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MAPPING BETWEEN DPM AND MDM

CEN WS XBRL

XBRL week in Luxembourg, December 10th, 2013.

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Madrid, December 10th, 2013.

- Introduction.
- Introduction to the Multidimensional Data Model.
- Preconditions on mapping.
- Terms and definitions.
- Mapping from Data Point Model to Multidimensional Data Model.
- Metamodel defined by the EBA (FINREP and COREP) mapped to MDM.
- Implementation of the DPM in the MDM using the design ROLAP.
- DPM of FINREP 2012 and the first prototype of Solvency II in the MDM using the design ROLAP.
- Conclusion.



INTRODUCTION

- This work is a contribution of Ignacio Santos (Bank of Spain), Roland Hommes (Rhocon) and Katrin Heinze (Deutsche Bundesbank).
- The Multidimensional Data Model (MDM) presented in this document is intended to be a starting point for a subsequent modelling process to be adjusted and extended to specific analytical or transactional needs.
- This document aims to provide an introduction to the topic of creating a conceptual model for storing multidimensional data which is received as XBRL instances that follow the rules defined by European taxonomies published by the European Banking Authority (EBA) or by the European Insurance and Occupational Pensions Authority (EIOPA).
- The structure of the data model is based on meta classes, introduced in part 1 and 4 of the CWA1 document.



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INTRODUCTION TO THE MDM

- The multidimensional database is primarily used to create OLAP (On-line Analytical Process) applications and their databases using a fact table and set of dimensions.
- A multidimensional structure stores multidimensional data, that is to say, cubes.
- A cell or fact is an intersection consisting of elements that form the dimension(s) which in turn form a cube.
- The Multidimensional Data Model (MDM) is used instead of the Relational Model, because the European architecture of economic-financial reports is relying on dimensions heavily, which makes implementation in MDM the logical choice.



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PRECONDITIONS ON MAPPING I

Types of Database Management Sytems (DBMSs)





PRECONDITIONS ON MAPPING II

- It is necessary to verify that database transactions are processed reliably. For this, a database must fulfil ACID (Atomicity, Consistency, Isolation, and Durability) properties. Not all databases fulfil the ACID requirements, this depends on the vendor.
- Fundamental choices:
 - Mapping the XBRL instance document to the relational model;
 - Storing the XBRL instance document as a blob, or PDF document in the database;
 - Storing the XBRL instance as a XML document or as a XBRL document.



PRECONDITIONS ON MAPPING III

- An XBRL instance document can be stored in a relational database as an XML document or in a relational format:
 - In XML, these queries use XQuery and XPath;
 - Relational Database use standard SQL;
 - If the XBRL instance document is stored directly in the database (as a blob), the problems are the same but the RDBMS is an inferior level. Cases are:
 - Storing as a photo (Blog or Clog);
 - Storing as a XML document.
 - Storing the XBRL instance as a XML document or as a XBRL document.



PRECONDITIONS ON MAPPING IV

Proposals	Native store	Convert before store
Quantity of aspects to store (direct from instance)	(+)(-)	(+)(-)
Quantity of aspects to store (indirect from Discoverable Taxonomy Set (DTS))	(-)	(+)
Speed of storage process	(+)	(-)
Maintenance (mapping table, mapping software)	(+)	(-)
Analyst queries, degree of difficulty	(-)	(+)
Analyst queries, speed	(-)	(+)
Easy handling of new DTS versions	(+)	(-)
Extensibility towards proprietary XBRL reports	(+)	(-)
Extensibility towards proprietary non-XBRL reports	(-)	(+)



PRECONDITIONS ON MAPPING V

- Fact definitions: presentation vs DPM.
- Storing native XBRL facts.
- Dimension/defaultMember.
 - All EBA defined dimensions will have a default member.
 - Naturally, these default dimension/member combinations must be identified in storage since they are not allowed in the instance.
- Options.
 - XBRL allows for more presentation texts to be added besides primary, dimension, member, table or axis.
- Versioning.
 - EBA has chosen to include two special attributes on every concept: creationDate and modificationDate.
- Changes on fact values.
 - If the NSA has the authority to change reported fact values, they
 must be aware that recreating the original instance may be
 cumbersome, unless appropriate versioning mechanisms have been
 put in place to conserve the original fact values.

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TERMS AND DEFINITIONS I

- The terms used directly or indirectly in the mapping of DPM in the MDM are (I):
 - Concept.
 - Data Point Model.
 - Dimension.
 - Domain.
 - Family.
 - Framework.
 - Item.
 - (Domain) member.
 - Namespace.
 - Owner.
 - Public elements.



TERMS AND DEFINITIONS II

- The terms used directly or indirectly in the mapping of DPM in the MDM are (II):
 - TableGroup.
 - DataPoint.
 - DataCube.
 - Module.
 - Hypercube.
 - Taxonomy.
 - Context.



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MAPPING FROM DPM TO MDM I

• Star model of the DPM using ROLAP tool.





MAPPING FROM DPM TO MDM II

• Framework (I):



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MAPPING FROM DPM TO MDM III

• Framework (II):





MAPPING FROM DPM TO MDM IV

• Taxonomy:



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Framework

- ID_Framework (pk)

- nameFramework

creatioDate

- userID_created

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labelFramework

- ModificationDate

MAPPING FROM DPM TO MDM V







MAPPING FROM DPM TO MDM VI

• Dimensions (II):





MAPPING FROM DPM TO MDM VII

Context (I):
 DPM



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MAPPING FROM DPM TO MDM VIII

Context (II):





MAPPING FROM DPM TO MDM IX

• Primary Items (I):





MAPPING FROM DPM TO MDM X

• Primary Items (II):





MAPPING FROM DPM TO MDM XI

Fact table or Data points (I): ٠



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MAPPING FROM DPM TO MDM XII

• Fact table or Data points (II):

ROLAP





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METAMODEL DEFINED BY THE EBA (FINREP AND COREP) MAPPED TO MDM





- Creation of the structure and load of the DPM from the EBA in a RDBMS.
- Loading DPM_ROLAP from DPM_EBA:
 - Mapping.
 - Code.



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IMPLEMENTATION OF THE DPM IN THE MDM USING THE DESIGN ROLAP

- Structure ROLAP.
- Creation of the infrastructure through MS SQL Server:
 - Code.





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DPM OF FINREP 2012 AND THE FIRST PROTOTYPE OF SOLVENCY II IN THE MDM USING THE DESIGN ROLAP.

Structure and Tables. •



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CONCLUSION

- This document is a starting point for a subsequent modelling process.
- This document does reference to CWA1 documents.
- Based on an easily comprehensible example, more complex issues are addressed that would need to be taken into account by defining an MDM for production use.



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