MES College of Engineering Pune-01
Department of Computer Engineering

Name of Student:	**Class:**
Semester/Year:	**Roll No:**
Date of Performance:	**Date of Submission:**
Examined By:	**Subject: LPVI (E-VI BI)**

Assignment No. 3

Aim: Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model

Theory:

What is OLAP?
OLAP (Online Analytical Processing) was introduced into the business intelligence (BI) space over 20 years ago, in a time where computer hardware and software technology weren't nearly as powerful as they are today. OLAP introduced a groundbreaking way for business users (typically analysts) to easily perform multidimensional analysis of large volumes of business data.
Aggregating, grouping, and joining data are the most difficult types of queries for a relational database to process. The magic behind OLAP derives from its ability to pre-calculate and pre-aggregate data. Otherwise, end users would be spending most of their time waiting for query results to be returned by the database. However, it is also what causes OLAP-based solutions to be extremely rigid and IT-intensive.

Limitations of OLAP cubes
OLAP requires restructuring of data into a star/snowflake schema
There is a limited number of dimensions (fields) a single OLAP cube
It is nearly impossible to access transactional data in the OLAP cube
Changes to an OLAP cube requires a full update of the cube – a lengthy process
OLAP from Ashir Ali [line]
Vendors offer a variety of OLAP products that can be grouped into three categories: multidimensional OLAP (MOLAP), relational OLAP (ROLAP), and hybrid OLAP (HOLAP). Here is a breakdown of the differences between them.

ROLAP
ROLAP stands for Relational Online Analytical Processing. ROLAP stores data in columns and rows (also known as relational tables) and retrieves the information on demand through user submitted queries. A ROLAP database can be accessed through complex SQL queries to calculate information. ROLAP can handle large data volumes, but the larger the data, the slower the processing times.
Because queries are made on-demand, ROLAP does not require the storage and pre-computation of information. However, the disadvantage of ROLAP implementations are the potential performance constraints and scalability limitations that result from large and inefficient join operations between large tables. Examples of popular ROLAP products include Metacube by Stanford Technology Group, Red Brick Warehouse by Red Brick Systems, and AXSYS Suite by Information Advantage.

MOLAP
MOLAP stands for Multidimensional Online Analytical Processing. MOLAP uses a multidimensional cube that accesses stored data through various combinations. Data is pre-computed, pre-summarized, and stored (a difference from ROLAP, where queries are served on-demand).
A multicube approach has proved successful in MOLAP products. In this approach, a series of dense, small, precalculated cubes make up a hypercube. Tools that incorporate MOLAP include Oracle Essbase, IBM Cognos, and Apache Kylin.

Its simple interface makes MOLAP easy to use, even for inexperienced users. Its speedy data retrieval makes it the best for "slicing and dicing" operations. One major disadvantage of MOLAP is that it is less scalable than ROLAP, as it can handle a limited amount of data.
What is HOLAP?

HOLAP
stands for Hybrid Online Analytical Processing. As the name suggests, the HOLAP storage mode connects attributes of both MOLAP and ROLAP. Since HOLAP involves storing part of your data in a ROLAP store and another part in a MOLAP store, developers get the benefits of both.
With this use of the two OLAPs, the data is stored in both multidimensional databases and relational databases. The decision to access one of the databases depends on which is most appropriate for the requested processing application or type. This setup allows much more flexibility for handling data. For theoretical processing, the data is stored in a multidimensional database. For heavy processing, the data is stored in a relational database.
Microsoft Analysis Services and SAP AG BI Accelerator are products that run off HOLAP.

Supported Operating Systems
Windows 10, Windows 7, Windows 8, Windows 8.1, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2

Also visit
https://learn.microsoft.com/en-us/analysis-services/multidimensional-models/create-a-cube-using-the-cube-wizard?view=asallproducts-allversion

Prerequisites
1. Visual Studio 2022
- Integration Services (EXTENSION)
- Analysis Services (EXTENSION)
2. SQL Server Management Studio
- Server type - analysis services and integration services
3. SQL Server
4. Setup SQL server authentication mode (in management studio)
- Connect database engine
- Right click on server and go to properties
- Securities → SQL Server and Windows Authentication mode → OK
- Security → Logins → sa → Create and save password (remember it we will need in later)
- In Status window make sure to make login enabled → OK
- Right click on server and restart the service

Steps to be followed to Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model –

Steps to follow
1. Create a Data Warehouse
- Download this SQLscript (https://drive.google.com/file/d/19tLUmocusu5It9JxWvGgtt1Euudngswf/view?usp=sharing) (SQLQuery1.sql)
- Open management studio → Click on new query → Paste the SQLquery in editor → Execute. (New database gets created in databases)

2. Start Visual Studio as administrator
- Create new project → Choose Analysis Services Multidimensional Project → Give appropriate project name → Click OK

3. Create Data Source
- Right click on Data Sources → New Data Source → Create a data source based on a existing connection → Delete → New → Choose provider as Microsoft OLE DB provider for sql server → Choose you server name →In authentication Choose SQL server authentication → Use your username as "sa" and password you just set in prerequisite step → Select database

from drop down i.e. Sales_DW → Test Connection → OK → next →
Choose inherit → Next → Finish

4. Create Data Source View

- Right click on Data source view → New data source view → Next → Next → Choose FactProductSales and Click on '>' → Add related tables → Next → Finish

5. Create a Cube

- Right click on Cube → New Cube → Next → Next → Choose FactProductSales → Next → Next → Next → Finish → Ctrl +S

6. Create Hierarchies

- Double Click on Dim Date → Drag year, month and quarter from Data Source View to Attributes → Now one by one drag year , quarter and month from attribute to hierarchies and place them one below other in order to create hierarchy → Ctrl+S

7. **Deployment**

- Right Click on project → Properties → Deployment → Choose Processing option as 'Full' , Server Mode as 'Deploy all' , Server as your server name → OK
- Click on Start (Deployment successful)
- Thus a Cube is created.

8. Analyze data using Cube

- Go to Management tool → In analysis server choose database → project name → Cubes → Right click on Sale_DW and choose browse
- To view how much of any product was sold in particular year

a. Drag Product key, year, Quantity from <All> to right side
b. Drag Dim Date and Dim Product from <All> to Dimension in upper right part
c. Now click on the execute query ' ! ' option in the menu bar, you'll get your results.

Quesions: https://www.wisdomjobs.com/e-university/olap-interview-questions.html

1. **What do you understand by cube?**
2. **Explain About Molap?**
3. **Explain About Rolap?**
4. **What Is Hybrid Olap?**
5. **Explain Difference between Molap And Rolap?**