Institute of Information Management

University of St.Gallen

Enterprise Master Data Architecture

Design Decisions and Options

Alexander Schmidt, Boris Otto
Lima, August 13, 2010

Institute of Information Management
Chair of Prof. Dr. Hubert Österle

CDQ
Corporate Data Quality

Motivation: Increasing Attention for Master Data on Enterprise Level

- Process Industry: Fulfillment of REACH provisions (EU guideline regulating registration, evaluation, authorization, and restriction of chemical substances) forces companies to gather data and give evidence of properties of their chemical substances across the entire supply chain
- Insurance Companies: With fierce competition in a highly saturated market, need to be able to view their customers from a 360° perspective, i.e. all customer master data, contract data, and performance data must be available in a consistent, up-to-date, and complete form across the company
- Procurement: In order to be able to conduct a comprehensive spend analysis in multi-divisional companies, the central procurement department has to have access to consistent supplier master data and product group codes. Also, ownerships structures of suppliers and their affiliates must be transparent so that purchasing volumes of all subsidiaries can be taken into account in an evaluation

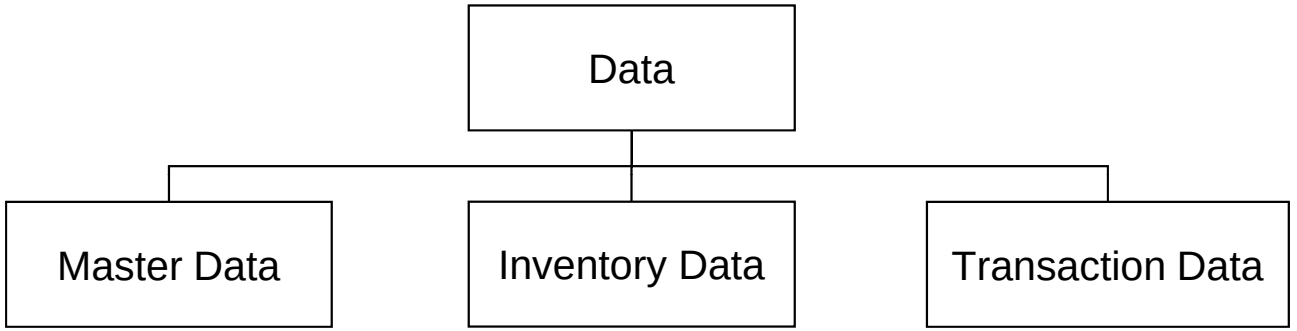
? **What design decisions do companies have to make with regard to master data management in general and, more specifically, with regard to their enterprise master data architecture and which design options do they have?**

Defining Master Data

Master Data

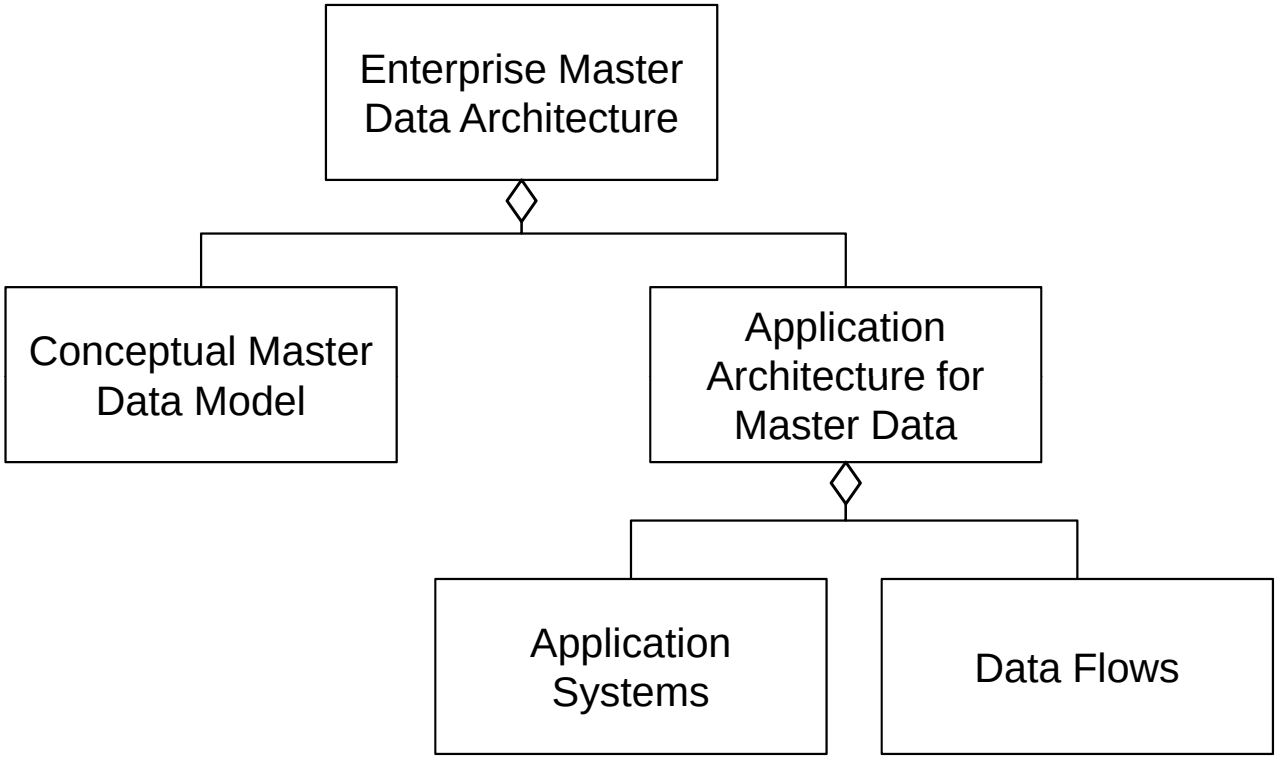
- Represents the business objects which are agreed on and shared across the enterprise, i.e. the “core business data entities”
- Typical master data is material and product master data, supplier and customer master data, and master data regarding employees and assets

[Dreibelbis et al. 2008, p. 35], [Smith and McKeen 2008, pp. 65-66]



Low reference to time	High reference to time	High reference to time
Low change frequency	High change frequency	Relatively low change frequency
Constant in volume	Relatively constant in volume	Increasing volume
Existentially independent → referenced e.g. by transaction data	Existentially dependent → reference master data	Existentially dependent → reference master data

Components of an Enterprise Master Data Architecture



[Periasamy and Feeny 1997, p. 198], [Pienimäki 2005, p. 39]

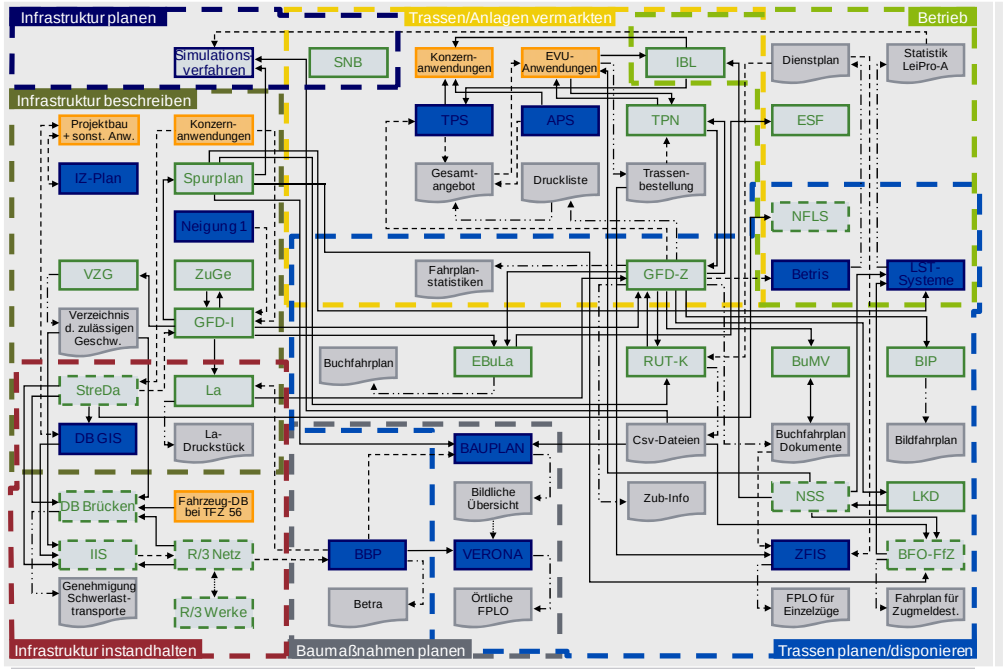
Literature Review: Appropriateness of Existing Architecture Frameworks

	Zachman	TOGAF	EAP	FEAF	EAC	DAMA
Enterprise master data architecture focus	◔	◑	◑	◔	◑	◕
Coverage of all enterprise master data architecture components	◕	◕	●	◕	◕	●
Reference to master data	○	○	○	○	○	◕
Specification of relevant design decisions	◔	◕	◕	◑	◔	◑
Identification of concrete design options	◔	◑	◕	◔	◔	◔

Legend:

TOGAF…. The Open Group Architecture Framework
EAP…….. Enterprise Architecture Planning
FEAF…….Federal Enterprise Architecture Framework
EAC…….. Enterprise Architecture Cube
DAMA……Data Management Association

Case A (DB Netz): Inventory of Infrastructure Assets (Tracks, Tunnels etc.)



?

- What is a common definition of the business object ‘station track’? (master data object definition)
- Which of the business object’s attributes must be used in a standardized way across different processes, and which need not? (master data validity, master data object definition)
- Which of the business object’s attributes are currently stored, altered, and distributed in which application systems? (metadata management)
- How do data flows between application systems look like? (master data application topology and distribution)
- Who is responsible for which data? (master data ownership)
- What data is created, used, changed in which activity of the business process? (master data lifecycle, master data operations)
- Should data describing station tracks be stored in a central system or in several, distributed systems? (master data application topology)

Case B (SBB Cargo): Identifying and Describing Master Data Objects

SBB CFF FFS Cargo

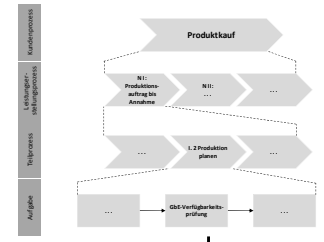
	Absolute Number	Percentage
Identified data objects	303	
with owner	279	92
owner still to be clarified	23	8
Identified data objects (per data type)	303	
Transaction data objects	62	20
Master data objects	47	16
Reference data objects	114	38
Synonym terms	78	25
still to be clarified	2	1
Data objects with master process	204	93
Data objects with identified master system	121	54

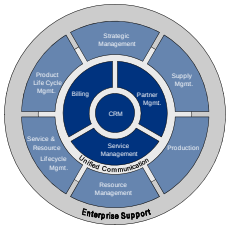
?

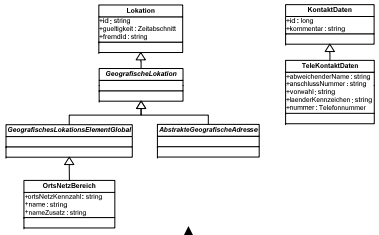
- Determine common uniform definitions and structures for the company's master data objects (master data object definition, conceptual master data model) as well as unique identifiers for each master data class for unambiguous identification (master data validity).
- Establish a central organizational unit responsible for carrying out changes on master data objects (master data operations, master data ownership).
- Determine the "leading system" for each master data class and optimize architecture of applications administrating master data (master data application topology).
- Create a Master Data Map depicting assignment of master data objects to applications and the data flows between them (master data application topology and distribution).
- Design and implement tool-supported master data management processes (master data lifecycle, master data operations)

Case C (Deutsche Telekom): Integrated Enterprise Master Data Modelling

Architecture Layer	Architecture Model	Data Model
Business Process Architecture	Process Model	Business Object Glossary (Definition of Master Data Objects)
Logical Architecture	Group Domain Model	Business Object Model
Application / System Architecture	Application Landscape	(Logical) Application Data Models







FlexProd	Typ	Feldlänge / Pattern
G12-Lokations-ID		
Onkz	Char	[2-9] (1) [0-9] (1..4)
Rufnummer	Char	[0-9] (1,10)
LeistungsKey	Char	14
G1-Produktanfrage		
LokationId	String	60
Produktinstanzid	String	38
Technisches Produkt	String	20
ProduktgruppenListe	String	4
VonDatum	String; dd.mm.yyyy	16
BisDatum	String; dd.mm.yyyy	16

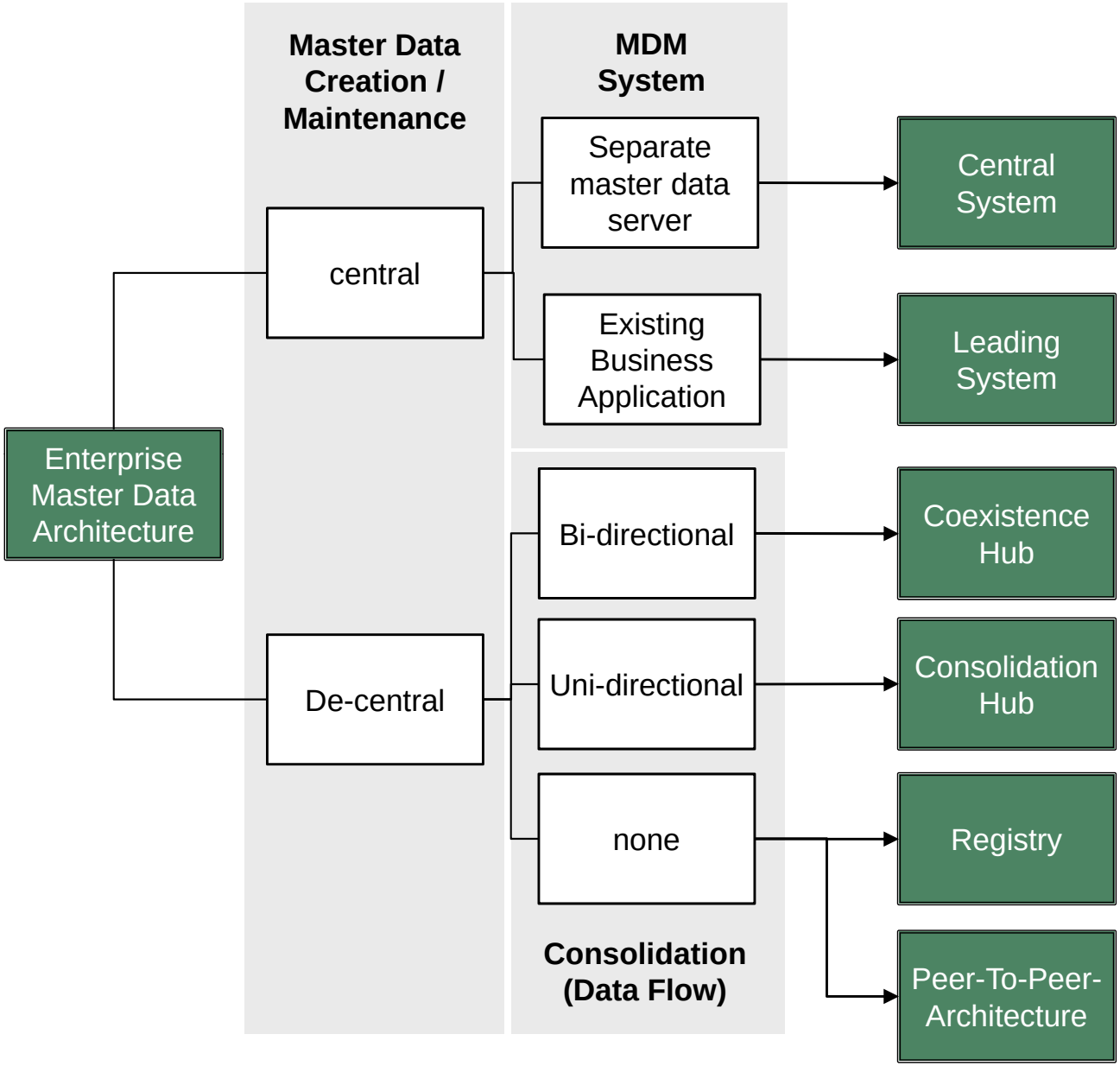
?

- Origin and distribution of master data objects on its current application architecture (master data application topology and distribution)
- Semantics of master data objects leading to ambiguous understandings and inconsistent usage (master data definitions, metadata management)
- Business requirements on enterprise-wide data quality of certain master data objects (master data validity)

Morphological Box: Options for Enterprise Master Data Architecture

	Design Decision	Design Options				Cases
Business Architecture	**Master Data Ownership**	Defined enterprise-wide			Defined locally	A, B and C
	Master Data Validity	Enterprise-wide		Specific business unit	Specific business process	A, B and C
	Master Data Operations	Centralized execution (by central unit)			Local execution (by the owner)	A and B
	Master Data Life Cycle (Create, Update, Deactivate)	Centrally standardized		Hybrid	Local design	A and B
Data Architecture	**Master Data Object Definition**	Enterprise-wide, unambiguous	Per business unit	Per project	Not defined	A, B and C
	Conceptual Master Data Model	Enterprise-wide, unambiguous	Per business unit	Per project	Not defined	B and C
	Metadata Management	Responsibility and processes are defined enterprise-wide		Not actively managed		A and C
Application Architecture	**Master Data Application Topology (including allowed redundancy)**	Central System	Leading System	Consolidation Hub	Registry	A, B and C
Integration Architecture	**Master Data Distribution**	Push		Pull	Not defined	A, B and C
	Master Data Processing	Real-time		Batch		B and C

Enterprise Master Data Architecture Patterns



[Dreibelbis et al. 2008], [Spath et al. 2009]

Evaluating Different Architecture Patterns

	Central System	Leading System	Coexistence Hub	Consolidation Hub	Registry	Peer-To-Peer
Adequacy for operative MDM	●	●	◕	○	◑	◑
Little implementation / maintenance effort	○	○	◔	◕	◑	◑
Consistency / Controlled Redundancy	●	●	◕	◔	◑	◔
Timeliness of master data	◕	◕	◔	◔	◕	◑
Scalability / Performance	◔	◔	◑	◕	●	●
Ability to improve master data quality	●	◕	◑	◔	◔	○

Contact Person

http://cdq.iwi.unisg.ch

Dr. Boris Otto
University of St. Gallen
Institute of Information Management
E-mail: boris.otto@unisg.ch
Phone: +41 71 224 3220

Alexander Schmidt
University of St. Gallen
Institute of Information Management
E-mail: alexander.schmidt@unisg.ch
Phone: +41 71 224 3784