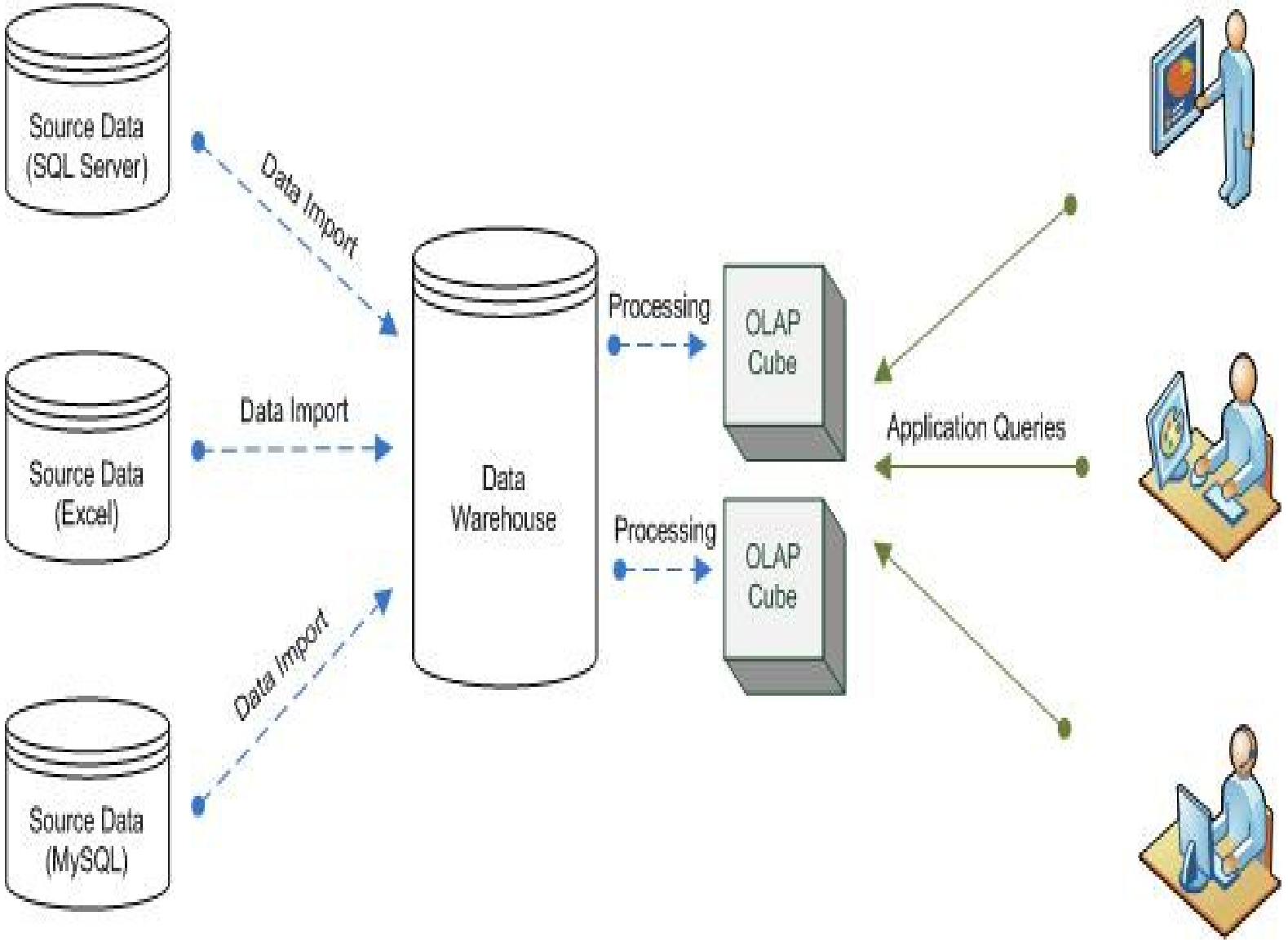
OLAP (Online Analytical Processing)

INTRODUCTION TO OLAP

- OLAP (online analytical processing) is **computer processing** that enables a user to easily and selectively extract and view data from different points of view.
- OLAP allows users to **analyze database information** from multiple database systems at one time.
- OLAP data is stored in **multidimensional databases**.


Source Data
(SQL Server)
Data Import
Source Data
(Excel)
Data Import
Source Data
(MySQL)
Data Import
Data
Warehouse
Processing
OLAP
Cube
Processing
OLAP
Cube
Application Queries

TYPES OF OLAP

- **Relational OLAP(ROLAP):**
  Extended RDBMS with multidimensional data mapping to standard relational operation.

- **Multidimensional OLAP(MOLAP):** Implemented operation in multidimensional data.

- **Hybrid Online Analytical Processing (HOLAP)** is a hybrid approach to the solution where the aggregated totals are stored in a multidimensional database while the detail data is stored in the relational database. This is the balance between the data efficiency of the ROLAP model and the performance of the MOLAP model.

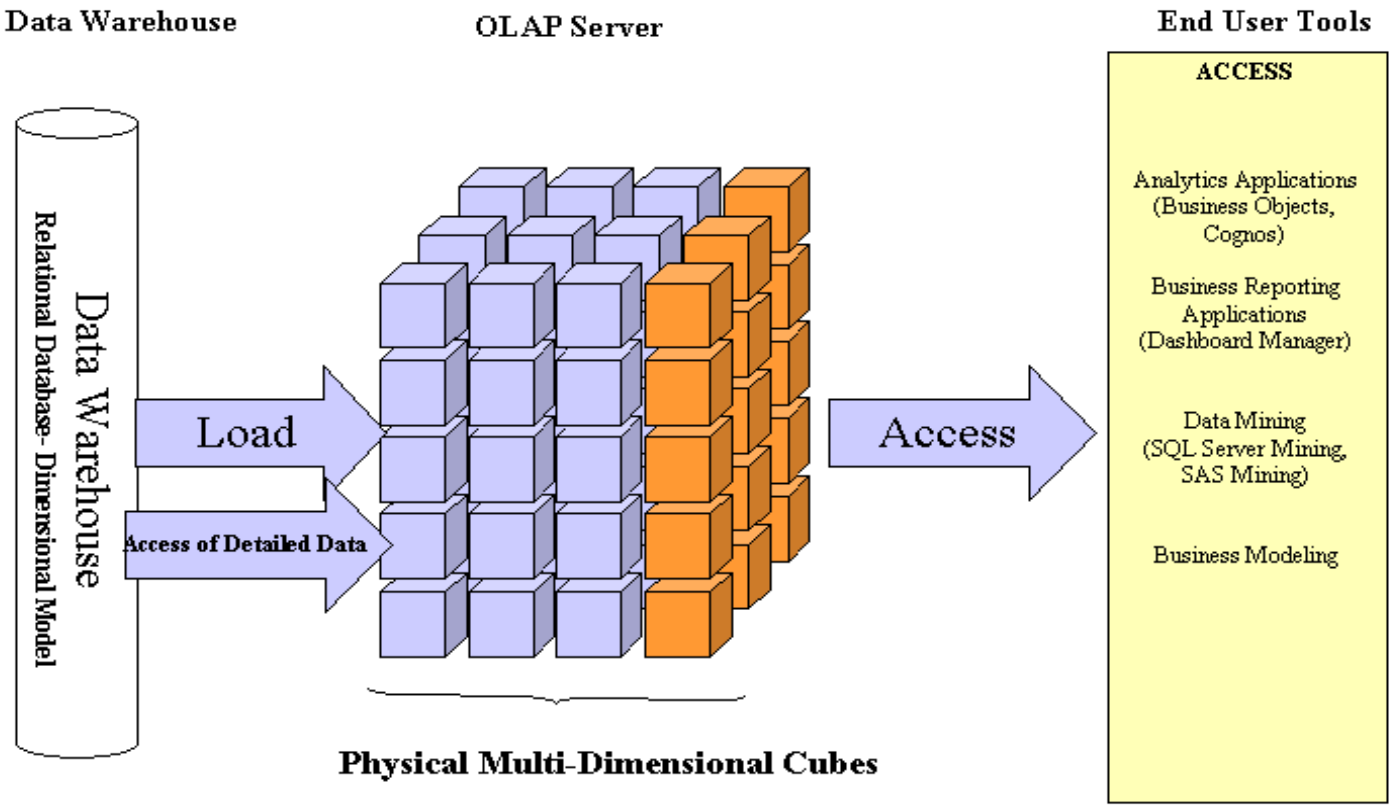
Multidimensional OLAP

- MOLAP extends OLAP functionality to MDBMS.
- Best suited to manage, store and analyze multidimensional data.
- Proprietary techniques used in MDBMS.
- MDBMS and users visualize the stored data as a 3-Dimensional Cube i.e Data Cube.
- MOLAP Databases are known to be much faster than the ROLAP counter parts.
- Data cubes are held in memory called “Cube Cache”

THE OLAP CUBE

- An OLAP Cube is a data **structure that allows fast analysis of data.**
- The arrangement of data into cubes overcomes a limitation of relational databases.
- It consists of numeric facts called **measures** which are categorized by dimensions.
- The OLAP cube consists of numeric facts called **measures** which are categorized by **dimensions.**

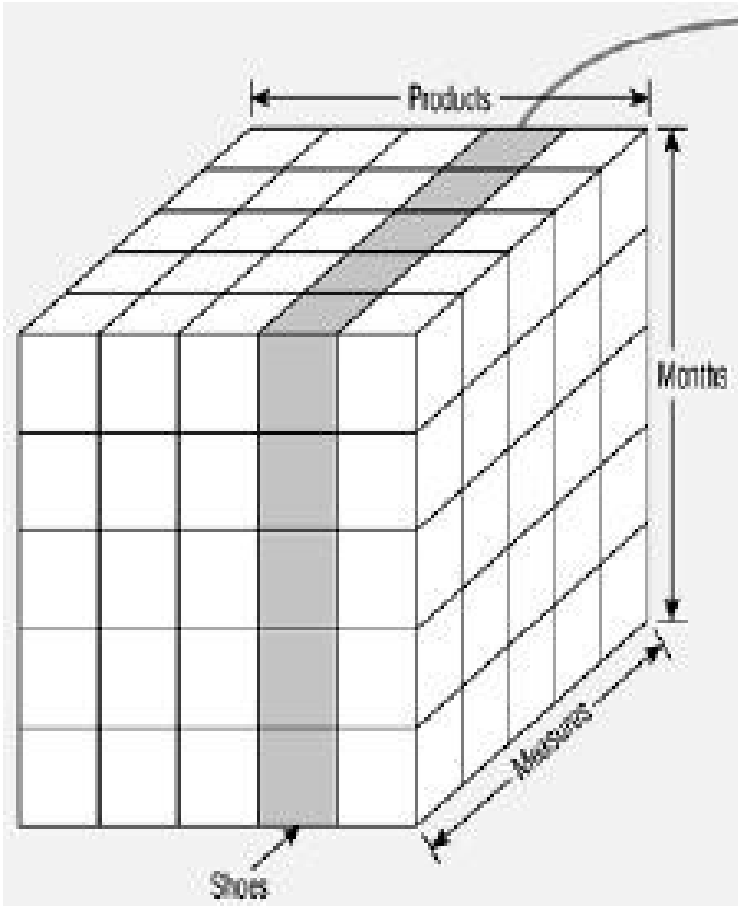
OLAP CUBE


Data Warehouse
OLAP Server
End User Tools
ACCESS
Analytics Applications (Business Objects, Cognos)
Business Reporting Applications (Dashboard Manager)
Data Mining (SQL Server Mining, SAS Mining)
Business Modeling
Data Warehouse
Relational Database- Dimensional Model
Load
Access of Detailed Data
Access
Physical Multi-Dimensional Cubes

Relational OLAP

- Provides functionality by using relational databases and relational query tools to store and analyze multidimensional data.
- Build on existing relational technologies and represent extension to all those companies who already used RDBMS.
- Multidimensional data schema support within the RDBMS.
- Data access language and query performance are optimized for multidimensional data.
- Support for very large databases.

AN EXAMPLE…



	Measure		
	Units	Revenue	Cost
January	250	1564	1020
February	200	1275	875
March	350	1800	1275
April	400	1935	1500
May	485	2000	1560

Product: Shoes

ROLAP v/s MOLAP

Characteristics	ROLAP	MOLAP
SCHEMA	User star Schema •Additional dimensions can be added dynamically.	User Data cubes •Addition dimensions require recreation of data cube.
Database Size	Medium to large	Small to medium
Architecture	Client/Server	Client/Server
Access	Support ad-hoc requests	Limited to pre-defined dimensions

Implementation of OLAP server

- **ROLAP**:
- Data is stored in tables in relational database or extended relational databases.
- They use an RDBMS to manage the warehouse data and aggregations using often a star schema.
- **Advantage**:
- Scalable
- **Disadvantage**:
- Direct access to cells.

- **MOLAP**:
- Implements the multidimensional view by storing data in special multidimensional data structures.
- **Advantages**:
- Fast indexing to pre-computed aggregations.
- Only values are stored.
- **Disadvantage**:
- Not very Scalable

- Some popular OLAP server software programs include:
  - **Oracle Express Server**
  - **Hyperion Solutions Essbase**
- OLAP processing is often used for **data mining.**
- OLAP products are **typically designed for multiple-user environments**, with the cost of the software based on the number of users.

APPLICATIONS OF OLAP

- OLE DB for OLAP

  OLE DB for OLAP (abbreviated **ODBO**) is a Microsoft published specification and an industry standard for multi-dimensional data processing.

  ODBO is the standard **application programming interface (API)** for exchanging metadata and data between an OLAP server and a client on a Windows platform.

  ODBO was specifically designed for Online Analytical Processing (OLAP) systems by Microsoft as an extension to Object Linking and Embedding Database (OLE DB).

/Contd…

- **Marketing and sales analysis**
- **Consumer goods industries**
- **Financial services industry** (insurance, banks etc)
- **Database Marketing**

BENEFITS OF OLAP

- One main benefit of OLAP is **consistency of information and calculations.**

- **"What if" scenarios** are some of the most popular uses of OLAP software and are made eminently more possible by multidimensional processing.

- It allows a manager to **pull down data** from an OLAP database in broad or specific terms.

- OLAP **creates a single platform for all the information and business needs, planning, budgeting, forecasting, reporting and analysis.**

THANK YOU!!