Service Oriented Architecture for Business Intelligence

Knowledge objectives

1. Explain what the Enterprise Service Bus is
2. Explain SOA principles
3. Explain the difference between distributed components and SOA
4. Explain the implementation protocol of a service
5. Define quality of service (QoS) and its measures
6. Recognize the importance of establishing Service Level Agreements (SLA)
7. Explain the five architectural alternatives for data warehousing and relate them to SOA
8. Enumerate the Master Data Management steps
9. Explain the five stars of Open Data

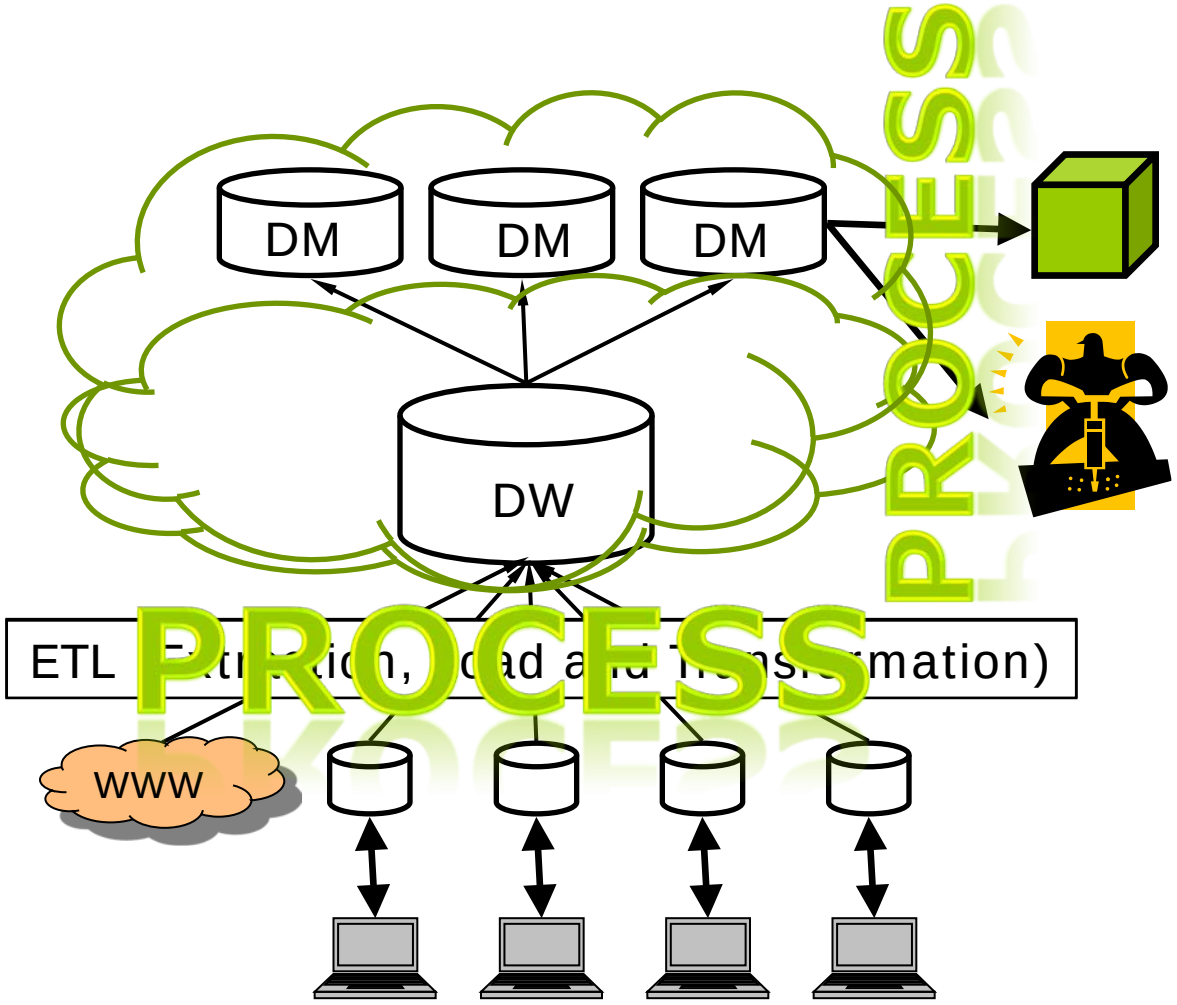
SaaS vs BaaS

- Business Process as a Services are focused on providing existing **business processes** **through a cloud**. If there is an existing process with steps that are known it can be provided as a service within the catalog. This allows the Cloud Service Provider to automate any steps within the process while leaving the changes transparent to the Cloud Service Consumer.

- Software Services allow a Cloud Service Consumer to select a specific **software instance** that they want created without the need to be aware of where and how it will be hosted. ... This allows the Cloud Service Consumer to focus on the characteristics of the application and gives the Cloud Service Provider the freedom to fulfill the request with any resources that will meet the need.

NIST (National Institute of Standards and Technology)

Reference Architecture



Service definition

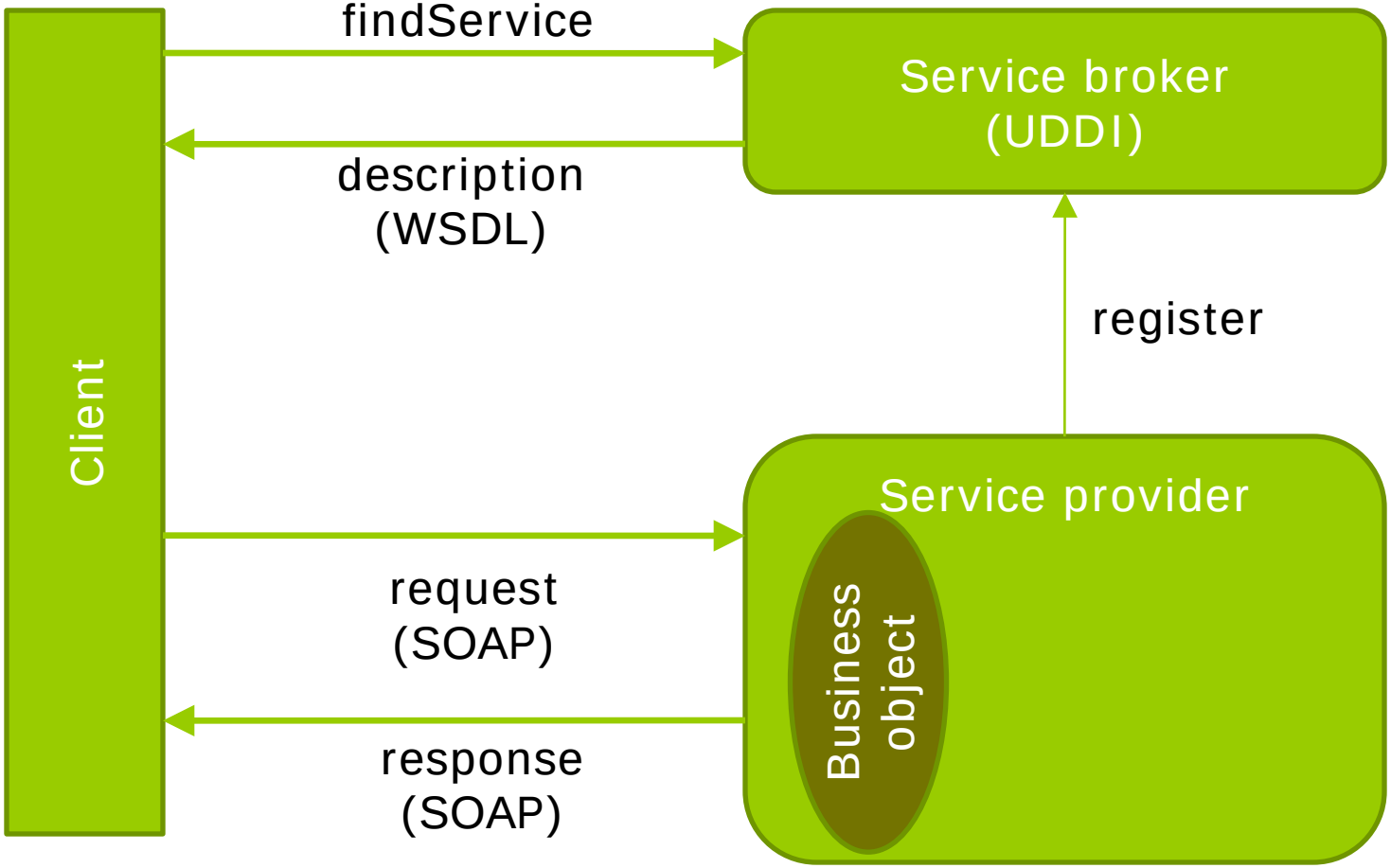
"Services are loosely-coupled computing tasks communicating over the internet that play a growing part in business-to-business interactions. [...] We reserve the term service-oriented for architectures that focus on how services are described and organized to support their dynamic, automated discovery and use."

Steve Burbeck

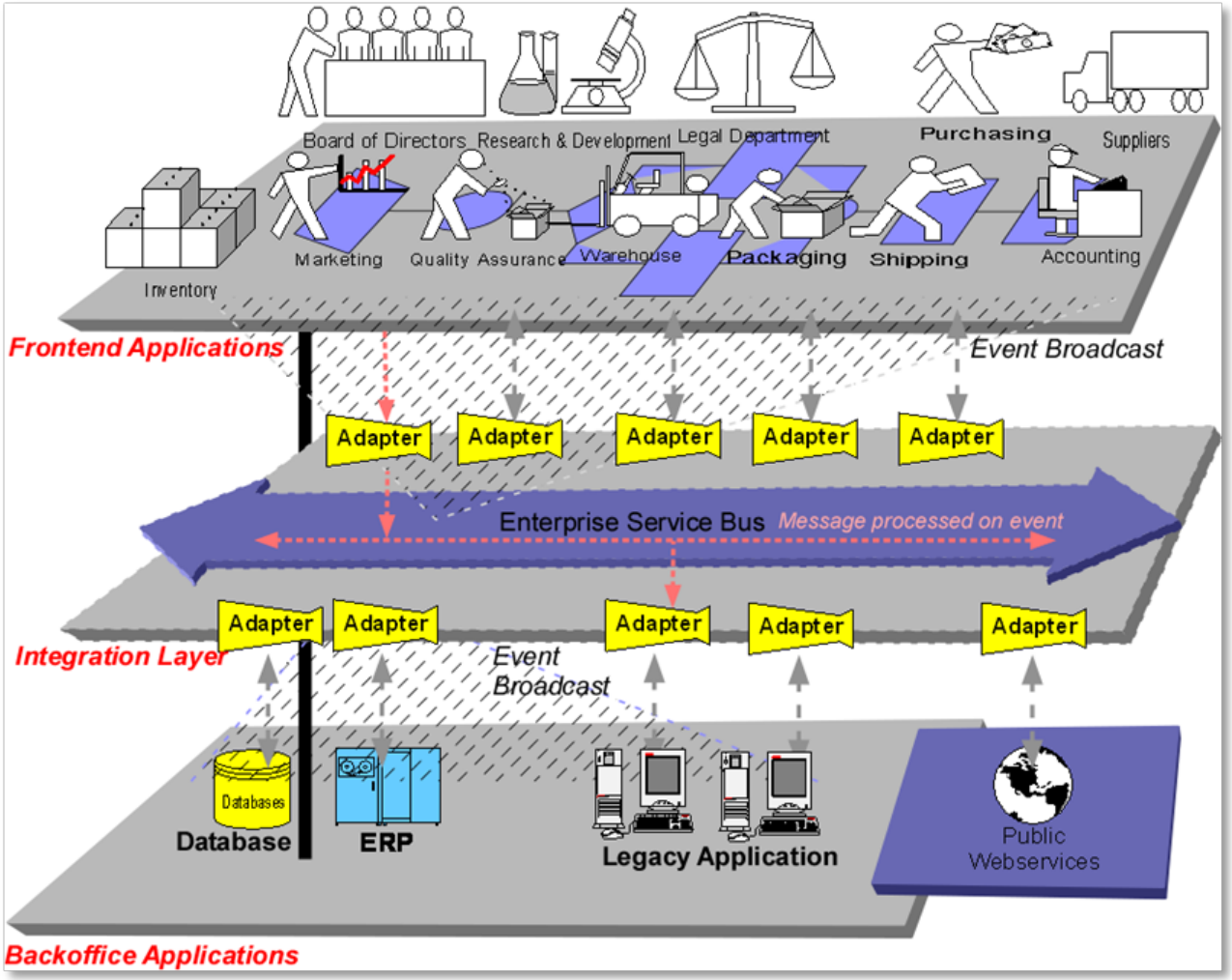
SOA principles

- Reusability
- Composability
- Loose coupling
- Abstraction
- Contract
- Statelessness
- Discoverability
- Autonomy

Implementation protocol



Enterprise Service Bus (I)



Wikipedia

Enterprise Service Bus (II)

"Middleware between service oriented applications and their consumers."

- Creates a potentially bottleneck
- Can be multi-tenant
  - Multiple ESB are shared by many applications
  - Complicates application management
    - Needs a brokering system

Paradigm

	Distributed components	SOA
Design	Functionality	Process
Designed to …	Last	Change
Development cycle	Long	Interactive and iterative
Centered on …	Cost	Business
Coordination	Blocks	Orchestration
Coupling	Tight	Loose (agile and adaptive)
Technologies	Homogeneous	Heterogeneous
Programming	Objects	Messages
Encapsulation	Partial	Full (contracts)

Service composition

- Primitive activity (i.e., task)
- Complex activity (i.e., activity)
  - Atomic transaction
  - Business activity
    - Orchestration
    - Choreography

Engineering challenges

- Service Engineering and Design
- Service Adaptation
- Service Monitoring
- Service Quality

Quality of Service

- Definition
  - Difference between perceived and expected
- Negotiation
  - Service Level Agreement
    - Service Level Objectives
- Assurance

Service Level Agreements

"Contract between a provider and a customer related to the quality (i.e., level) of service, based on a set of measurable characteristics of a service known as Service Level Objectives (SLO) (e.g., price, availability, response time, throughput, number of available tuples, number of retrieved tuples, query cost, locality and legal issues, etc.)."

- Terms
  - Security
  - Priorities
  - Responsibilities
  - Guarantees
  - Billing modalities

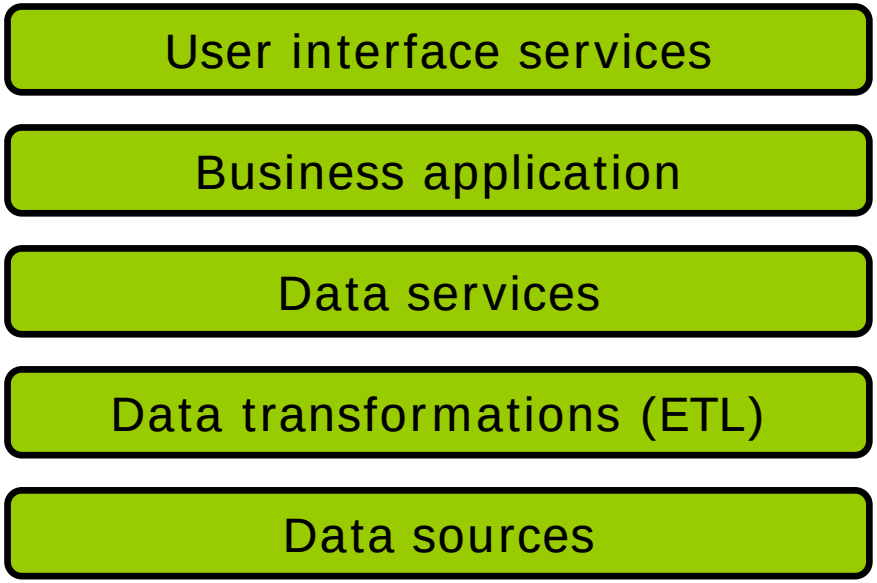
QoS metrics

- Input
  - Supply
  - Cost
- Process
  - Performance
  - Security
- Outcome
  - Customization
  - Satisfaction
- Systemic
  - Reproducibility
  - Sustainability

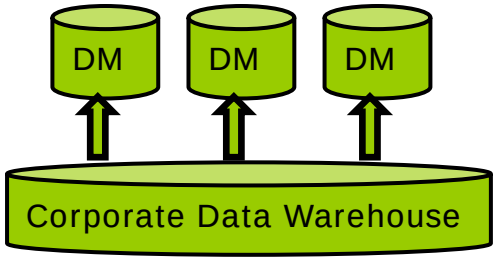
Dealing with broken agreements

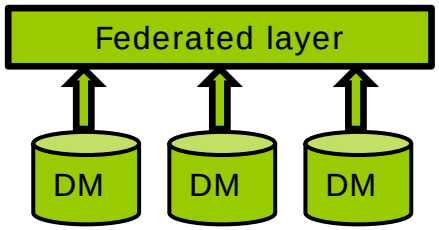
- 99.95% data-center availability
  - Amazon advertizes a failure ration of 0.1%-0.5%
- No guarantees of performance
  - Oversubscribed physical resource can fluctuate

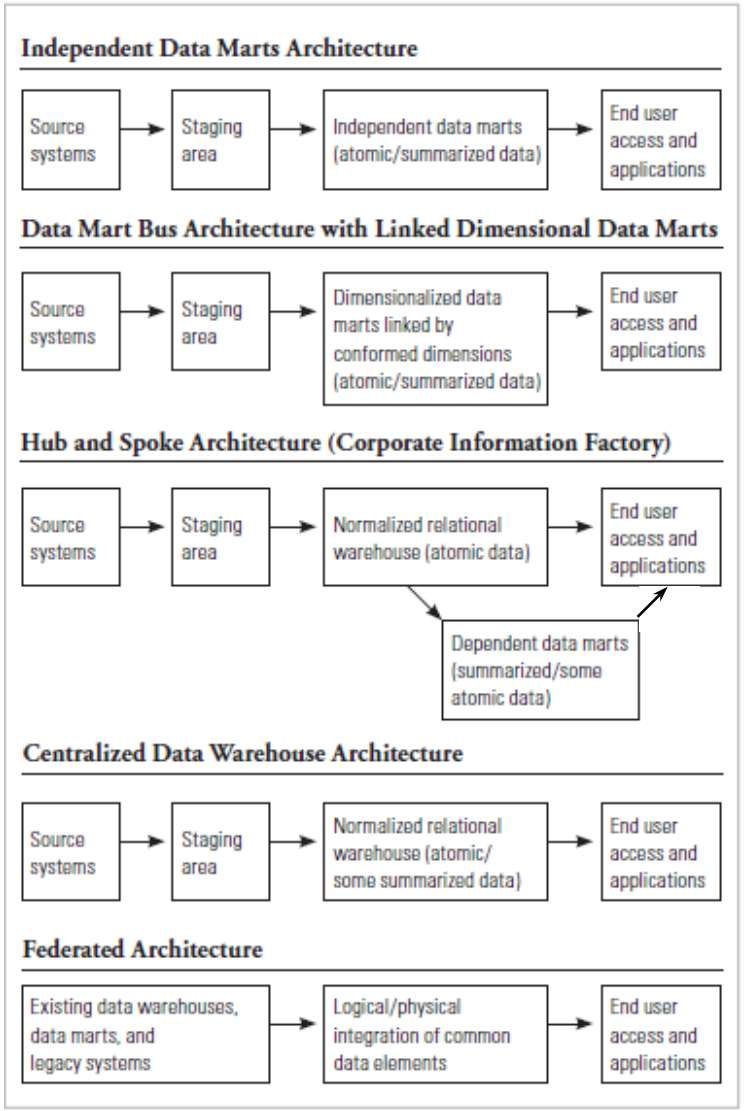
Data management layers

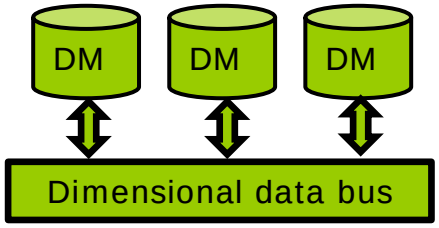


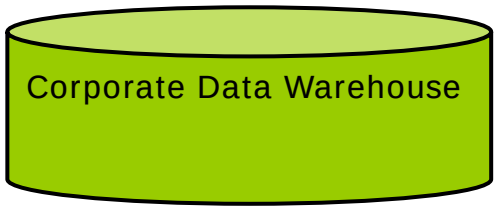
Data Warehousing architectural alternatives











T. Ariyachandra & J. Watson

Data Warehousing architectures success

	Independent Data Marts	Bus Architecture	Hub and Spoke	Centralized (No Dependent Data Marts)	Federated
Information Quality	4.42	5.16	5.35	5.23	4.73
System Quality	4.59	5.60	5.56	5.41	4.69
Individual Impacts	5.08	5.80	5.62	5.64	5.15
Organizational Impacts	4.66	5.34	5.24	5.30	4.77

T. Ariyachandra & J. Watson

- Information quality: accuracy, completeness, and consistency
- System quality: flexibility, scalability, and integration
- Individual impacts: users can quickly and easily access data
- Organizational impacts: the system meets the business requirements
  - Facilitates the use of business intelligence
  - Supports the accomplishment of strategic business objectives
  - Enables improvements in business processes
  - Leads to high, quantifiable ROI
  - Improves communications and cooperation across organizational units.

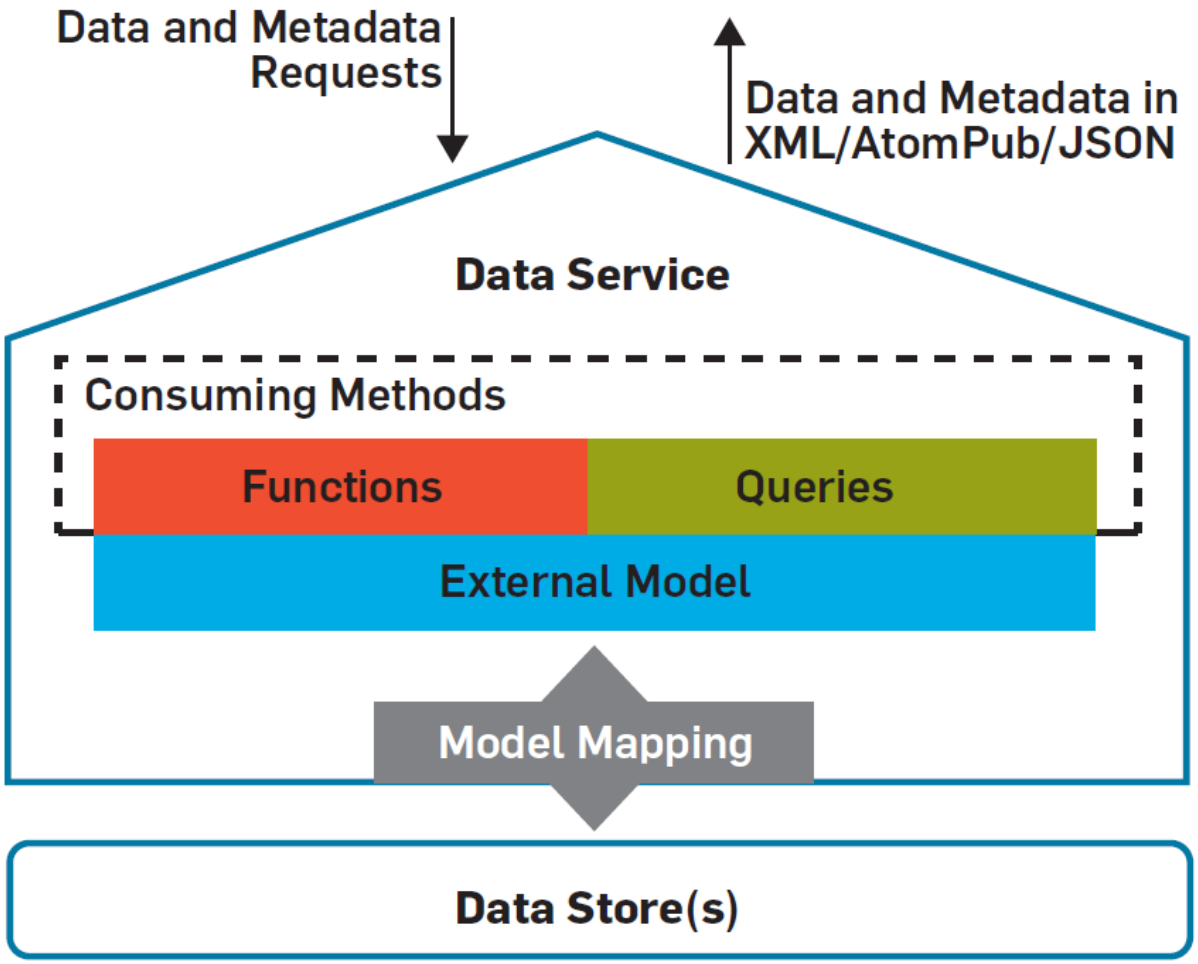
Activity

- *Objective: Design architectural components*
- *Considerations: Assume your DW is already in place and think about the processes that this would involve (ignore those involving the "Source systems" and "Staging area")*
- *Tasks:*
  1. *(5') Individually define the main service calls for one of the three successful architectures*
  2. *(10') Explain your service calls to the others*
  3. *(10')* Make a grid of calls for the three architectures
  4. *Hand in the grid*
- *Roles for the team-mates during task 2:*
  a) *Explains his/her material*
  b) *Asks for clarification of blur concepts*
  c) *Mediates and* ***controls time***

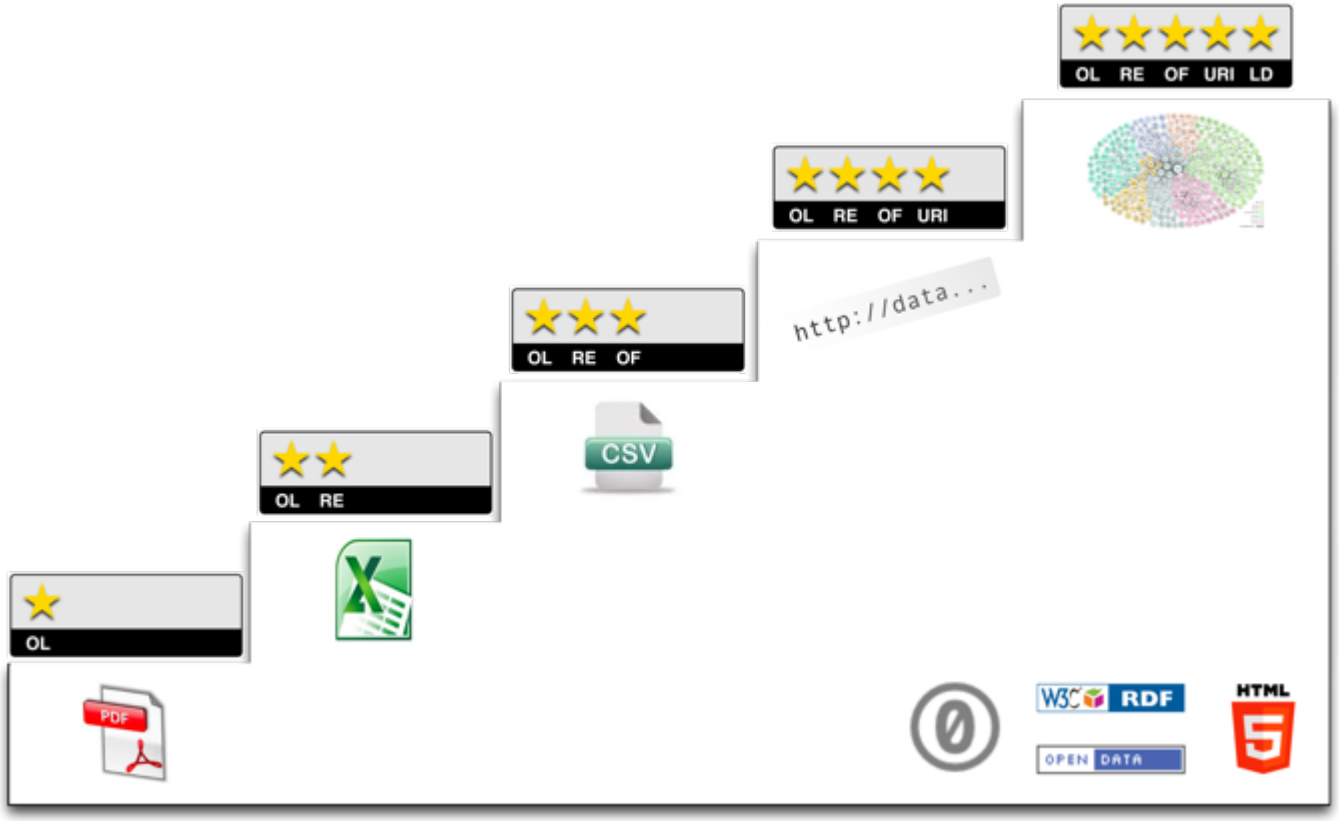
Master Data Management steps

1. Identify sources of master data
2. Identify the producers and consumers of the master data
3. Collect and analyze metadata for your master data
4. Appoint data stewards
5. Implement a data-governance program and data-governance council
6. Develop the master-data model
7. Choose a toolset
8. Design the infrastructure
9. Generate and test the master data
10. Modify the producing and consuming systems
11. Implement the maintenance processes

Data Services



Open data



Tim Berners-Lee

Summary

- Enterprise Service Bus
- QoS
- Service Level Agreements
- Master Data Management
- Data services
- Open data

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Resources

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- http://www.ibm.com/developerworks/websphere
- http://www.oracle.com/technetwork/middleware/service-bus/overview/index.html
- http://www.odata.org
- http://catalogue.fi-ware.eu
- https://open-data.europa.eu/en/data