SQL Server Analysis Services 2008 Overview

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Outline

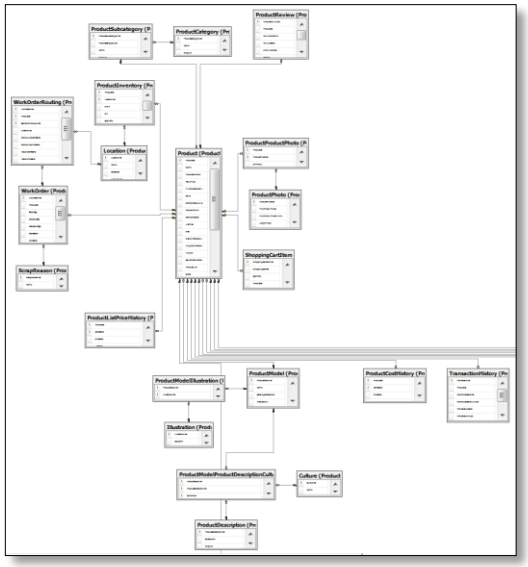
- **Introduction to SQL Server Analysis Services**
  - Defining Online Transaction Processing (OLTP) Databases
  - Defining Online Analytical Processing (OLAP) Databases
  - Multi-Dimensional Concepts
  - SQL Server Analysis Services (SSAS)
- **Developing SSAS Databases**
  - System Roles & Workflow
  - Demo: Creating, Deploying and Processing SSAS Databases
- **Analysis Services Clients**
  - Overview of SSAS Clients
  - Developer APIs
  - Demo: Excel, SQL Server Reporting Services, and .NET Clients

Introduction to SQL Server Analysis Services

- Defining Online Transaction Processing (OLTP) Databases
- Defining Online Analytical Processing (OLAP) Databases
- Multi-Dimensional Concepts
- Introducing SQL Server Analysis Services

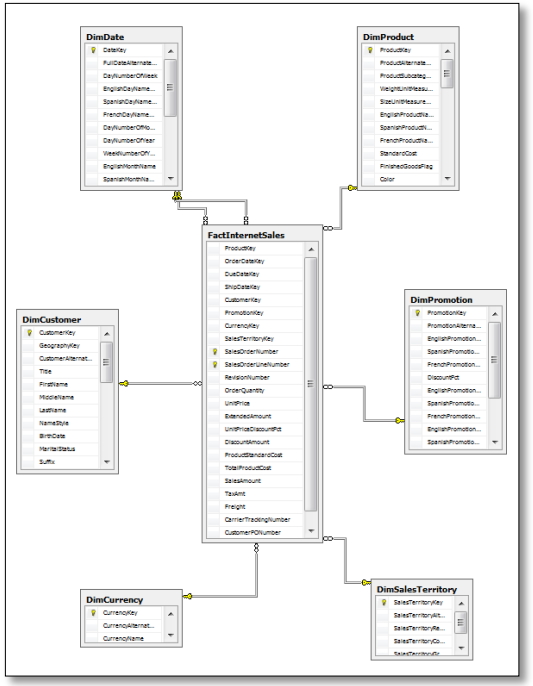
Defining Online Transaction Processing (OLTP) Databases

OLTP Databases
Highly Normalized
Modeled for fast and efficient change
Reporting requires numerous expensive joins
Multi-level aggregations require GROUP BY and ROLLUP or CUBE Operators
Aggregations are calculated each time the query is run
Crosstab style reporting is difficult (PIVOT Operator)



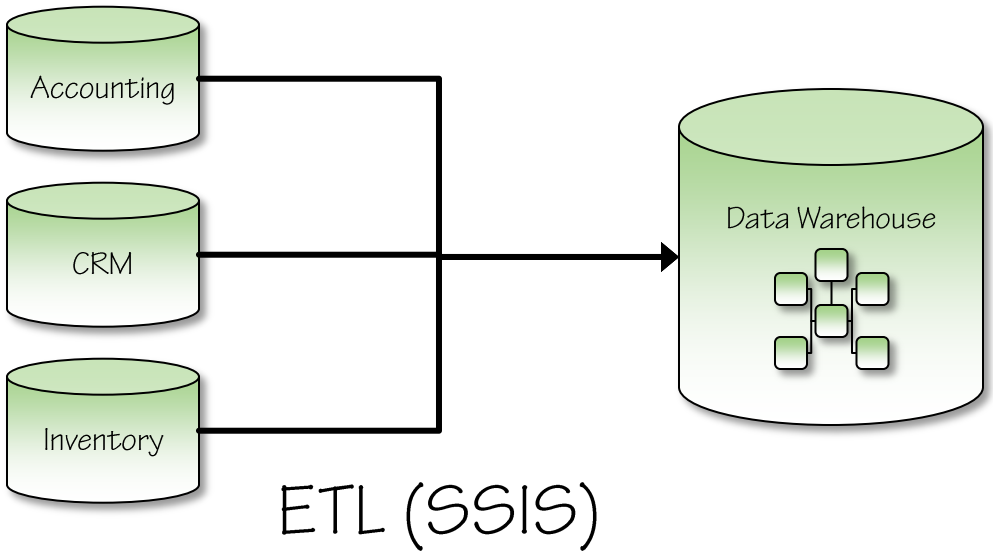
Defining Online Analytical Processing (OLAP) Databases

OLTP Databases	OLAP Databases
Highly Normalized	Highly De-Normalized
Modeled for fast and efficient change	Modeled for fast and efficient querying
Reporting requires numerous expensive joins	De-Normalized model means fewer joins
Multi-level aggregations require GROUP BY and ROLLUP or CUBE Operators	Multi-level aggregations are part of the database structure and content
Aggregations are calculated each time the query is run	Aggregations are pre-calculated and stored in the database
Crosstab style reporting is difficult (PIVOT Operator)	Crosstab style reporting is the norm using MDX



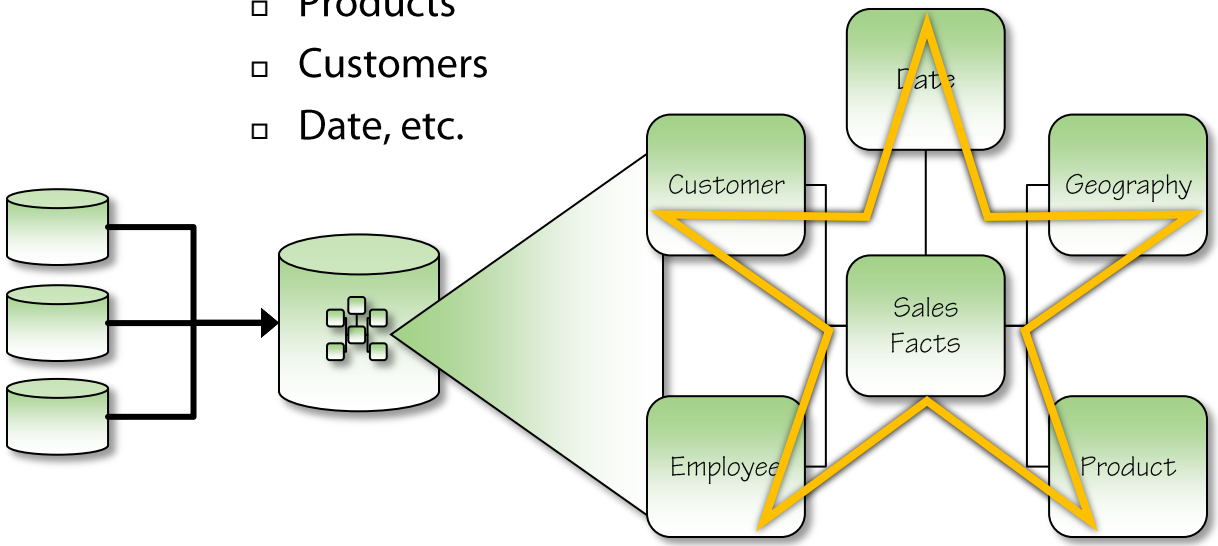
Multi-Dimensional Concepts

- **Data Warehouse**
  - Relational Database
  - Central Storage for Enterprise Reporting Data
  - Source data comes from production OLTP databases
  - Loaded by "Extraction Transformation and Load" (ETL) tool



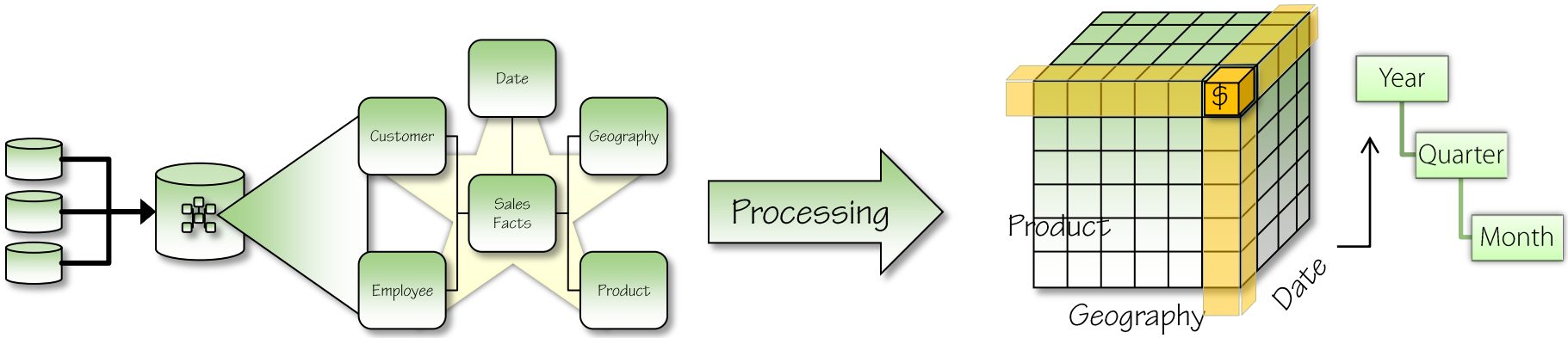
Multi-Dimensional Concepts

- **Star Schema**
  - Set of related tables in the Data Warehouse
  - "Fact" table records store:
    - Business Numbers (Sales Dollars, Quantities, Counts)
    - Foreign Keys to Dimension tables
  - "Dimension" Tables store business context data like:
    - Products
    - Customers
    - Date, etc.



Multi-Dimensional Concepts

- **Cubes**
  - Cubes are multi-dimensional objects made of Dimensions & Measures
- **Dimensions**
  - Provide the structure of the cube.
  - Come from the "Dimension Tables" in the Star Schema
- **Measures**
  - Provide the data in the cube
  - Come from the "Fact Tables" in the Star Schema
  - Are aggregated at multiple levels along dimensions

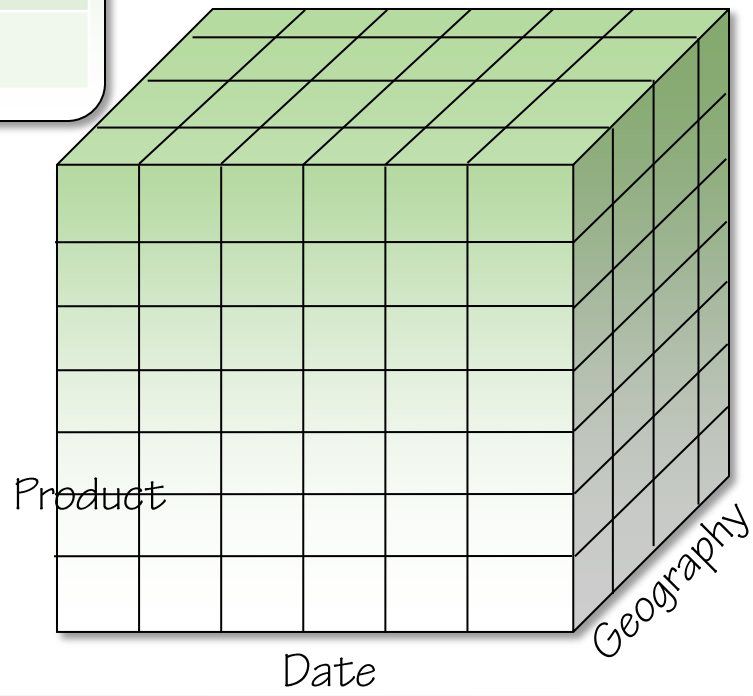


Understanding Dimensions

AdventureWorksDW2008 Product Data

Category	Product
Accessories	All-Purpose Bike Stand
Accessories	Bike Wash – Dissolver
Components	Chain
Components	Front Brakes

- Warehouse Dimension Tables
- Become Cube Dimensions



Understanding Dimension Members

AdventureWorksDW2008 Product Data

Category	Product
Accessories	All-Purpose Bike Stand
Accessories	Bike Wash – Dissolver
Components	Chain
Components	Front Brakes

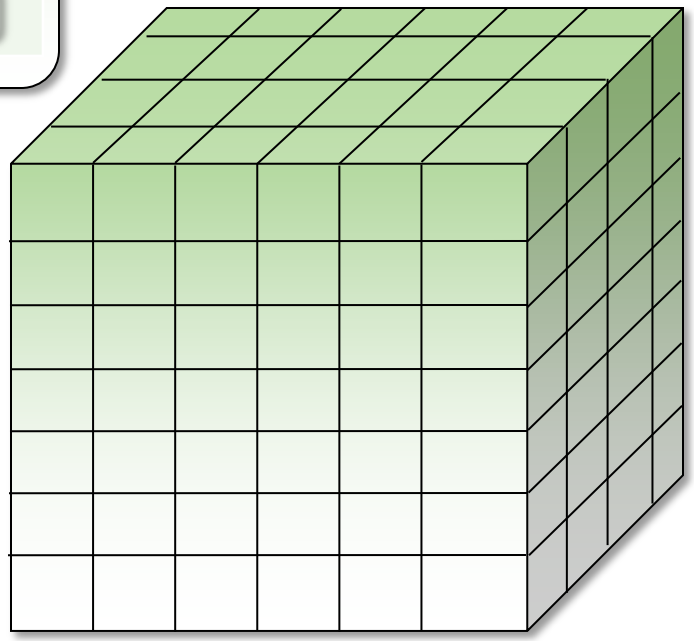
- Distinct Dimension Table values
- Become Cube Dimension's "Members"

All-Purpose Bike Stand . .

Bike Wash – Dissolver . .

Chain . . . . . .

Front Brakes . . . . . .



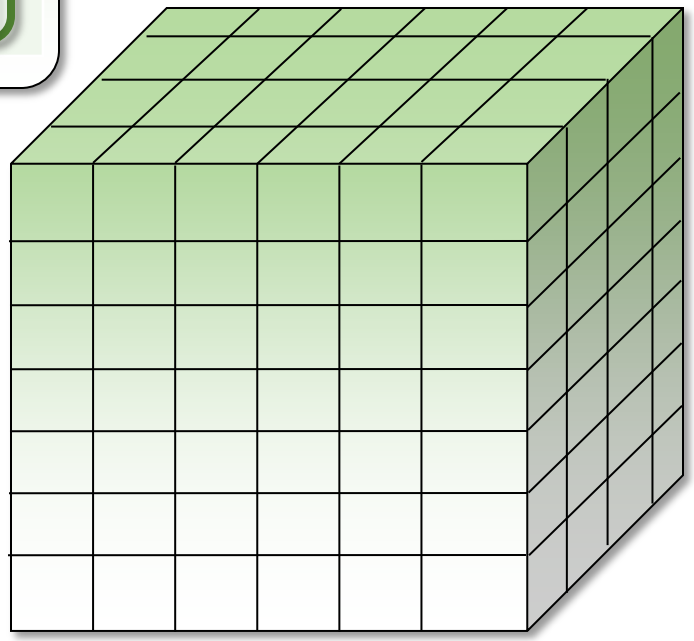
Understanding Levels & Level Members

AdventureWorksDW2008 Product Data

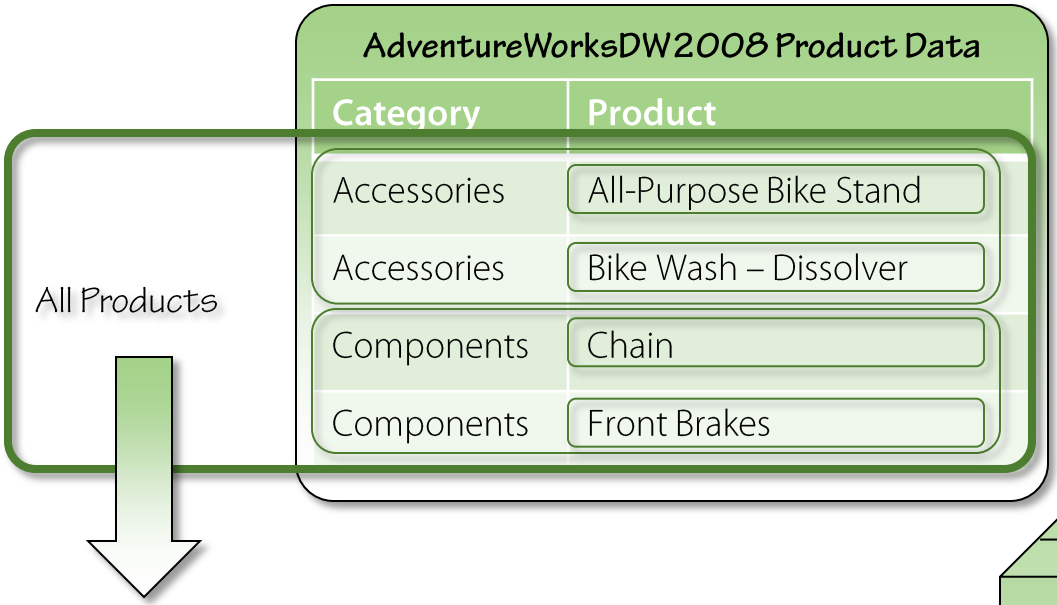
Category	Product
Accessories	All-Purpose Bike Stand
Accessories	Bike Wash – Dissolver
Components	Chain
Components	Front Brakes

Products Rollup into Categories

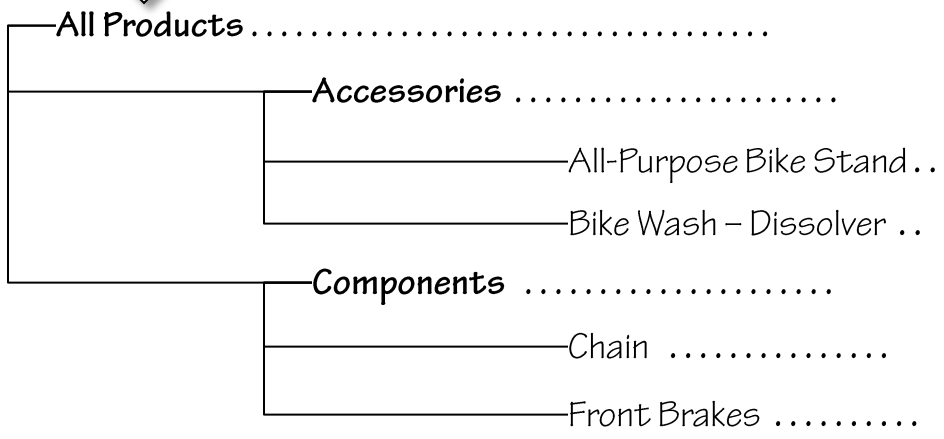
- Accessories
  - All-Purpose Bike Stand
  - Bike Wash – Dissolver
- Components
  - Chain
  - Front Brakes

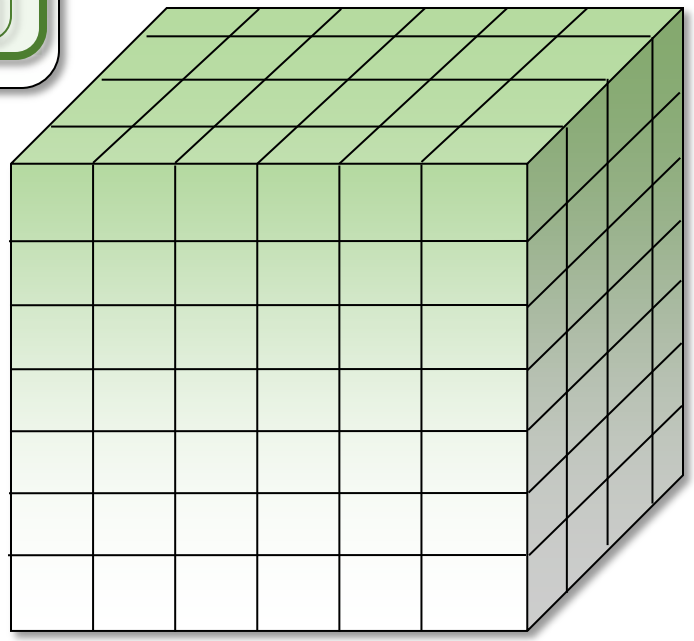


Understanding Levels & Level Members



Categories rollup into "All Products"





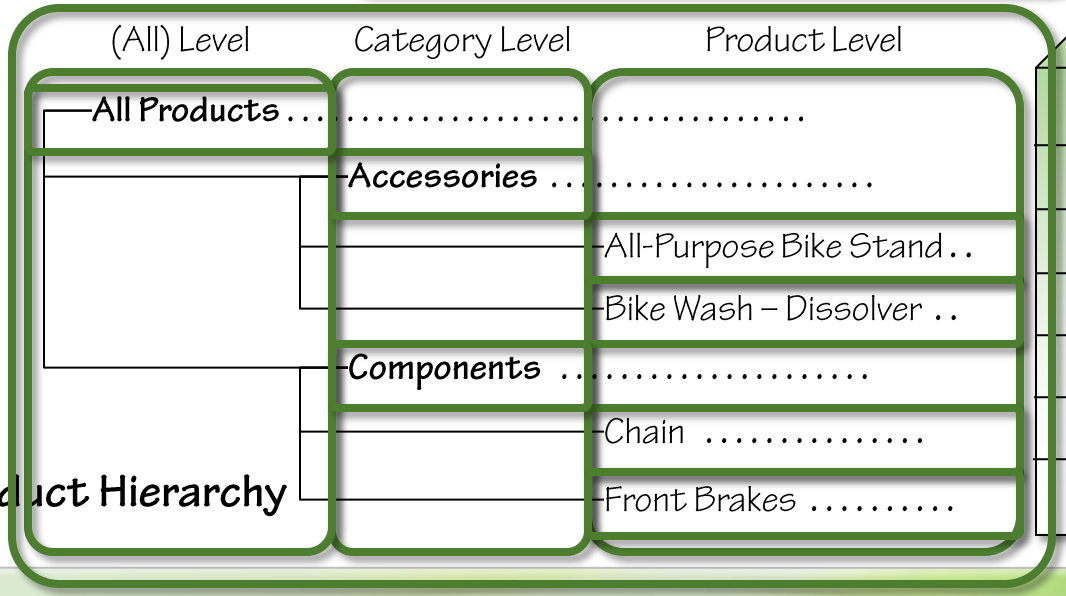
Understanding Hierarchies

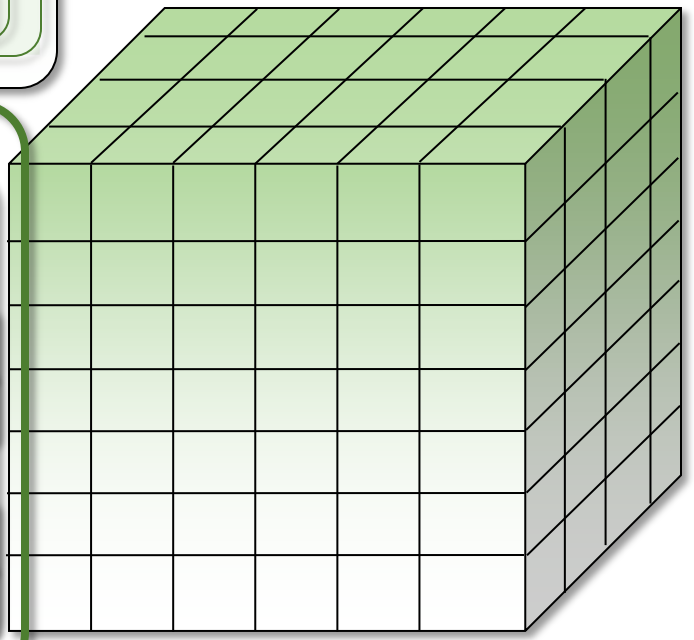
AdventureWorksDW2008 Product Data

Category	Product
Accessories	All-Purpose Bike Stand
Accessories	Bike Wash – Dissolver
Components	Chain
Components	Front Brakes

All Products

- Dimension "Members"
- At multiple "Levels"
- Create "Hierarchies"



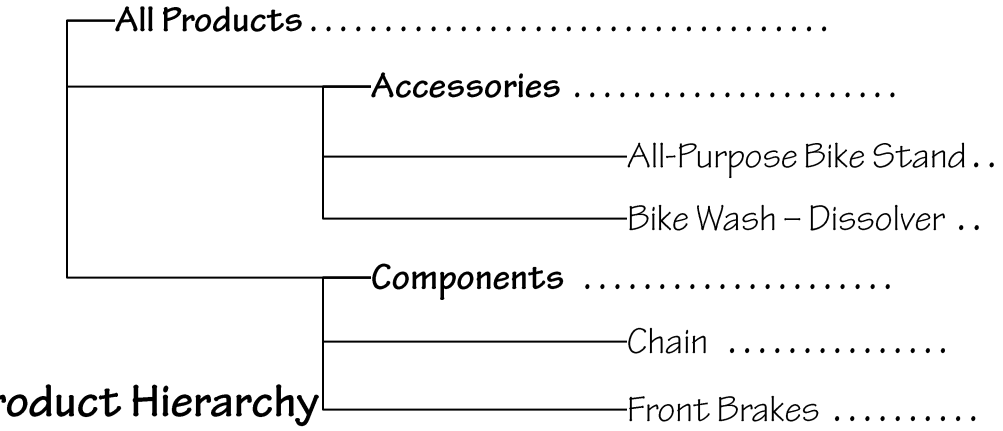


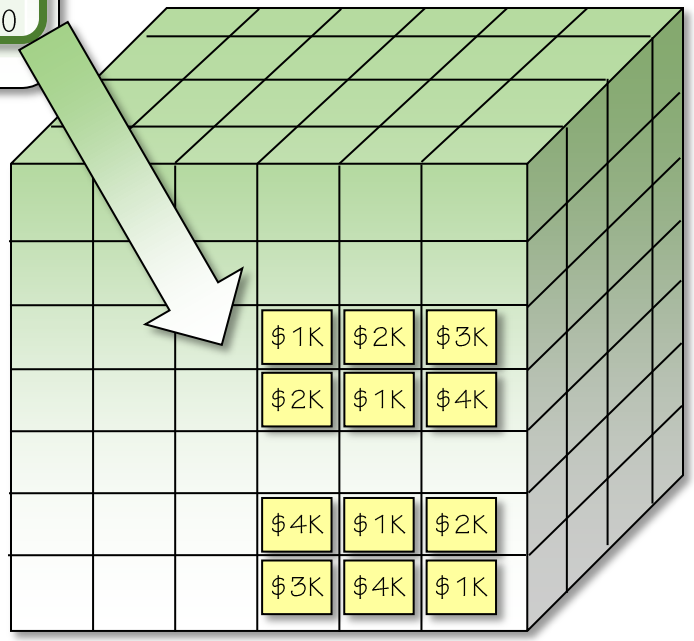
Understanding Measures

AdventureWorksDW2008 Fact Data

Order Date	Product	Geography	Sales
20031001	484	17	1000
20031015	484	43	2000
20031101	489	26	3000
20031115	489	133	4000

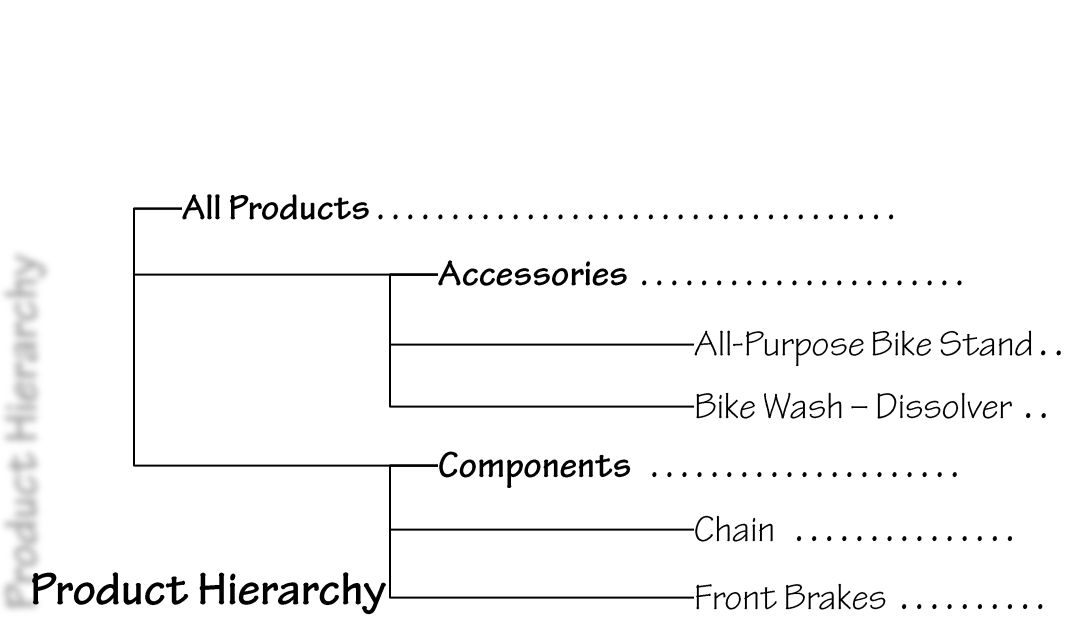
- Fact Table Data
- Become Cube Measures

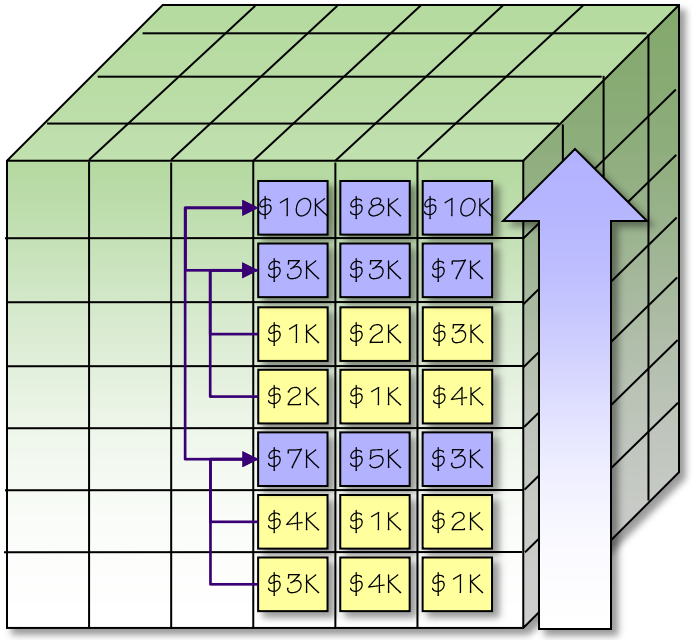




Understanding Aggregates

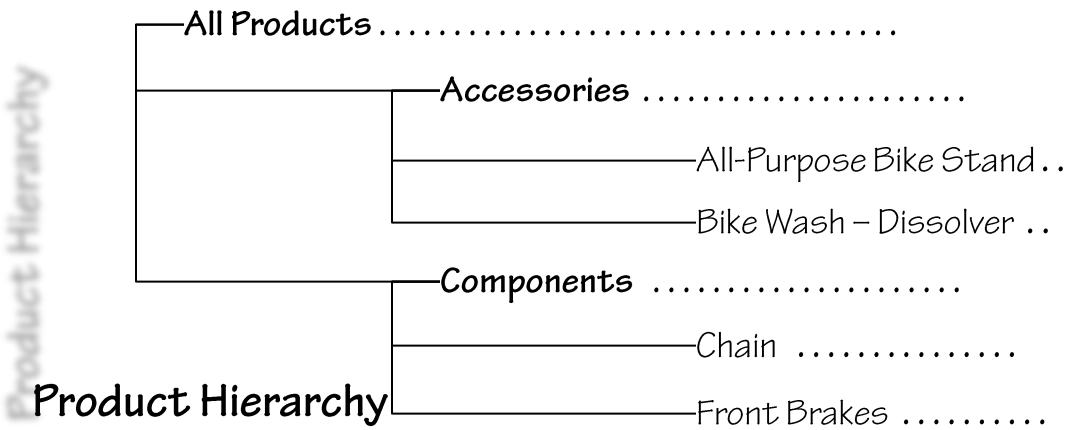
Measure values Rollup into aggregates In non-leaf levels of hierarchies

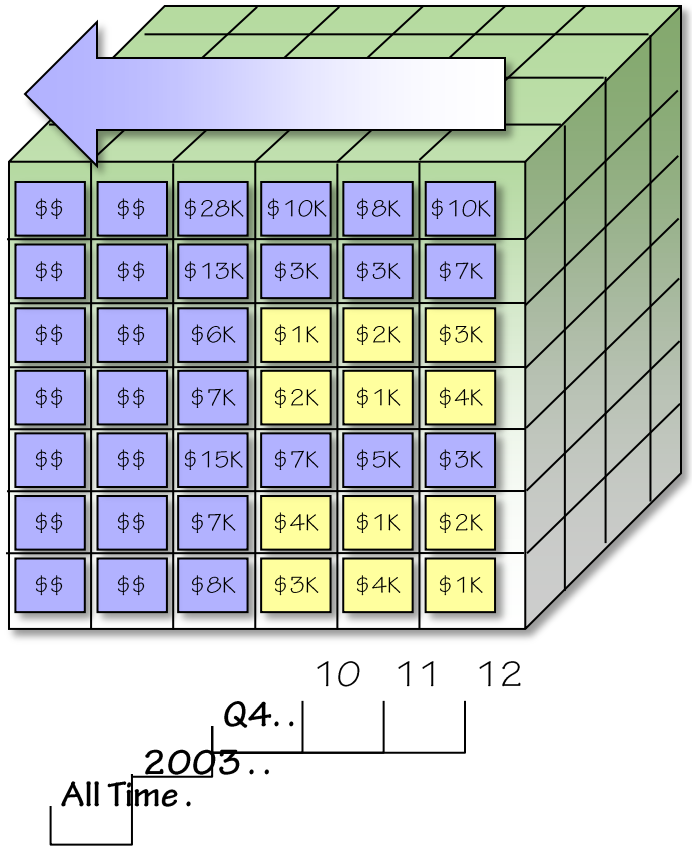




Understanding Aggregates

- Rollups occur on all dimensions
- Aggregations are calculated
- Results are stored in the cube





SQL Server Analysis Services (SSAS)

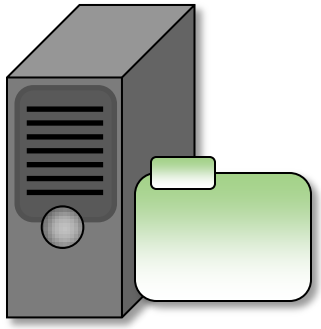
- **Microsoft's Multi-Dimensional Database Engine**
- **Stores Cubes and Dimensions and processes queries against cubes**
- **Comes with SQL Server Standard and Enterprise Editions**
- **SSAS is NOT SQL Server - It's a totally separate database engine**
- **SSAS does not require SQL Server be installed**
  - Can consume data from SQL Server if available
  - Can also consume data from other db engines (Oracle, DB2, etc.)
- **Has it's own client protocols:**
  - XMLA - XML for Analysis
- **Has it's own client APIS**
  - Analysis Management Objects (AMO)
  - ADOMD .NET (Multi-Dimensional ADO.NET objects)
- **Has it's own query language:**
  - MDX – Multi-Dimensional Expressions

Developing SSAS Databases

- **Developing SQL Server Analysis Services Databases**
  - System Roles
  - Workflow
  - Demo: Creating, Deploying and Processing SSAS Databases

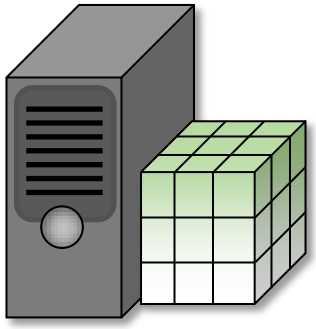
System Roles

Developer Workstation



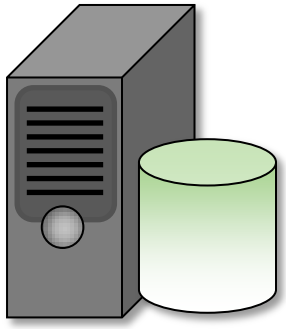
Runs Business Intelligence Development Studio (BIDS)

SQL Server Analysis Services Instance



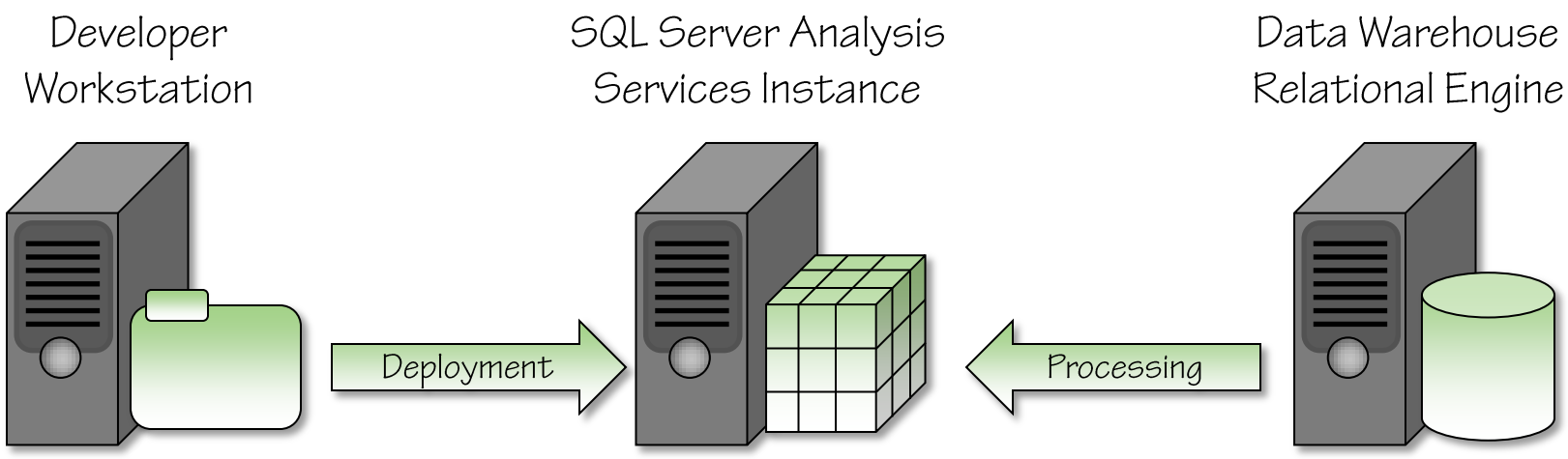
Stores the Cubes and Dimensions

Data Warehouse Relational Engine



Stores the Star Schemas

SSAS Database Development Workflow



1. The developer creates the Analysis Services Database, Dimensions and Cubes using BIDS

2. The database project is deployed to the Analysis Server. This creates the database, dimension, and cube definitions on the server.

3. The SSAS Database is processed. During processing, data is pulled from the data warehouse and stored in the SSAS dimensions and cubes

Demo: Creating, Deploying and Processing an SSAS Database

- Create an Analysis Services database project in BIDS
- Deploy the database to an Analysis Services Instance
- Process the database
- Browse the cube using the Cube Browser in BIDS

SSAS Clients

- Overview of SSAS Clients
- SSAS Protocols and APIs
- SSAS Languages
- Demo: Excel, SQL Server Reporting Services, and .NET Clients

Overview of SSAS Clients

- **A wide range of clients that can consume data from SSAS**
- **General Purpose Tools like Excel 2007**
- **Business Intelligence Specific Tools**
  - Proclarity
  - PerformancePoint
  - SQL Server Reporting Services
- **SharePoint**
- **Custom Applications**
  - Using the Protocols, APIs and Language discussed next

SSAS Protocols and APIs

- **SQL Server Analysis Services Protocols and APIs**
  - XMLA – XML for Analysis. The client/server protocol
  - ADOMD.NET
    - Microsoft.AnalysisServices.AdomdClient
      - AdomdConnection
      - AdomdCommand
      - AdomdDataAdapter
      - AdomdDataReader
    - Microsoft.AnalysisServices.AdomdServer
      - Creating Stored Procedures and UDFs on the server
  - AMO – Analysis Management Objects
    - .Net Object Model that represents and SSAS Instance and its objects

SSAS Languages

- **Mutlidimensional Expressesions (MDX)**
  - Query language for multi-dimensional databases
  - Created by the Analysis Services team at Microsoft
  - Now an industry standard across vendors.
  - Uses some SQL-like keywords (SELECT, FROM, WHERE), but is NOT SQL.
- **Data Mining Extensions (DMX)**
  - Used to create, train, query and predict using Data Mining
  - We don't go into Data Mining or DMX in the module
- **Analysis Services Scripting Langauge (ASSL)**
  - XML based scripting language for defining objects

Demo: Excel, SQL Server Reporting Services, and .NET Clients

- Querying An SSAS Cube in Excel
- Reporting Against an SSAS Cube in SSRS
- Consuming SSAS via ADOMD.NET in a Web Application

Review

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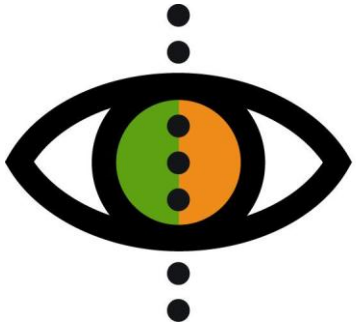

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