

Produced by:

Dr. Brenda Mullally

Ruth Barry

bmullally@wit.ie

rbarry@wit.ie

Department Computing Maths and Physics

Waterford Institute of Technology

www.wit.ie

moodle.wit.ie

MSc Enterprise Software Systems

Business Intelligence

Business Intelligence



Organisational
Memory



Information
Integration



Information
Insights



Information
Presentation

BI Capabilities

- ▶ **Organisational Memory:** The ability to store information and knowledge.
- ▶ **Information Integration:** The ability to link structured and unstructured data from a variety of sources.
- ▶ **Insight Creation:** The ability to develop new insights and use them in the short-term or long-term to make better decisions.
- ▶ **Presentation:** The ability to use appropriate reporting and balanced scorecards tools, and thereby make BI more valuable to users.

Organisational Memory, Data Model & Data Type

- ▶ **Organizational Memory**
 - ▶ Storage of information in such a form that it can be later accessed and used for BI
 - ▶ Also termed as corporate memory, or institutional memory
- ▶ **Data Model**
 - ▶ Describes how data is represented and accessed (i.e. provides definition and format of data)
- ▶ **Data Types**
 - ▶ Structured Data
 - ▶ Unstructured Data

Organisational Memory

- ▶ **Two relevant technologies for the structured data:**
 - ▶ Enterprise Resource Planning (ERP): transactional systems that capture organisational memory related to all the business processes that the organisation engages in.
 - ▶ Data Warehouses (DW): Type of database to store large amounts of historical organisational data loaded into the DW. A DW provides the source of data and information for business intelligence analysis.

Enterprise Resource Planning Systems (ERP)

- ▶ ERP Systems are software packages composed of several modules such as human resources, sales, finance, and production, providing a cross-organization integration of data through embedded business processes (facilitate the flow of information between business functions).

Enterprise Resource Planning Systems (ERP)-Benefits

- ▶ Integrate business processes across the enterprise
- ▶ Single view of information for all departments
- ▶ Access to accurate, relevant data in real time
- ▶ Elimination of costly stand alone legacy systems with maintenance complexities for connectivity
- ▶ Provide the infrastructure for organization to improve management of order fulfillment processes
- ▶ Better financial and business wide reporting
- ▶ Connectivity

(ERP)- Vendors

- ▶ The top four vendors to date include:
 - ▶ SAP (www.sap.com)
 - ▶ Oracle (www.oracle.com)
 - ▶ Infor (www.infor.com)
 - ▶ Microsoft (www.microsoft.com/dynamics)
- ▶ There are also open source versions of ERP systems,
 - ▶ iDempiere
 - ▶ Odoo
 - ▶ webERP
 - ▶ Openbravo
 - ▶ ERPNext

Data Warehousing

- ▶ What is a data warehouse?
 - ▶ A physical repository where relational data are specially organized to provide enterprise-wide, cleansed data in a standardized format
 - ▶ Holds a copy of transactional data, structured for querying and reporting.
 - ▶ It is a prerequisite to Enterprise BI since it helps the organization to obtain value from its data sources by preparing and storing the enterprise data into a repository designed to support decision making

Characteristics of DW (Inmon, 2005)

- ▶ Subject oriented
- ▶ Integrated
- ▶ Nonvolatile
- ▶ Time-variant (time series)

Data Warehouse - Vendors

▶ Vendors:

- ▶ Oracle (www.oracle.com)
- ▶ Teradata (www.Teradata.com)

▶ Opensource

- ▶ MySQL (www.mysql.com)
- ▶ Greenplum (www.greenplum.org)
- ▶ Talend (www.talend.com)
- ▶ Pentaho (www.pentaho.com)

Enterprise Data Model

- ▶ The Enterprise data model consists of four levels:
 - ▶ Operational Level
 - ▶ Data Warehouse Level
 - ▶ Data Mart or Departmental Level
 - ▶ Individual Data Level

DW definitions

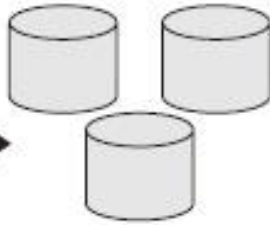
- ▶ **Data Mart:** A departmental data warehouse that stores only relevant data
- ▶ **Dependent data mart:** a subset that is created directly from a data warehouse
- ▶ **Independent data mart:** a small data warehouse designed for a strategic business unit or a department
- ▶ **Operational data stores (ODS):** a type of database often used as an interim area for a data warehouse
- ▶ **Enterprise data warehouse (EDW):** a data warehouse for the enterprise
- ▶ **Metadata:** data about data. In a data warehouse, metadata describes the contents of a data warehouse and the manner of its acquisition and use.

	Source Data	Data Staging	Data Storage	Information Delivery
CENTRALIZED				
INDEPENDENT DATA MARTS				
FEDERATED				
HUB-AND-SPOKE				
DATA-MART BUS				

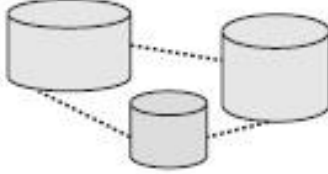
CENTRALIZED



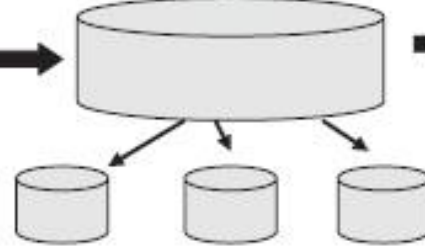
INDEPENDENT
DATA MARTS



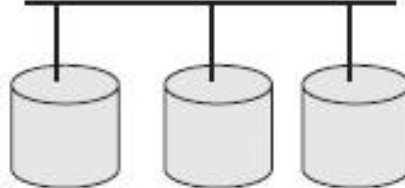
FEDERATED



HUB-AND-
SPOKE

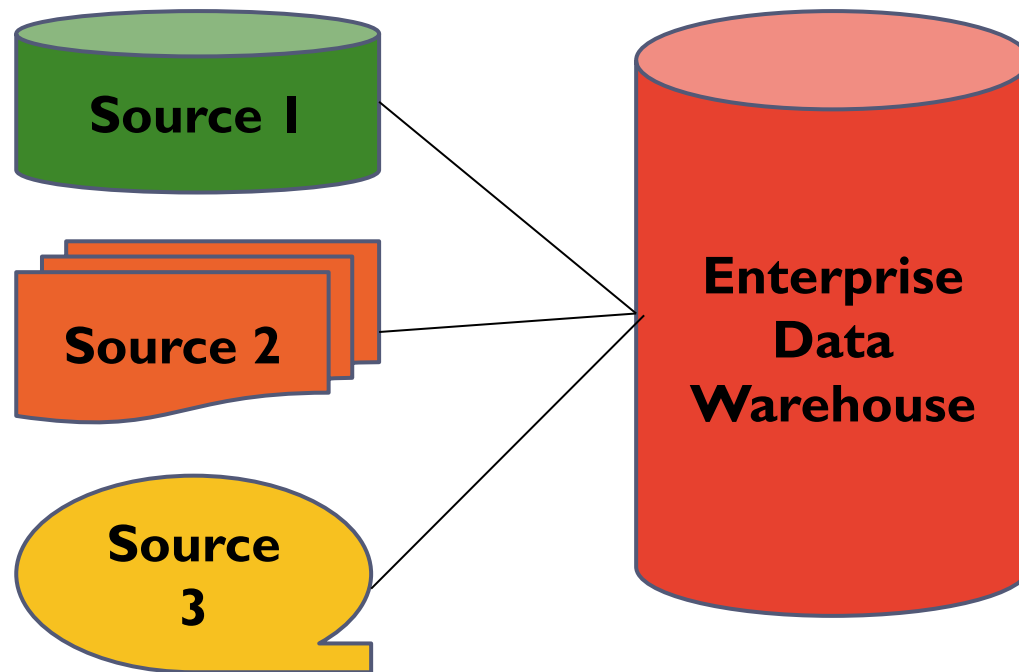


DATA-MART
BUS

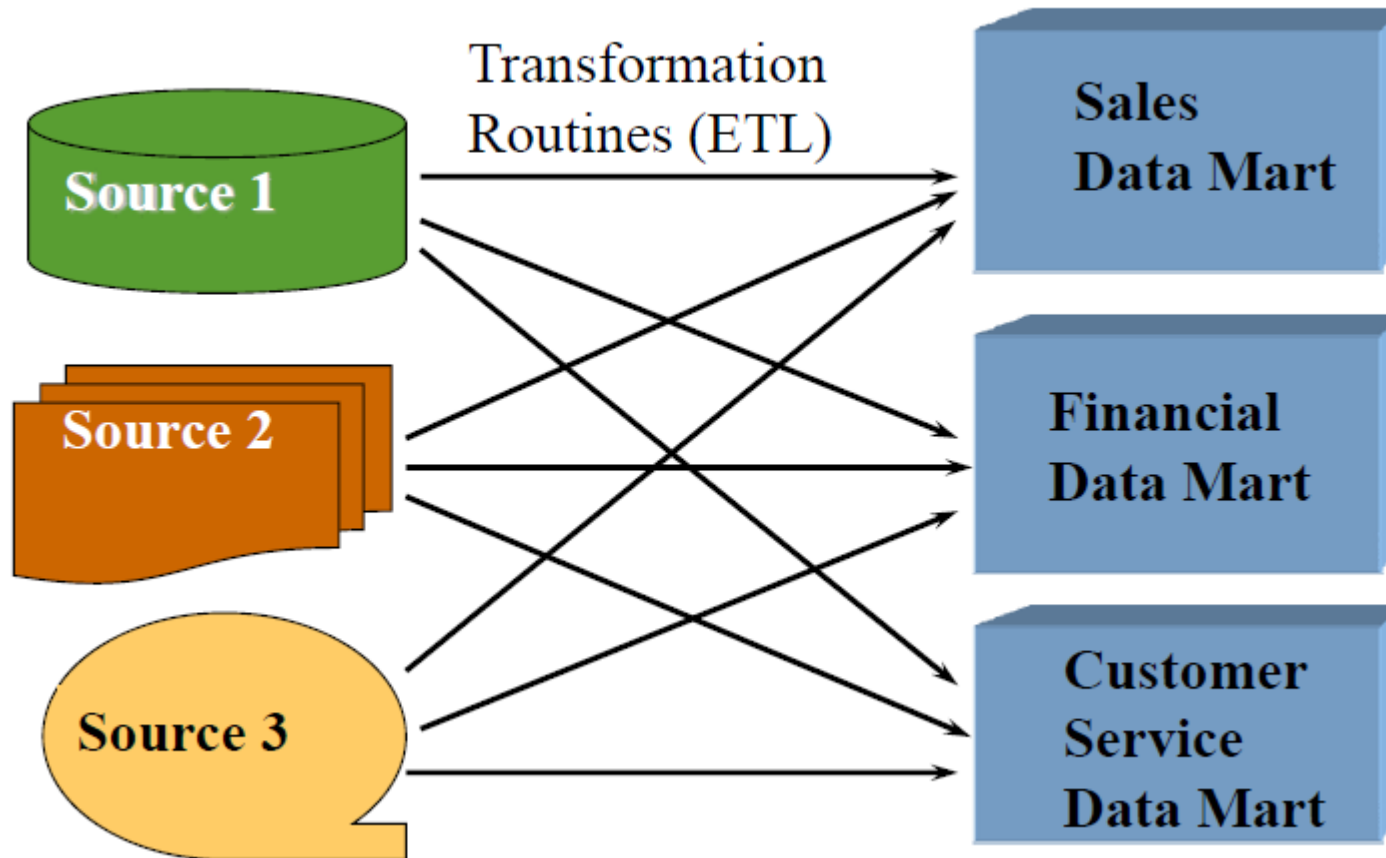


Data warehouse architectural types.

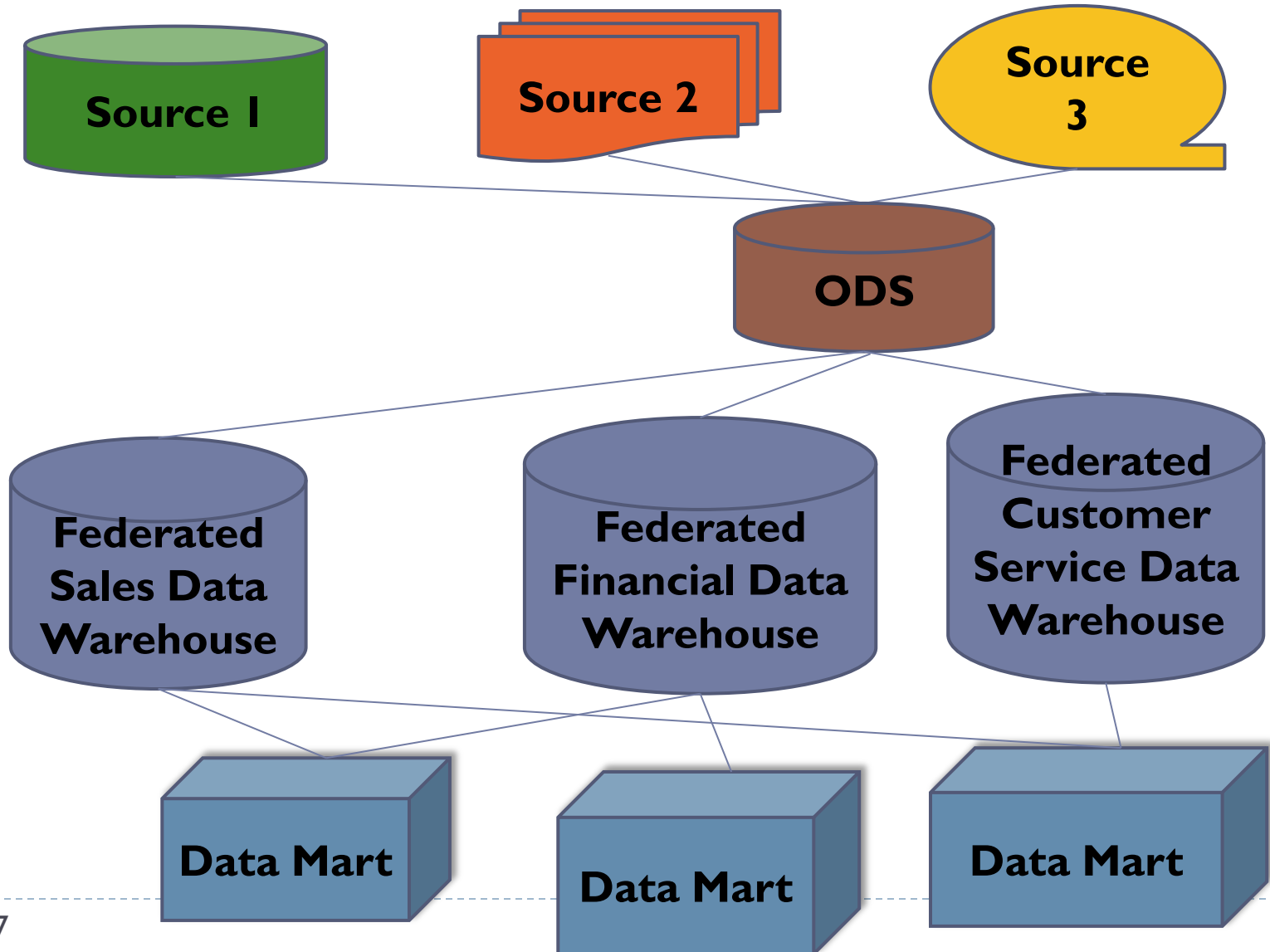
Centralised Data Warehouse



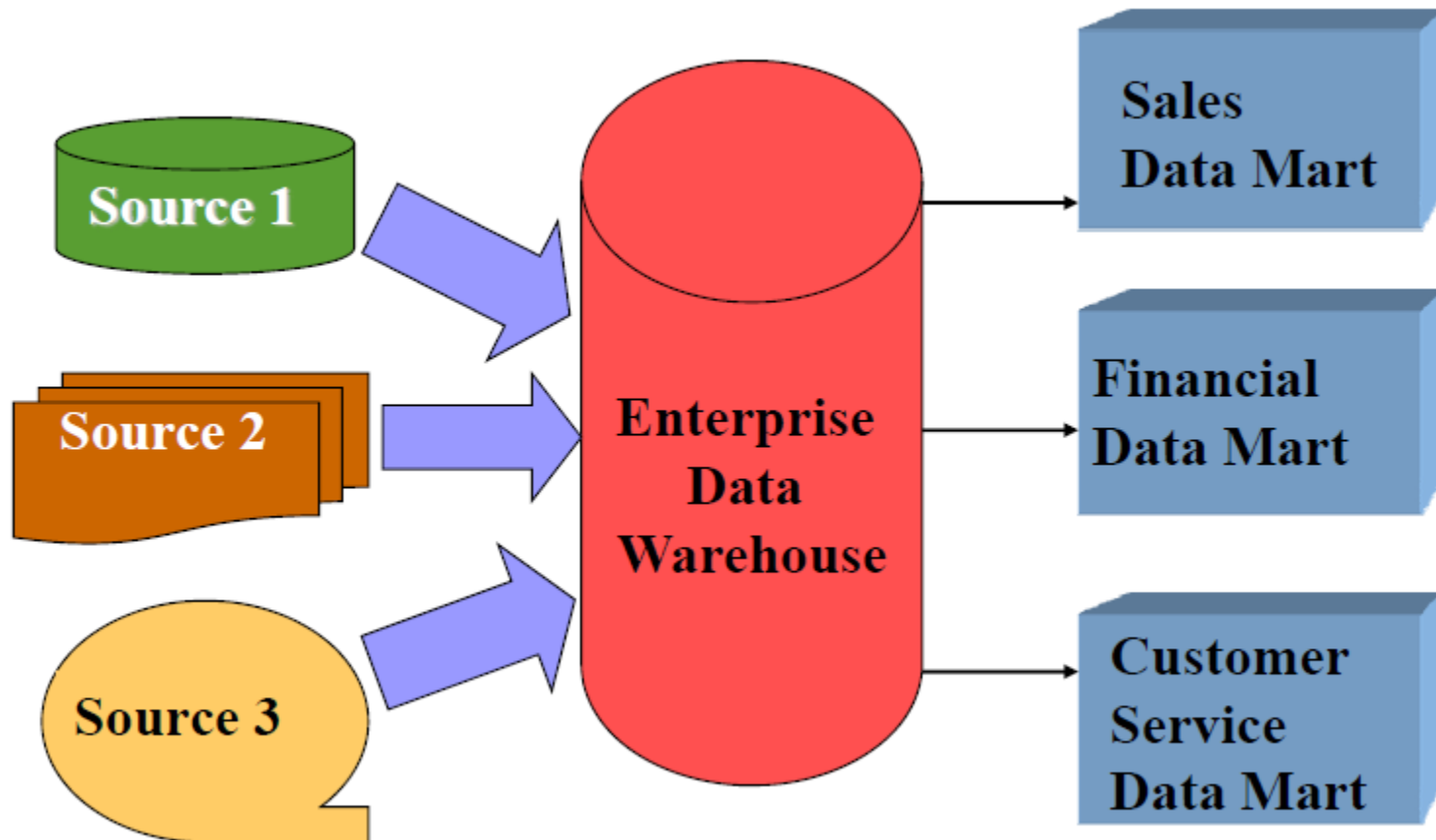
Independent Data Marts



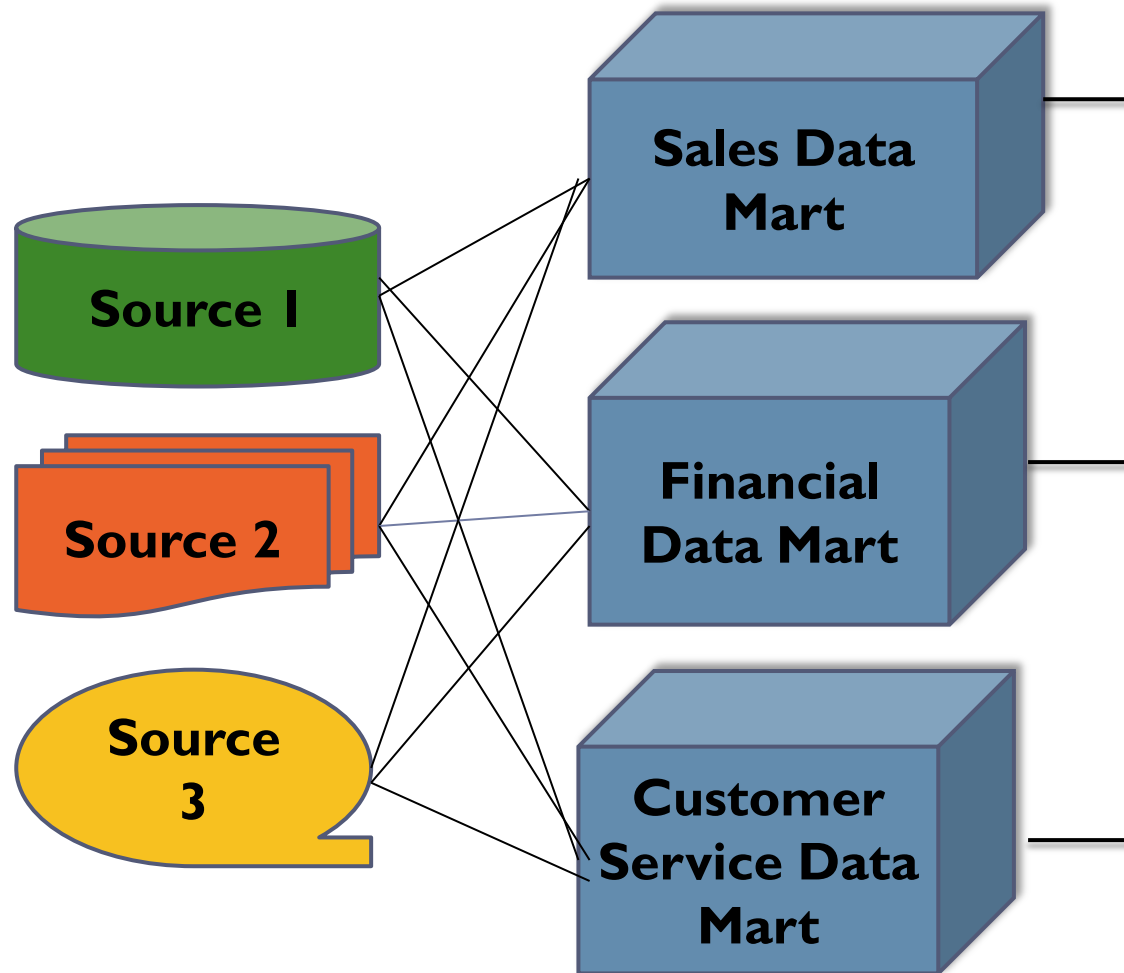
Federated Data Warehouse



Hub and Spoke Data Warehouse



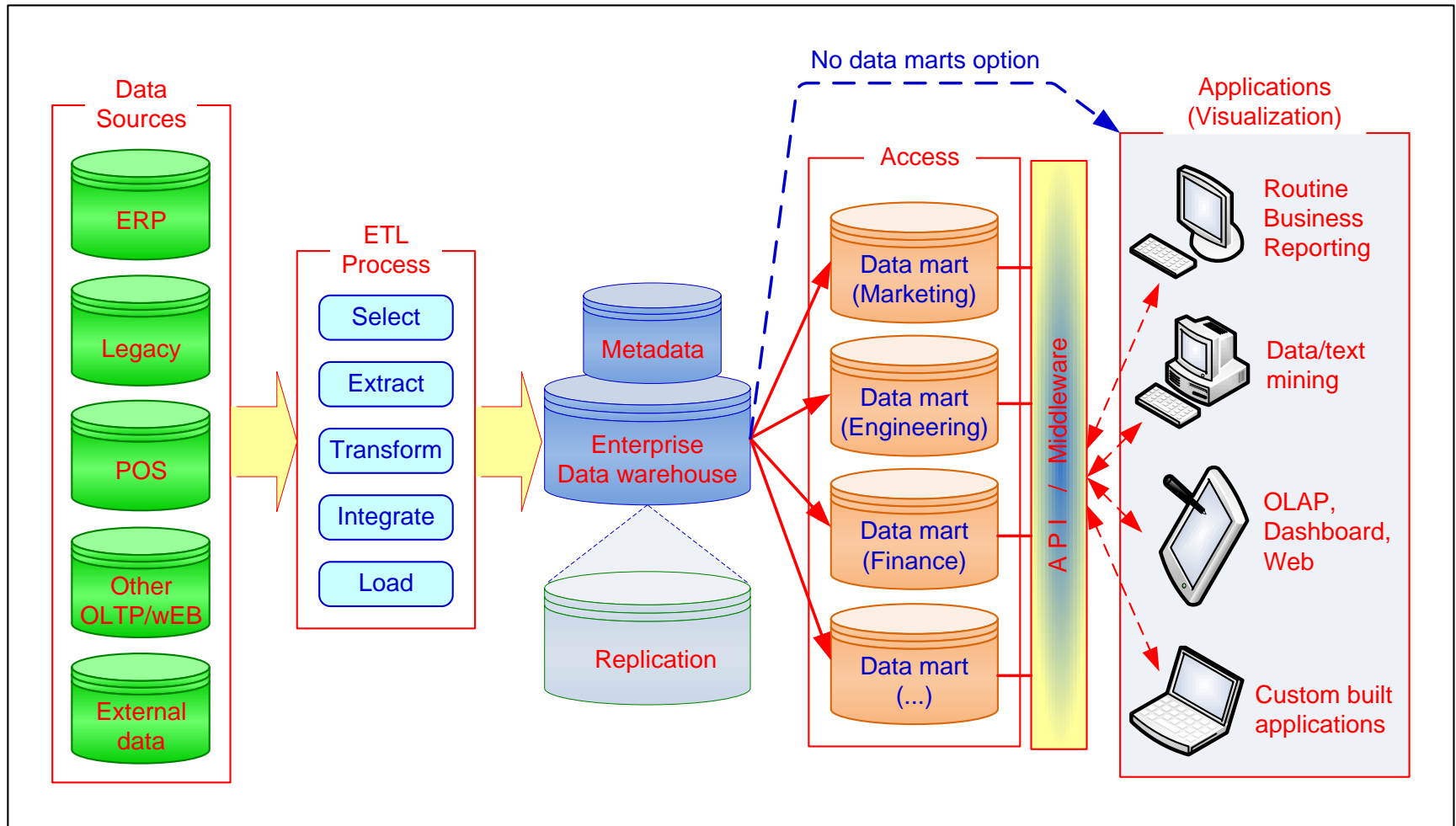
Data Mart Bus



DW Architectures

1. Independent Data Marts
 2. Data Mart Bus Architecture
 3. Hub-and-Spoke Architecture
 4. Centralized Data Warehouse
 5. Federated Data Warehouse
- ▶ Each has pros and cons!

Data Warehouse Framework



Data Warehousing Architectures

- Three parts of a data warehouse:
 1. Data acquisition (back-end) software that extracts data from legacy systems and external sources, consolidates and summarizes them, and loads them into the data warehouse.
 2. The data warehouse that contains the data and associated software
 3. Client (front-end) software that allows users to access and analyse data from the warehouse

Data Warehousing Architectures

- ▶ Issues to consider when deciding which architecture to use:
 - ▶ Which database management system (DBMS) should be used?
 - ▶ Will parallel processing and/or partitioning be used?
 - ▶ Will data migration tools be used to load the data warehouse?
 - ▶ What tools will be used to support data retrieval and analysis?

Characteristics of a Mature Data Warehouse

- ▶ Data
- ▶ Architecture
- ▶ Stability of the production environment
- ▶ Warehouse staff
- ▶ Users
- ▶ Impact on users' skills and jobs
- ▶ Applications
- ▶ Cost & Benefits
- ▶ Organizational impact

Designing the Enterprise Architecture

- ▶ Firms define their underlying enterprise architecture by making two important choices about their business operations units:
 - ▶ 1. How standardized their business processes should be across operational units (meaning departments, regions, market segments, etc.)
 - ▶ 2. How integrated their business processes should be across those units
- ▶ What is standardisation? How much is enough? What are the benefits?
- ▶ What is integration? What are the benefits?

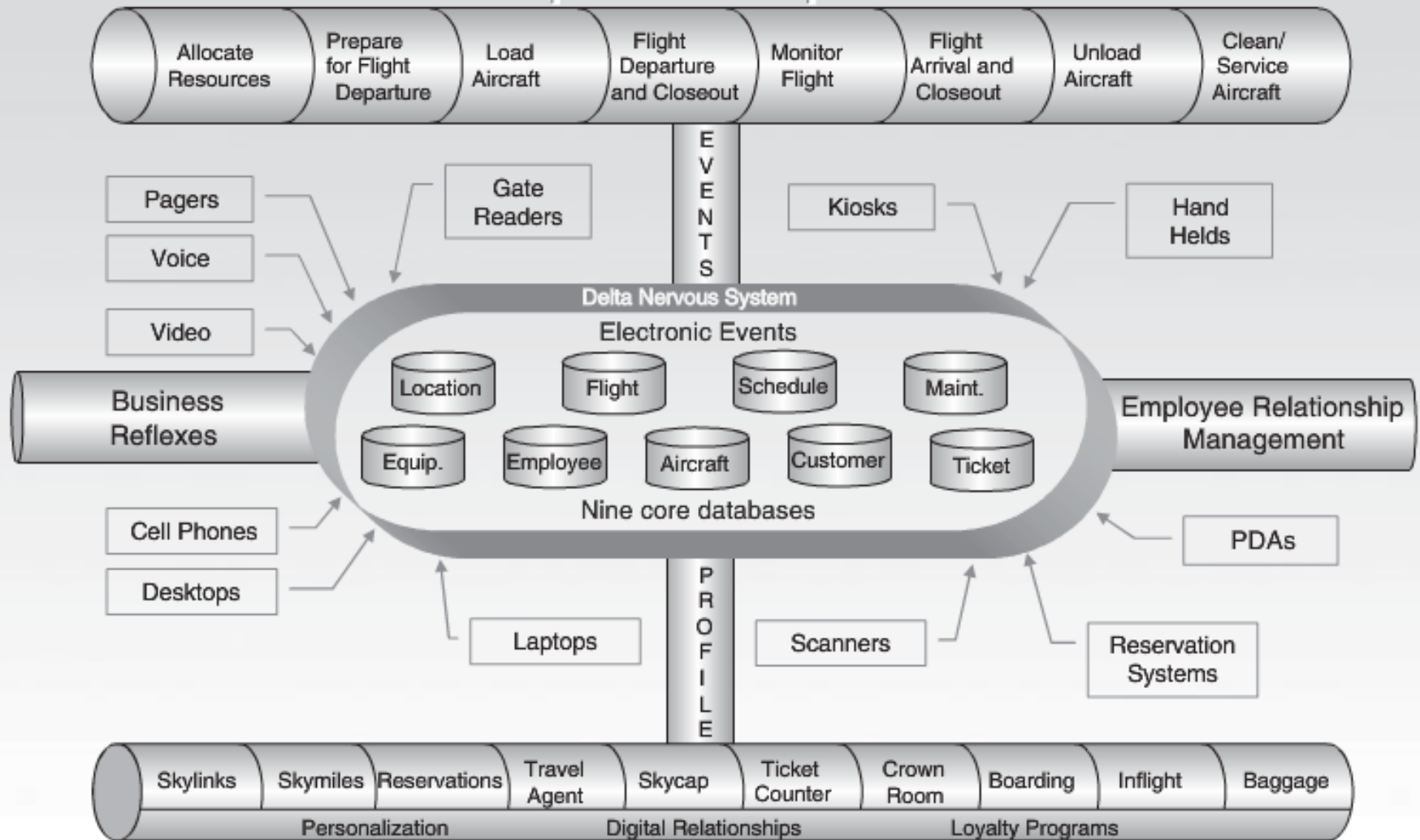
Business Operating Models

Four Operating Models

Business Process Integration	High	<i>Coordination</i> <ul style="list-style-type: none"> ■ Shared customers or suppliers ■ Independent transactions with a need to know customer interactions ■ Operationally unique business units ■ Autonomous business management ■ Business unit control over business process design ■ Shared customer/supplier data ■ Consensus processes for designing IT infrastructure services; IT application decisions are made in business units 	<i>Unification</i> <ul style="list-style-type: none"> ■ Customers and suppliers may be local or global ■ Globally integrated business processes often with support of enterprise systems ■ Business units with similar or overlapping operations ■ Centralized management often applying functional/process/business unit matrices ■ High-level process owners design standardized process ■ Centrally mandated databases ■ IT decisions made centrally
	Low	<i>Diversification</i> <ul style="list-style-type: none"> ■ Few, if any, shared customers or suppliers ■ Independent transactions ■ Operationally unique business units ■ Autonomous business management ■ Business unit control over business process design ■ Few data standards across business units ■ Most IT decisions made within business units. 	<i>Replication</i> <ul style="list-style-type: none"> ■ Few, if any, shared customers ■ Independent transactions aggregated at a high level ■ Operationally similar business units ■ Autonomous business unit leaders with limited discretion over processes ■ Centralized (or federal) control over business process design ■ Standardized data definitions but data locally owned with some aggregation at corporate ■ Centrally mandated IT services
		Low	High
		Business Process Standardization	

Delta's Enterprise Architecture Requirements

Operational Pipeline



Customer Experience

Knowledge Repository

- ▶ Also known as knowledge sharing systems
- ▶ Include technologies that support:
 - ▶ Document management systems
 - ▶ Digital content management systems

Characteristics of efficient KR

- ▶ Knowledge owners:
 - ▶ Knowledge sharing
 - ▶ Conditions of sharing
 - ▶ Rewarded for knowledge sharing
- ▶ Knowledge seekers:
 - ▶ Explore possibilities for searching and ranking
 - ▶ Applicability of explicit knowledge

Vendors: Microsoft (sharepoint), OpenText (Hummingbird, LiveLink), EMC (Documentum) Opensource: OpenKM, KnowledgeTree

Classification of Knowledge Repositories

- ▶ Incident Report Databases
- ▶ Alert Systems
- ▶ Best Practice Databases
- ▶ Lessons Learned Systems (LLS)
- ▶ Expertise Locator Systems