Palestinian Central Bureau of Statistics

Databases, Data Warehouses and Statistical Dissemination Systems

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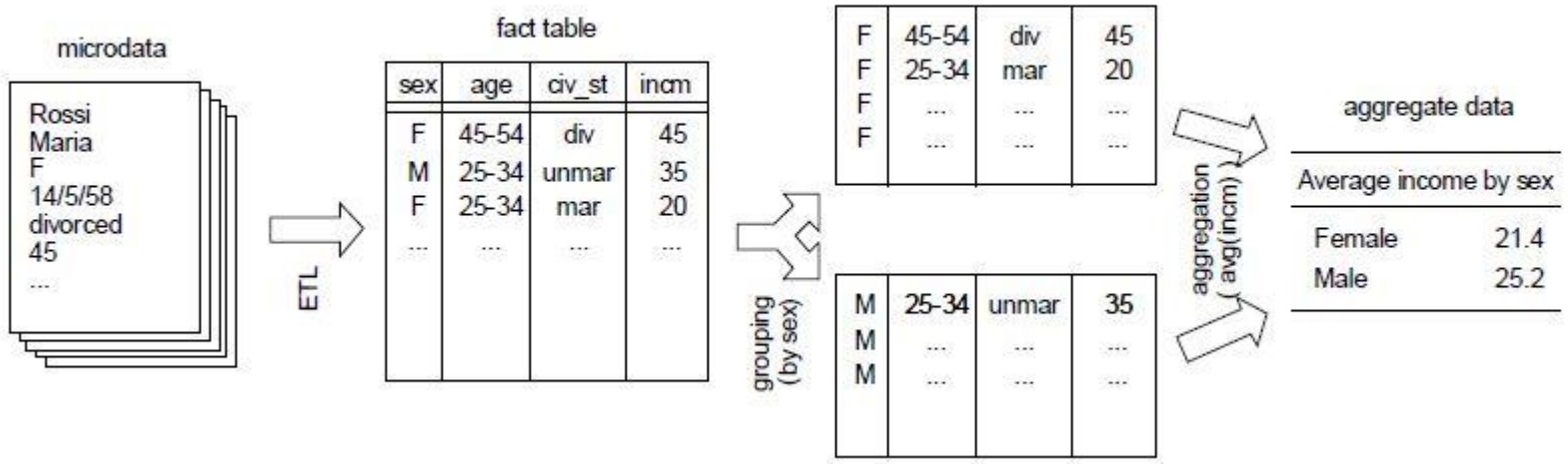
The Definitions

- **Database:** Organized collection of data. The data are typically organized to model relevant aspects of reality in a way that supports processes requiring this information
- **Data Warehouse**: A database used for reporting and data analysis. Integrating data from one or more disparate sources creates a central repository of data, a data warehouse (DW). Data warehouses store current and historical data and are used for creating trending reports for senior management reporting such as annual and quarterly comparisons
- **Statistical Dissemination System / Statistical Data Warehouse ???**

Data warehouse basic terminology

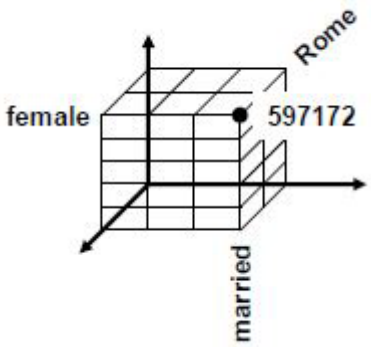
- **Aggregate data:** obtained by applying aggregations (count, sum, avg, etc.) over elementary data (aka raw data or microdata)
- **Fact tables (D1 , D2 , … , Dn; M)**
  - ✓ dimension codes (used to group data and/or to consider only specific subsets of data)
  - ✓ measure(s) (possibly to be aggregated and deriving from microdata quantitative variables)



Data warehouse basic terminology (2)

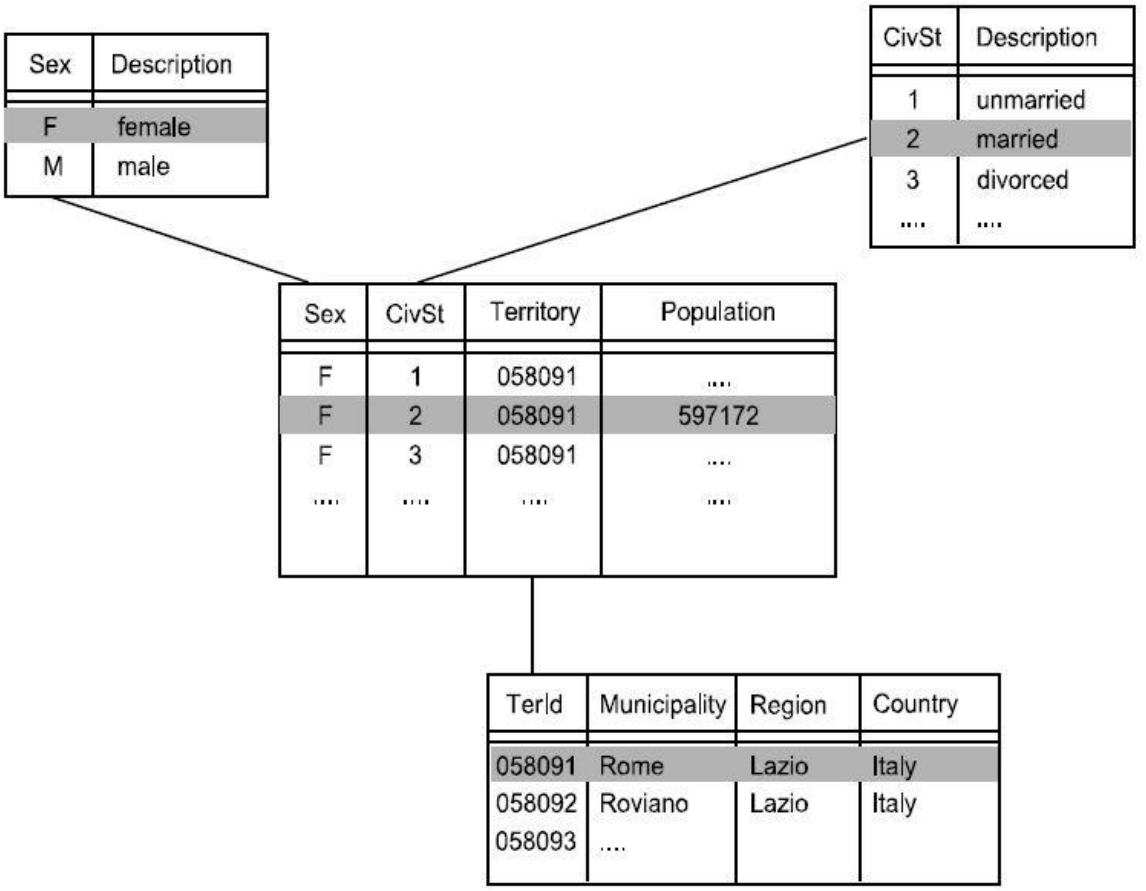
- **Dimensions and dimension levels:** dimensions are often articulated in different dimension levels, e.g. a territorial dimension may comprise the levels: national, regional, municipality

- **Data cube:** the association between dimension code combination and measure is represented by a n-dimensional hypercube



A relational perspective for data cubes

- **Star schema:** the codes in the fact table/data cube are decoded by (possibly de-normalized) single dimensional tables



Sex	Description
F	female
M	male

CivSt	Description
1	unmarried
2	married
3	divorced
....	....

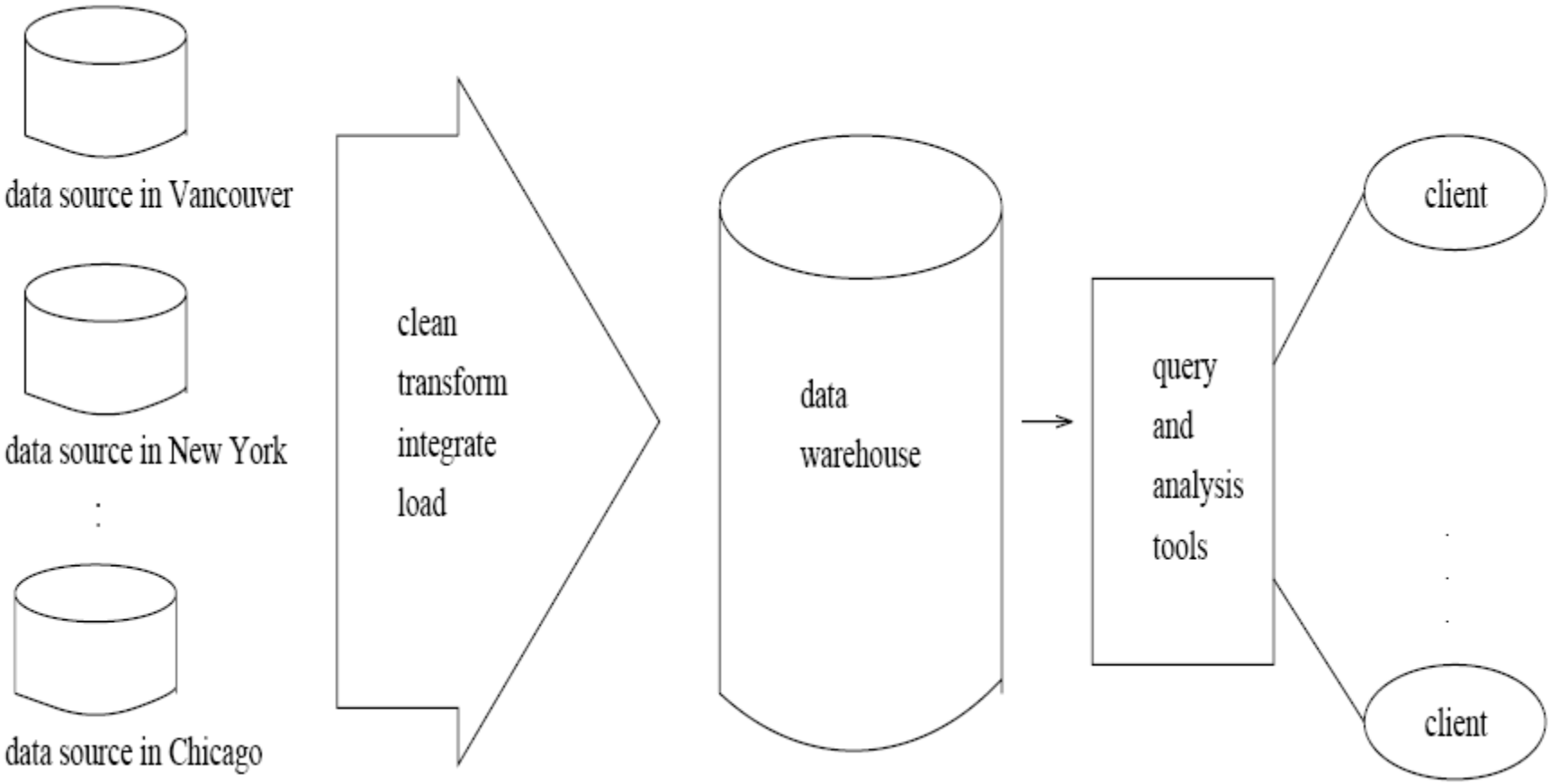
Sex	CivSt	Territory	Population
F	1	058091	....
F	2	058091	597172
F	3	058091	....
....	....	....	....

TerId	Municipality	Region	Country
058091	Rome	Lazio	Italy
058092	Roviano	Lazio	Italy
058093	....		

DATA WAREHOUSES

- **Data Warehouses:** Data spread in several databases – physically located at numerous sites
- Data warehouse – repository of multiple DBs in single schema; resides at single site.
- Data warehousing processes:
  - ✓ Data Cleaning
  - ✓ Data Integration
  - ✓ Data Transformation
  - ✓ Data Loading
  - ✓ Periodic data refreshing

Data warehouse diagram



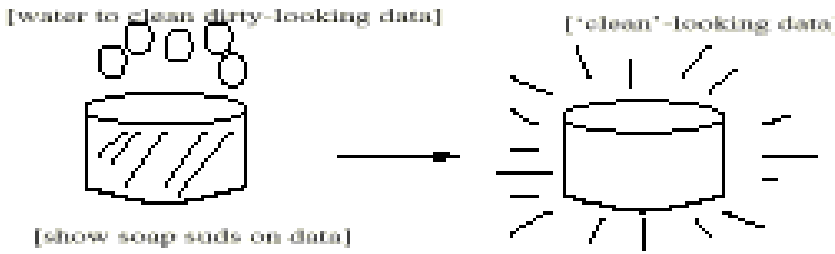
Data warehouse diagram

Data warehousing processes

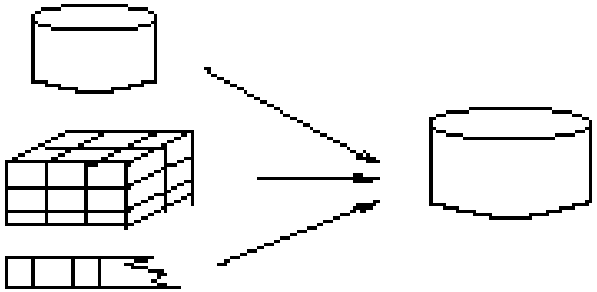
- **Data cleaning:-Data** Cleaning includes, filling in missing values, smoothing noisy data, identifying or removing outliers, and resolving inconsistencies.
- **Data integration:-**Data Integration includes integration of multiple databases, data cubes, or files.
- **Data transformation**:-Convert data from legacy or host format to warehouse format.
- **Load** :-sort; summarize, consolidate; compute views; check integrity. Build indices and partitions.
- Refresh:-Propagates the update from data sources to the warehouse.

Data warehousing processes

Data Cleaning



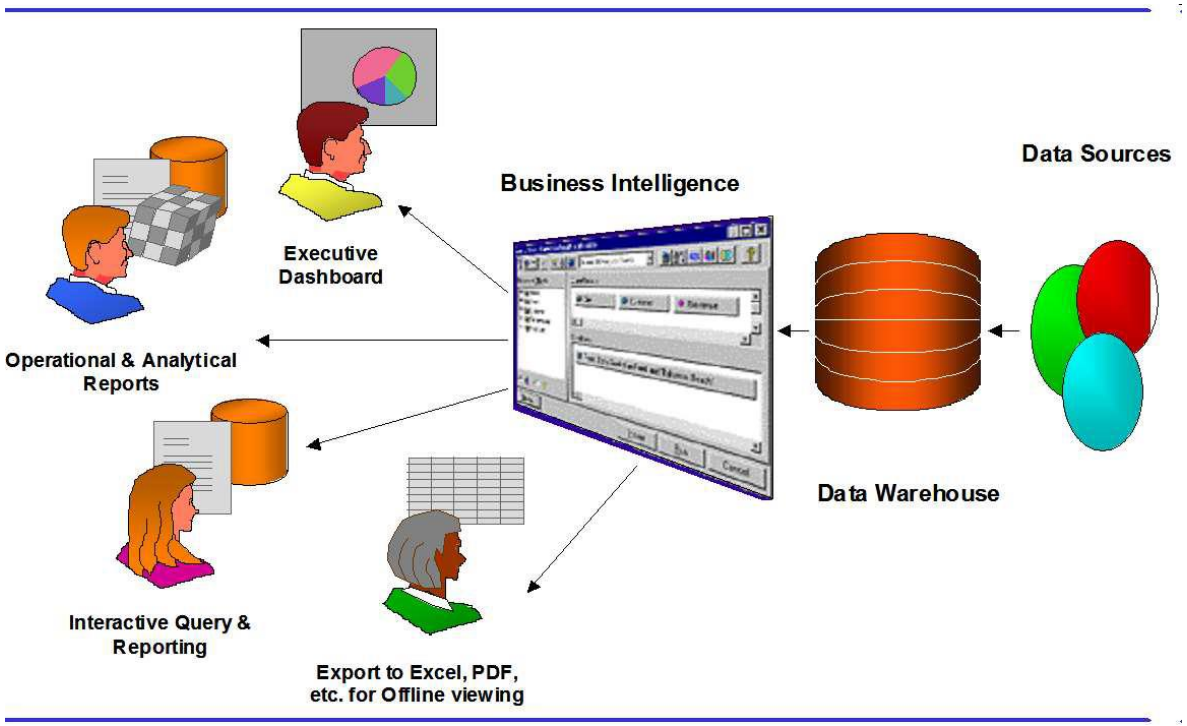
Data Integration



Data Transformation -2, 32, 100, 59, 48 → -0.02, 0.32, 1.00, 0.59, 0.48

Components of a data warehouse

- Sources –Data source interaction
- Data Transformation
- Data warehouse (data storage)
- Reporting (Data presentation)
- Metadata



Data Warehouse Advantages

- **Complete control over the four main areas of data management systems: -Sources – Data source interaction**
  - ✓ Clean data
  - ✓ Query processing: multiple options
  - ✓ Indexes: multiple types
  - ✓ Security: data and access

Data Warehousing Disadvantages

- Adding new data sources takes time and associated high cost.
- Data owners lose control over their data, raising ownership, security and privacy issues.
  يفقد مالكو البيانات السيطرة على بياناتهم ، ويثيرون قضايا الملكية والأمن والخصوصية.
- Long initial implementation time and associated high cost.
- Difficult to accommodate changes in data types and ranges, data source schema, indexes and queries.

Characteristics of Data Warehousing

- Subject –Oriented:-A data warehouse can be used to analyze a particular subject
- area. For example:-"sales" can be a particular subject.
- Integrated:-A data warehouse integrates data from multiple data sources. For example:- Source A and source B may have different ways of identifying a product, but in a data warehouse, there will be only a single way of identifying a product.
- Time Variant :-**Historical data** is kept in a data warehouse. For example:-One can retrieve data from 3 months ,6months, 12 months , or even older data from a data warehouse.
- Non volatile:-Once data is in the data warehouse, it will not change. So, historical data in a data warehouse should never be altered.
- It must be optimized for access to very large amount of data.
- It is based on client server architecture.
- It is capable of handling dynamic matrices.
- It maintains transparency.
- It is consistent and flexible.

DATA WAREHOUSE USAG

Three kinds of data warehouse applications

- **Information processing**:-Supports querying, basic statistical analysis, and reporting using crosstabs, tables, charts and graphs
- **Analytical processing**:-
  - ✓ Multidimensional analysis of data warehouse data
  - ✓ Supports basic OLAP operations, slice-dice, drilling, pivoting
- **Data mining**:-
  - ✓ Knowledge discovery from hidden patterns
  - ✓ Supports associations, constructing analytical models, performing classification and prediction, and presenting the mining results using visualization tools.
- Differences among the three tasks

DATA WAREHOUSE USAG

- In the next few years, data warehousing is expected make big strides in software, especially for optimizing queries:-
- indexing very large tables
- enhancing SQL
- improving data compression
- expanding dimensional modeling
- Real-Time Data Warehousing
- Multiple Data Types
- Adding Unstructured Data

DATA WAREHOUSE USAG (2)

- Searching Unstructured Data
- Spatial Data
- Data Visualization
- Major Visualization Trends
- Visualization Types
- Advanced Visualization Techniques Chart Manipulation.
- Drill Down.
- Advanced Interaction

Thank you for your kind Attention