SSAS Multidimensional vs. SSAS Tabular
Which one do I choose?

Microsoft SQL Server
ANALYSIS SERVICES

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Which Model Should I Choose?

Tangibles

BISM

Different Flavors of Analysis

Considerations

Scalability

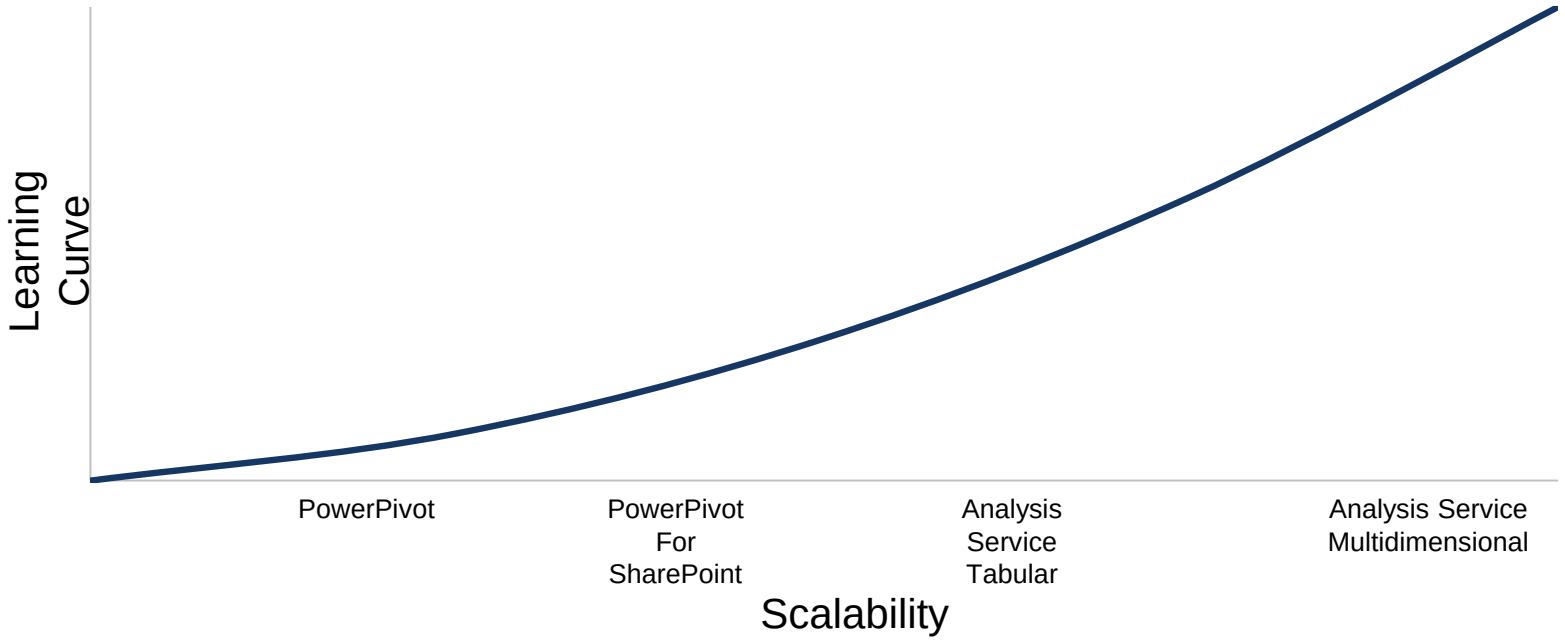
Performance

Time to Develop

Complex Business Problems

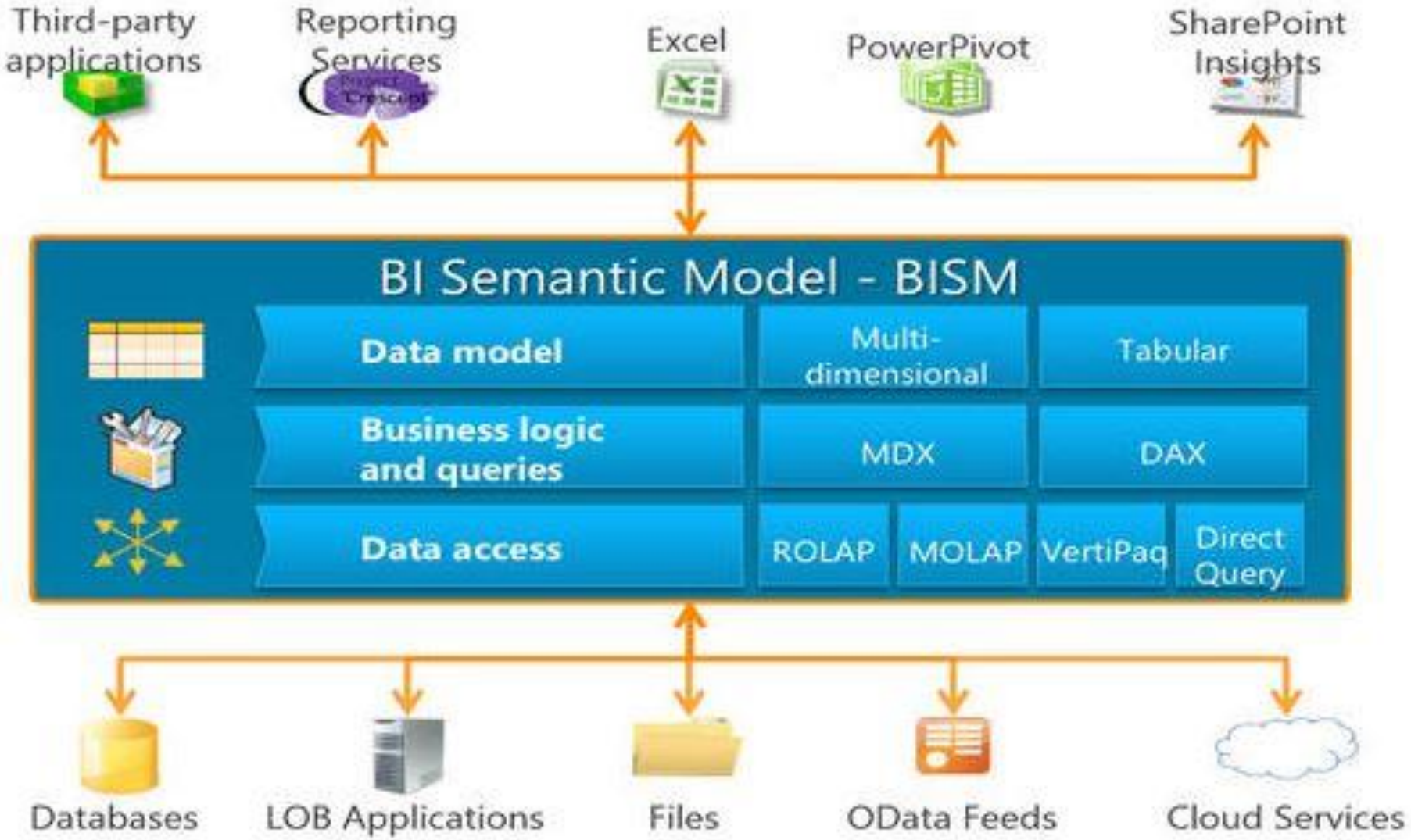
Learning Curve

Different Flavors of Analysis



Feature	Multidimensional Modeling	Tabular Modeling	Power Pivot for Sharepoint
Data Sources	Relational Databases	Relational databases, Analysis Services cubes, Reporting Services reports, Azure DataMarket datasets, data feed, Excel files and text files	Relational databases, Analysis Services cubes, Reporting Services reports, Azure DataMarket datasets, data feed Excel files and text file
Development Tool	SQL Server Data Tools (SSDT)	SQL Server Data Tools (SSDT)	PowerPivot for Excel
Management Tool	SQL Server Management Studio (SSMS)	SQL Server Management Studio (SSMS)	SharePoint Central Administration PowerPivot Configuration Tool
API	AMO, AMOMD.NET and PowerShell	AMO, AMOMD.NET and PowerShell	No Support
Reporting & Analysis Tool	Report Builder, Report Designer, Excel PivotTable and PerformancePoint dashboard	Report Builder, Report Designer Excel PivotTable, PerformancePoint dashboard and Power View	Report Builder, Report Designer, Excel PivotTable, PerformancePoint dashboard and Power View
Query & Expression Language	MDX Scripting – Calculations (cube designer) MDX – Queries & Calculations DMX – Data Mining Queries	DAX – Calculations & Queries MDX – Queries	DAX – Calculations & Queries MDX – Queries
Write Back Support	Yes	No	No
Security	Role-based permissions in SSAS & cell-level security	Role-based permissions in SSAS and row-level security	File-level security using SharePoint permissions
Data Compression	3+ times	10+ times	10+ times

BI SEMANTIC MODEL (BISM): ARCHITECTURE



Scalability

How Does the Server Handle Being Overloaded?

Amount of Data

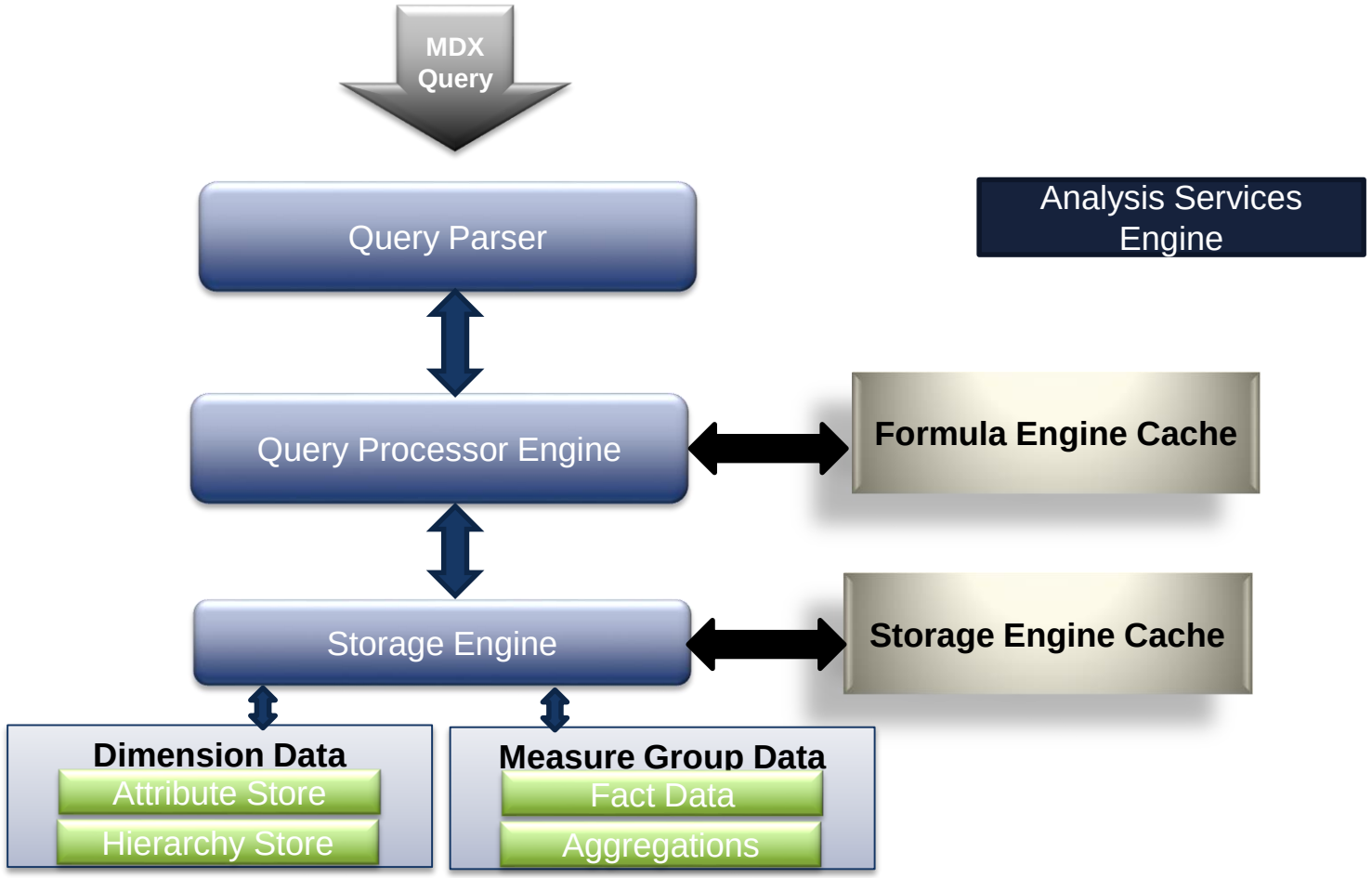
Server Resources

Disk Space

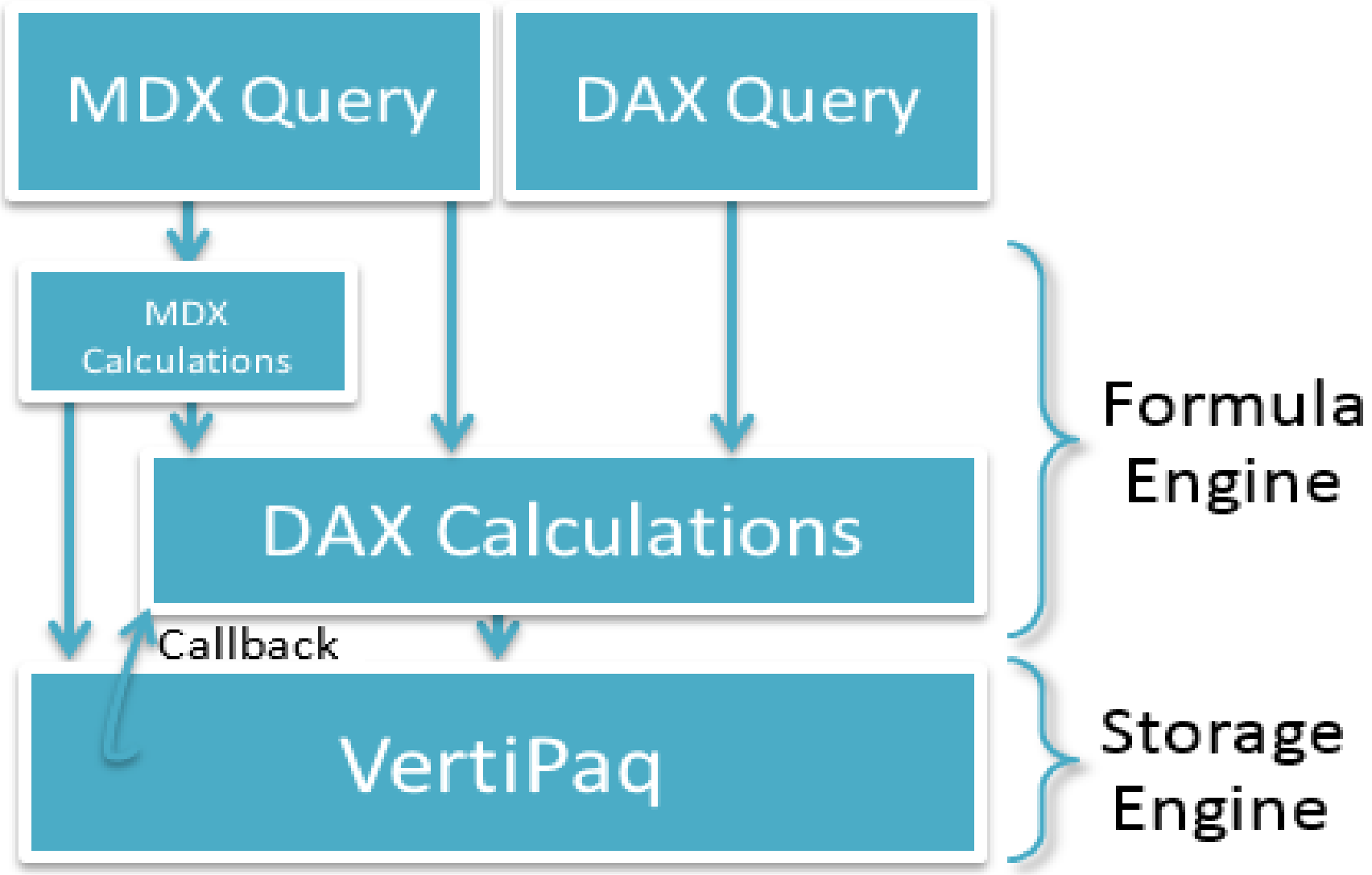
Scalability

Multidimensional	Tabular
• Pre-Aggregated Data From Disk	• In-Memory Technology (x-Velocity)
• Can Store Very Large Amounts of Data	• Can Store Large Amounts of Data
• Uses Aggregations to Increase Query Performance	• No Aggregations. Column-Based Storage.
• Data Compression 3x	• Data Compression 10x

SSAS UDM Query Processing



SSAS Tabular Query Processing



Comparing the UDM vs Tabular Storage Engines

Server	Scenario	Approximate Query Performance
UDM	If query hits an aggregation	~ seconds
UDM	If query misses aggregations but the fact data is cached in memory in the file system cache	~ minute
UDM	If query misses aggregations and no fact data is cached in memory in the file system cache	~ minutes
Tabular		~ milliseconds

Performance

Multidimensional

- Pre-Aggregated Data From Disk
- Can Store Very Large Amounts of Data
- Uses Aggregations to Increase Query Performance
- Often Faster Than Tabular When Pulling From Warm Cache

Tabular

- Generally Speaking Tabular will Perform Faster
- Tabular Engine Does Not Require a Great Deal of Performance Tuning
- Best at Returning Low Granularity Data

Demo

Tabular Trace

OLAP Trace

Query End Events

Time to Develop

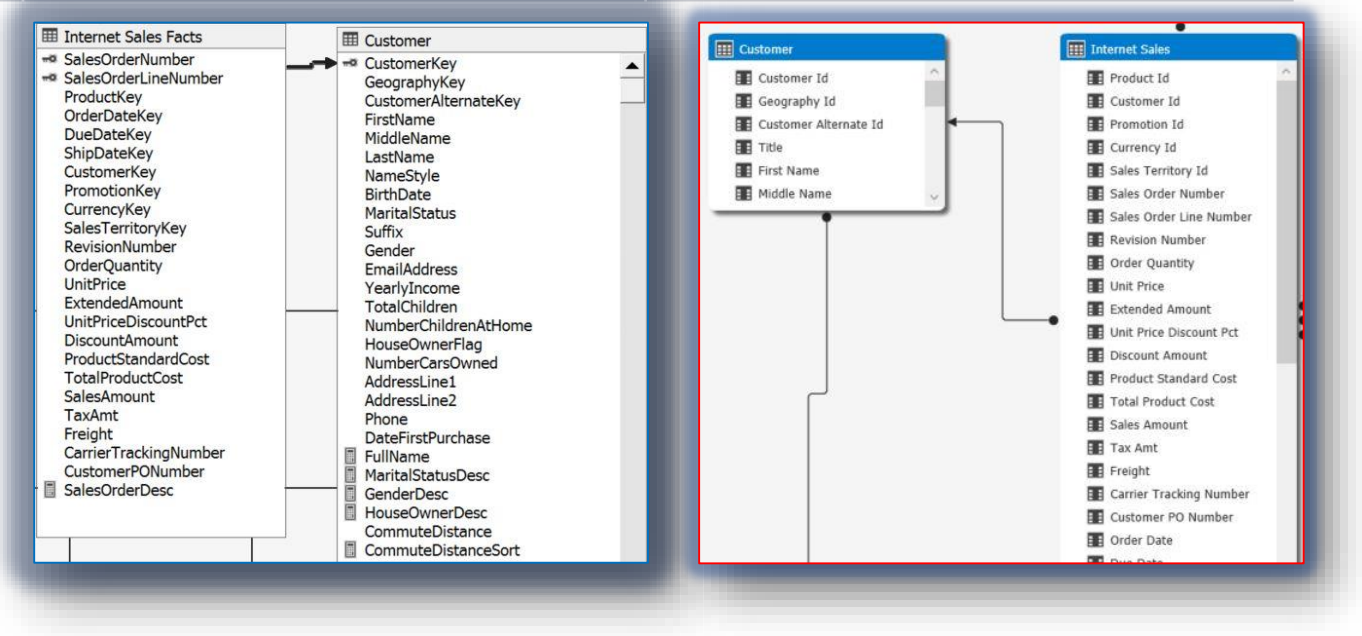
Multidimensional	Tabular
• Long Planning and Development Cycles • No Upgrade Path • Requires Dimensional Model	• By Far Less Time to Develop • Can Upgrade From Power Pivot • Does Not Require Dimensional Model • Much Simpler Interface for Creating Model

Data Model - Data Relationships

- One-to-many
- Parent-Child Hierarchies
- Role-playing dimensions
- Many-to-Many Relationships
- Reference Relationships
- Hierarchies
- Additional Modeling Features

Data Relationships – One-to-Many

Relationship	Multidimensional Modeling	Tabular Modeling
One-to-Many		



Data Relationships – Many-to-Many

Relationship	Multidimensional Modeling	Tabular Modeling
Many-to-Many		

Customer ID	Customer Name
1	Elizabeth Johnson
…	…

Customer Table

Customer ID	Sales Order	Sales Amount
1	S9100	$ 4,000
1	S9101	$ 2,500
1	S9102	$ 7,000
…	…	…

Sales Order Table

CustomerID	Customer Profile
1	Sports Enthusiast
1	Casual Gamer
1	Fitness Expert
…	…

Bridge / Intermediate Table
to assign the customer profile

Data Relationships – Reference Relationships

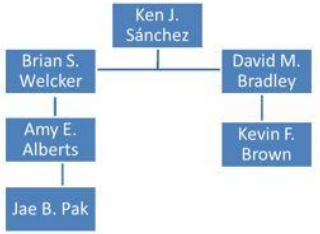
Relationship	Multidimensional Modeling	Tabular Modeling
Reference		

Data Relationships – Hierarchies

Relationship	Multidimensional Modeling	Tabular Modeling
Standard Hierarchies	✓	✓
Ragged Hierarchies	✓	✗
Parent-Child	✓	!

Employee	Manager
Ken J. Sánchez	Ken J. Sánchez
Brian S. Welcker	Ken J. Sánchez
Amy E. Alberts	Brian S. Welcker
Jae B. Pak	Amy E. Alberts
David M. Bradley	Ken J. Sanchez
Kevin F. Brown	David M. Bradley

Parent Child Source Data



Parent Child Hierarchy Tree

Data Relationships – Additional Modeling Features

Relationship	Multidimensional Modeling	Tabular Modeling
Perspectives		
Translations		
Actions		
Drillthrough		
Write-back		

Complex Business Problems

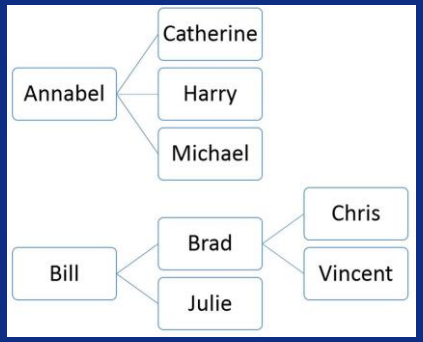
Multidimensional	Tabular

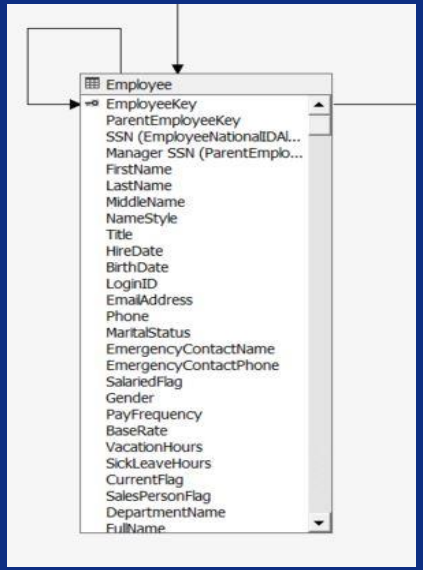
• Has Built-in Capabilities for Complex Relationships.
  • Role Playing
  • Parent-Child
  • Many-to-Many
	• Can Handle Complex Relationships with DAX

Demo

DAX – Parent Child

OLAP – Parent Child





Learning Curve

Multidimensional	Tabular
• Uses MDX (Multi-Dimensional Expressions) for Query Language • Difficult to Learn but has Benefits (Navigating Hierarchies) • More Complex KPI Creation • Multiple relationship types	• Uses DAX (Data Analysis Expressions) for Query Language • If You Know Excel Formulas Then DAX Will Be Easy • Simple Drag and Drop KPI Creation • Relationships are simple (no composite keys)

Business Logic

- Row-Level Transformations
- Aggregated Values
- Calculations
- Business Logic Scenarios

Business Logic

Row-Level Transformations

Multidimensional Modeling	Tabular Modeling
• Must be performed before the data is loaded into the model.	• Row-level transformations are created using calculated columns.
• Performed when the model is queried.	• Evaluation occurs on every record.
• Can transform dimension attributes.	• Enhance data directly in the model.
• Transformations can be applied using MDX.	• Not intended for heavy data cleansing (no ETL).

Business Logic

Aggregated Values

Multidimensional Modeling	Tabular Modeling
• Measures are used to create aggregate values.	• Measures are used to create aggregate values.
• Aggregated bottom to top across all hierarchies.	• Data is stored in memory
• Source data at the lowest granularity	• Aggregates are calculated at query time.
• Requires the use of native cube functions.	• Can include calculations that are based on multiple aggregated columns.

Business Logic

Calculations

Multidimensional Modeling	Tabular Modeling
• Use MDX to create calculations	• Use DAX to create calculations.
• Scope	• Filter
• Scope assignments do the work of multiple calculated measures	• Combination of DAX row-level and aggregation functions
	• DAX can dynamically evaluate a formula in different contexts.

Business Logic

Business Logic Scenarios

Multidimensional Modeling	Tabular Modeling
• **Hierarchy Logic** – MDX provides functions to work with data organized into a hierarchy.	• **Hierarchy Logic** – MDX provides functions to work with data organized into a hierarchy.
• **Custom Rollups** – parent child hierarchies & built in account intelligence	• **Custom Rollups** – not built in – can create using calculated columns and measures
• **Semi-additive Measures** – FirstChild, LastChild, FirstNonEmptyChild	• **Semi-additive Measures** - ClosingBalanceMonth and OpeningBalanceMonth
• **Time Intelligence** – can create using a wizard	• **Time Intelligence** – create using DAX functions
• **KPIs** - Supported	• **KPIs** - Supported
• **Currency Conversion** – can create using a wizard	• **Currency Conversion** – create using DAX functions
• **Named Sets –** Provides a way to return sets	• **Named Sets –** not available

Business Logic

Multidimensional

- Row Level Transformations
  - Must be done prior to data load
- Aggregated Values
  -Stored on Disk
- Calculations
  -MDX very robust
- Business Logic Scenarios
  – Provides a way to return sets

Tabular

- Row Level Transformations
  -Done in the Model
- Aggregated Values
  - Stored in Memory
- Calculations
  - DAX is very flexible
- Business Logic Scenarios
  - Named Sets Not Available

Security

- Row/Attribute-Level Security
- Dynamic Security
- Cell-Level and Advanced Security

Row/Attribute Security

Multidimensional

- Based on the concept of dimension data security to manage row-level access.
- Implementing dimension security for roles
- More complex security configurations can be accomplished through MDX.
- The access you grant or deny to a dimension member impacts the access a role has to related dimension members.

Tabular

- Implemented by granting access to rows in a table.
- Grant permission by entering a DAX expression that filters the rows in a table.
- The role has access to new table rows if they satisfy the DAX filter.
- The access you grant to a row in one table impacts the access a role has to rows in related tables.

Dynamic Security

Multidimensional

- Supports dynamic security
- You can configure dynamic, user-based security if your data contains a relationship between user IDs and the data users have permission to access by including the relationship in the MDX

Tabular

- Supports dynamic security
- You can configure dynamic, user-based security if your data contains a relationship between user IDs and the data users have permission to access by including the relationship in the DAX

Cell-Level & Advanced Security

Multidimensional

- Multidimensional projects natively allow you to implement advanced security capabilities not available in a tabular project.
- In a multidimensional project you can implement cell-level security to restrict access to a particular cell or group of cells in your model.
- Multidimensional projects also enable you to control the use of visual totals, grant or deny permission to drill through to detail data, and create default members for each role.
- In a multidimensional project, pre-aggregated summary values are calculated when data is processed into a model in order to improve query response times

Tabular

- Cell-level security is not provided in a tabular model.

Cell-Level & Advanced Security

Multidimensional

- Multidimensional projects also enable you to control the use of visual totals, grant or deny permission to drill through to detail data, and create default members for each role.
- In a multidimensional project, preaggregated summary values are calculated when data is processed into a model in order to improve query response times

Summary

Consider Tabular…

If You Have a Short Development Timeline
If You are Working with a Plethora of Memory
If Your Data Model is Simple
If You Have Many Disparate Data Sources
If Users Need to Query Large Amounts of Detail Data

Consider Multidimensional…

If You are Using SQL Server 2008 R2 or Earlier
If You Have a Multi-Terabyte Data Source
If You Have a Complex Data Model
If You Need Multidimensional only features (Actions, Data Mining, Writeback, Translations)

Demo

Decision Matrix

Resources

DAX

- Parent-Child Hierarchies

Modeling

- Choosing a Tabular or Multidimensional Modeling Experience in SQL Server 2012 Analysis Services
- SSAS Multidimensional Modeling MSDN
- When to use MDM and Tabular Models

Profiling SSAS

- Analysis Services Trace Events
- Clearing the SSAS Caches
- Milliseconds to Seconds Conversion
- Clear SSAS Server Query Cache for MDX Query Performance Testing

Thank You for Attending