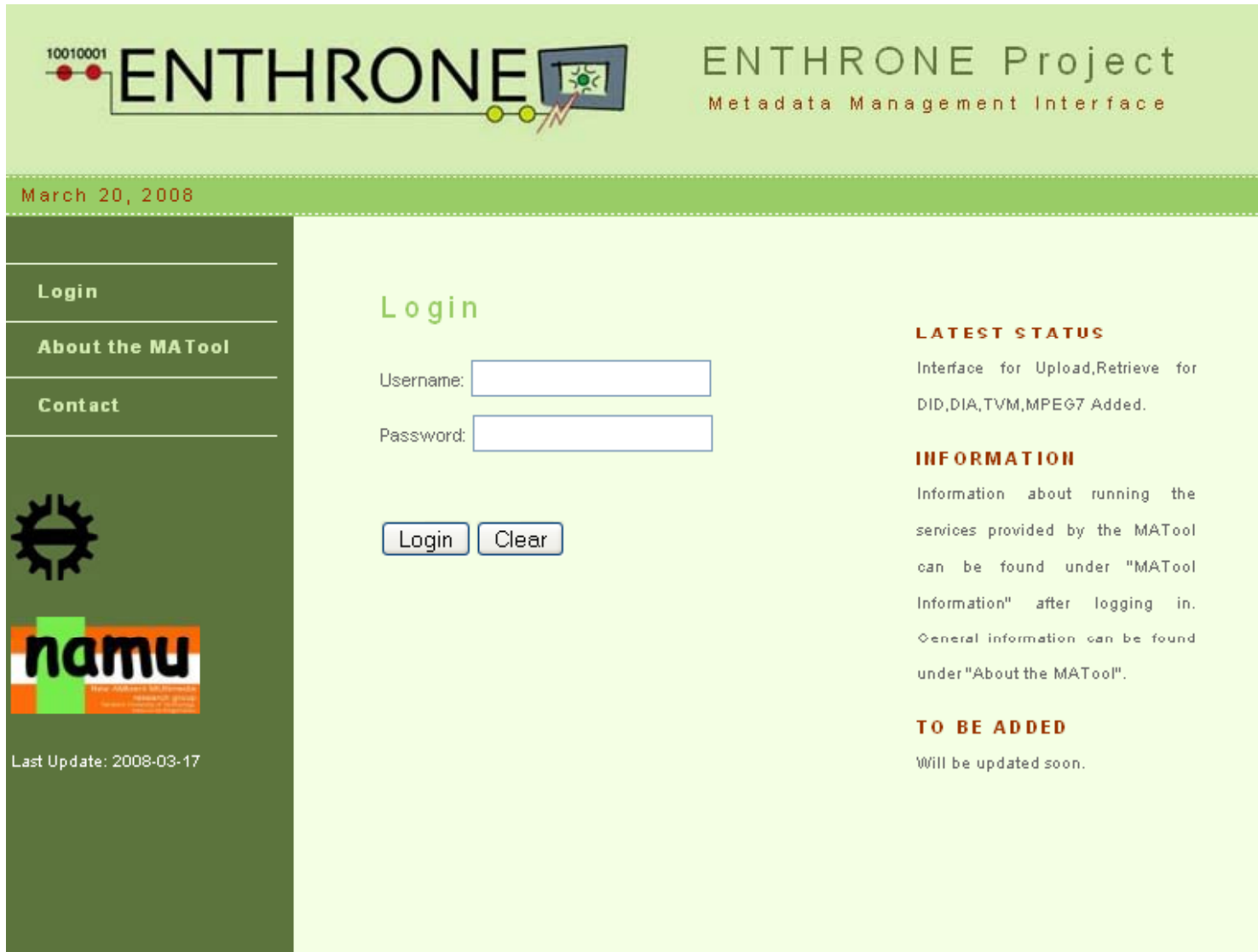
Number of TVM(s) is: 2
Number of DIA(s) is: 0
Number of DID(s) is: 1


INFORMATION

For detailed information related with MATool's database please check Server Information.




MATool3 WEB INTERFACE



10010001 **ENTHRONE**  ENTHRONE Project
Metadata Management Interface

March 20, 2008

[Login](#)
[About the MATool](#)
[Contact](#)


Last Update: 2008-03-17

Login

Username:

Password:

LATEST STATUS

Interface for Upload, Retrieve for DID, DIA, TVM, MPEG7 Added.

INFORMATION

Information about running the services provided by the MATool can be found under "MATool Information" after logging in. General information can be found under "About the MATool".

TO BE ADDED

Will be updated soon.

30.4.2008



SERVICE PROVIDER WORKFLOW

The screenshot shows the ENTHRONE web interface. At the top left, there is a logo with the number 10010001 and the word ENTHRONE. Below the logo, the date March 20, 2008 is displayed. On the left side, there is a vertical navigation menu with the following items: Server Information, Upload, Retrieve/Query, MATool Information, Service Provider Workflow (highlighted), MXF TV-Anytime Conversion, and Logout. Below the menu is a gear icon and the word namu.

The main content area shows the configuration for a service provider. It includes a status indicator (online), a select configuration section, and a table of available service provider DIDs.

Status: online

Select configuration

Content Provider	enthronedid:rb: RBB		CP DID	TVM/AoS	SC
Service Provider	enthronedid:dtag: DTAG				

Functions

To create a service provider DID please follow the following steps

1. Select a service provider DID identifier, content provider DID, and TVMAoS parameters
2. Select the service classes for the CP DID
3. Select the licencing information (REL) (currently not supported)
4. Build the service provider DID and upload it to the database
5. Refresh!

Available Service Provider DIDs

#	Description	Select
0	enthronedid:dtag:testiweb12 --- RBB-Online_Nachrichten	+++ download +++
1	enthronedid:dtag:testiSNAP1 --- RBB-Online_Nachrichten	+++ download +++



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**

