Bases de Dados e Armazéns de Dados

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Data Warehouse Architectures

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Data Warehouse Bus Architecture (Ralph Kimball)

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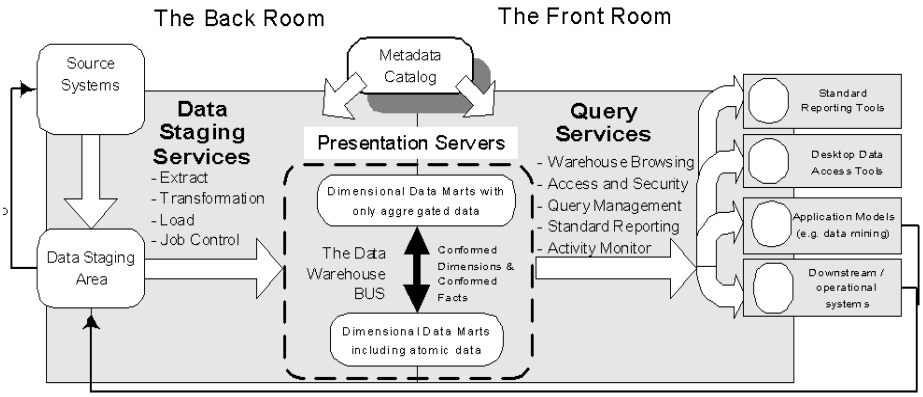
DW BUS Architecture



- DW is built on a series of incremental data marts
  - "**Bottom-up**" or **incremental methodology**
- Has two major types of components: **services** and **data stores**

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DW BUS Architecture

- Is divided into two groups of components and processes
  - **Back room (data acquisition)**
    - Part responsible for gathering and preparing the data
    - Where data acquisition and data staging processes take place
  - **Front room (data access)**
    - Part responsible by delivering data to business users
- Flow from source systems to user desktop is supported by the **metadata catalog**
- Includes two types of data marts in the data presentation area
  - **Atomic data marts**
  - **Aggregated data marts**

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Back Room

- Where the **data staging process** takes place
- **Engine room** of the DW
- **Primary concern**:
  - Getting the right data, with the appropriate transformations, at the right time, and load it into de DW

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Source Systems

- Are the **obvious sources** of interesting business data
- Other high-value sources may be **external to the business**
  - Demographic customer information and target customer lists
- **Data storage types** dictated by the source system
  - Many older legacy systems are standard mainframe data storage facilities: IMS, IDMS, VSAM, and DB2 are common
- **Flat file** is one often standard source for the DW
- Understanding their nature **is critical** for creating the back room architecture

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Data Staging Area

- Is both a **storage area** and a **set of processes** commonly referred as **Extraction, Transformation and Loading** (ETL), not seen by end-users
- **Everything between** the source system(s) and the DW
- Where much of the **data transformation** takes place and much of the **added value** of the DW is created
  - **Cleaning the data**
    - Correcting misspellings, resolving domain conflicts, dealing with missing elements, or parsing into standard formats
  - **Combining/Integrating data** from multiple sources
  - **De-duplicating data**
  - **…**

Back Room Services

- **Tools and techniques** employed in the data staging process
  - Also known as ***data staging services***
- **Service** is an elementary function or task, that can be as simple as:
  - Creating a table in a database
  - Copying data from a table to another

Back Room Services

- Extract services
  - **Pulling the data from the source system(s)**
  - Largest effort in the DW project, especially if the source systems are decades-old or mainframe-based
- Data transformation services
  - Acts performed on the data to **convert it into something presentable to users and valuable to the business**
- Data loading services
  - Set of services responsible by **loading the data into the DW**
- Job control services
  - Captures metadata regarding the **progress and statistics of execution of the job itself**

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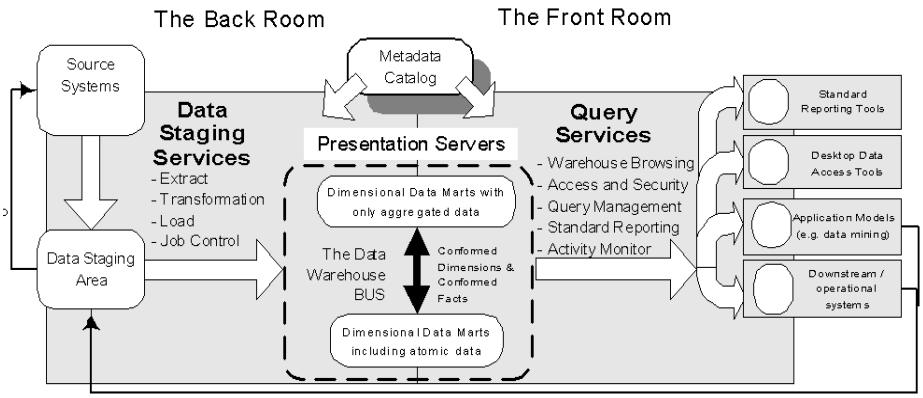
DW BUS Architecture



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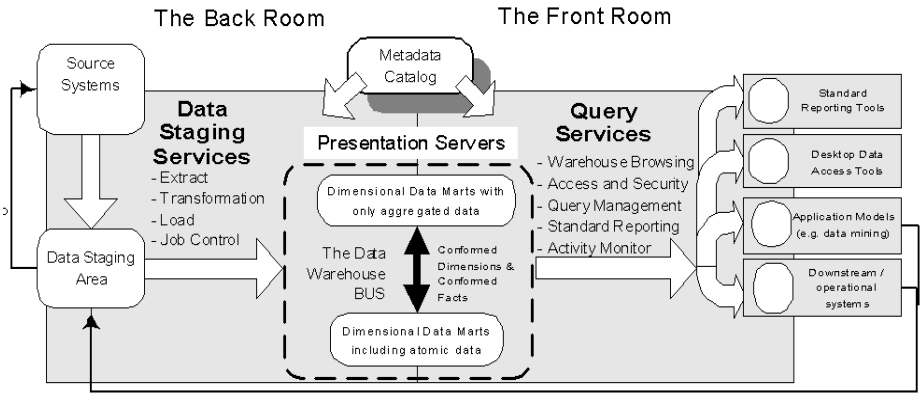
Presentation Server

- Where the **data is stored** for direct querying by end-users, data analysis tools, reporting tools and other applications
- Is a **series of integrated data marts**
  - Data mart presents the data from a single business process
- Data in the queryable presentation server of the DW must be:
  - **Dimensional**
  - **Atomic** (to unpredictable ad-hoc user queries)
- All data marts must be built using ***common dimensions***

Data Marts in Presentation Server

- **Atomic data marts**
  - Hold multidimensional data at the **lowest detail level**
- **Aggregated data marts**
  - Hold multidimensional data that have been **summarized**
  - Improve **query performance**
  - Loaded from the **data staging area** or from the **atomic data marts**
- Collection of star schemas which share dimensions is the basis of the **DW Bus Architecture**

DW BUS Architecture



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Front Room

- **Public face of the DW**
  - It's what the business users see and work with day-to-day
- **Data access services are between the users and the data**, hiding some of the complexities and helping them to find what they are looking for

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Front Room Services

- Warehouse browsing
  - Takes advantage of the metadata catalog to support the users in their efforts to **find and access the data they need**
- Access and security services
  - Control a **user's connection to the DW**
- Query management services
  - Set of capabilities that manage the exchange between the **query formulation**, the **execution of the query** on the database, and the **return of the result set** to the desktop
- Standard reporting services
  - **Ability to create fixed-format reports** that have limited user interaction and regular execution schedules
- Activity monitoring services
  - Capture information about the **use of the DW**

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Corporate Information Factory (Bill Inmon)

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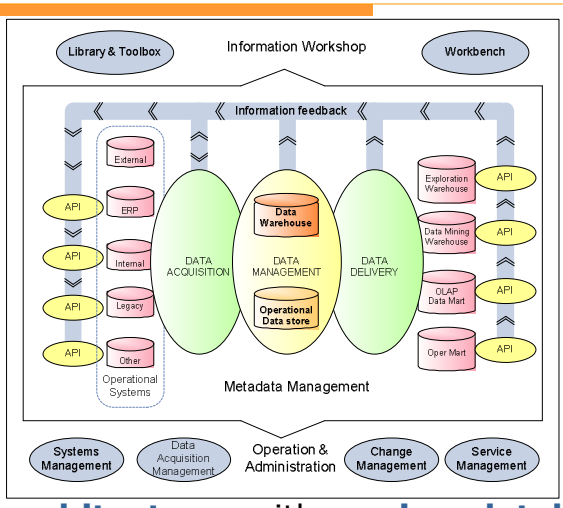
CIF Architecture



Logical architecture with **major databases** and **processes** to effectively and efficiently move data from source systems to business users

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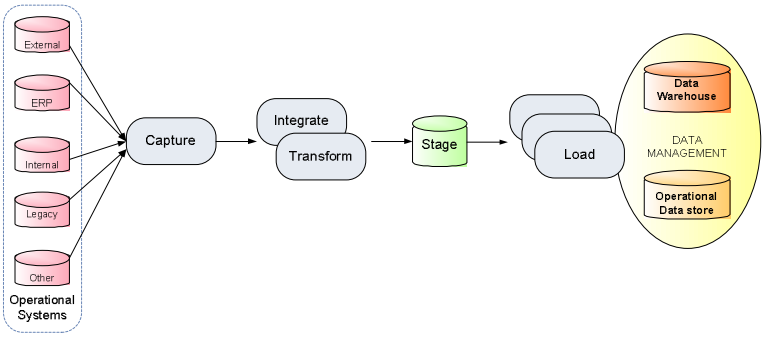
Data Acquisition



- Set of processes and programs that extract data from the operational systems to the **DW** and to the **Operational Data Store (ODS)**
- Perform the **cleaning**, **integration** and **transformation** of the data into an enterprise format

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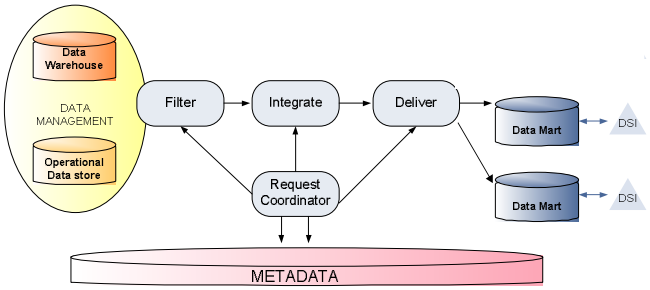
Data Delivery



- Process that **moves data from the DW or ODS** into **data marts**
- Like in the acquisition layer, data is manipulated as it is moved
- Origin is the **DW** or **ODS**, which already contains high quality integrated data that **conforms to the enterprise business rules**

DW vs. ODS

- **DW** – A subject-oriented, integrated, time variant and non-volatile collection of data used in strategic decision making [Inmon and Hackathorn, 1994]
- **ODS**
  - Data is **fully integrated** like in a DW
  - **Data is current**
  - **Data is volatile or updatable** (no history is retained)
  - Data is **entirely detailed**
  - Source of **near real-time** and **accurate data**
    - Accessible from anywhere in the corporation