

Tabular versus Multidimensional

May the Best Model Win

Stacia Misner

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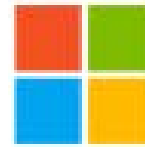


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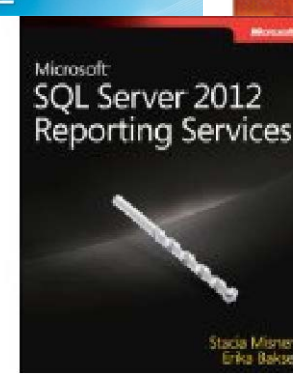
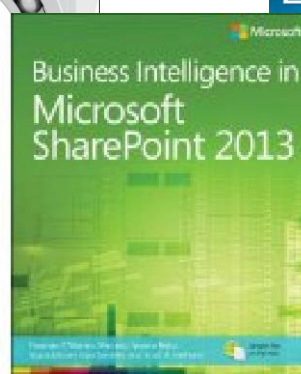
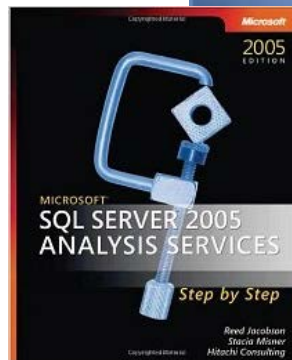
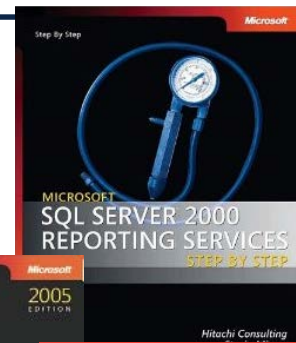
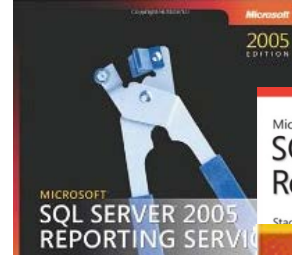
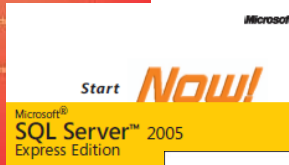
O'REILLY®



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Overview

- Business Intelligence Semantic Model
- Data Model Layer
- Business Logic & Queries Layer
- Data Access Layer

Business Intelligence Semantic Model

Multidimensional

Tabular

MDX

DAX

MOLAP

HOLAP

ROLAP

xVelocity

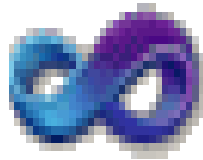
DirectQuery

Data Model Layer

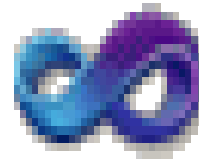
- Development Environment
- Data Sources
- Model Design Features

Development Environment

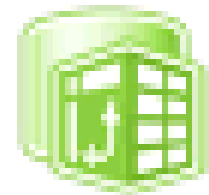
Multidimensional



SSDT BI



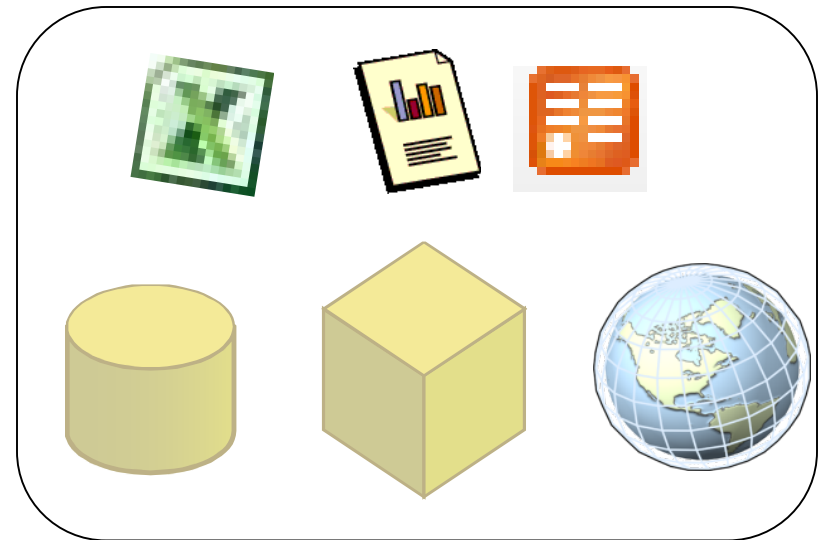
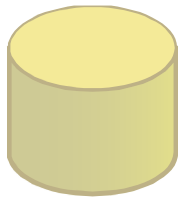
SSDT BI



PowerPivot

Data Sources

Multidimensional



Model Design Feature	Multidimensional	Tabular	PowerPivot for SharePoint
Actions	✓		
Aggregations	✓		
Calculated Measures	✓	✓	✓
Custom Assemblies	✓		
Custom Rollups	✓		
Distinct Count	✓	✓	✓
Drillthrough	✓		✓
Hierarchies	✓	✓	✓
Key Performance Indicators	✓	✓	✓
Linked Objects	✓		✓ (Linked tables only)
Many-to-Many Relationships	✓		
Parent-Child Hierarchies	✓	✓	✓
Partitions	✓	✓	
Perspectives	✓	✓	✓
Semi-additive Measures	✓	✓	✓
Translations	✓		
Writeback	✓		

SSAS Multidimensional: Many-to-Many

Why did you buy this product?



Price

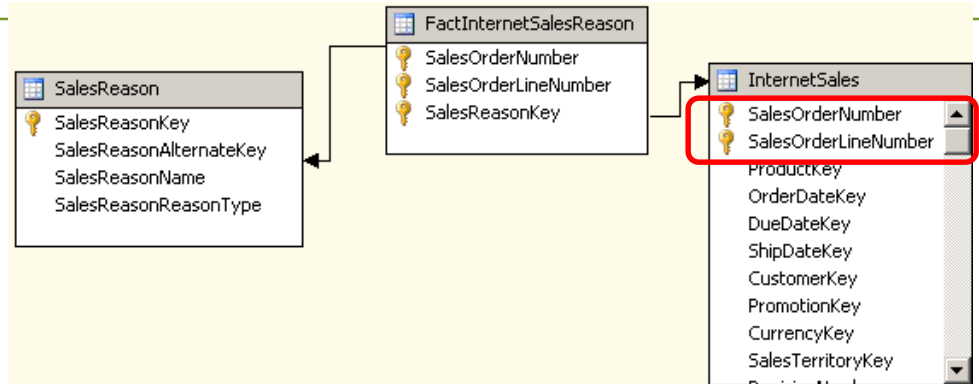


On Promotion

Magazine Advertisement

Television Advertisement

...



Many-to-many

Degenerate dimension

Sales Reason ▼			
Manufacturer	Quality	Grand Total	
Sales Order Number ▼	Order Quantity	Order Quantity	Order Quantity
SO43697	1	1	1

SalesOrderNumber	SalesOrderLineNumber	SalesReasonKey
SO51522	1	1
SO51522	1	2
SO51522	2	1
SO51522	2	2

SalesReasonKey	SalesReasonKey
1	Price
2	On Promotion
3	Magazine Advertisement
4	Television Advertisement

Factless Fact Table (aka Bridge Table)

SSAS Multidimensional: Writeback

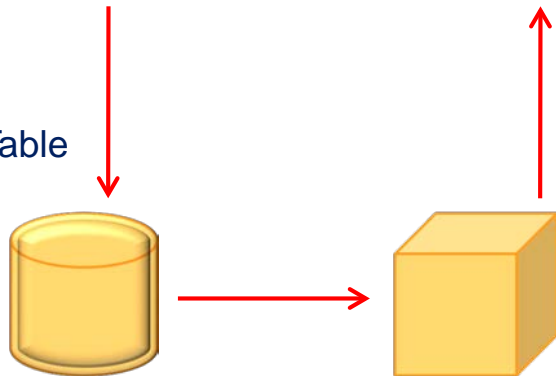
				Calendar Year ▼		Quarter	Month		
				2006					
				2006 Q1		2006 Q2	2006 Q3	2006 Q4	Total
Account Level 01 ▼	Account Level 02	Account Level 03	Scenario ▼	Amount	Amount	Amount	Amount	Amount	Amount
Balance Sheet				.00	.00	.00	.00	.00	.00
Net Income	Operating Profit	Gross Margin	Actual	3,541,681.80	3,488,015.90	7,814,404.18	6,282,537.43	21,126,639.31	21,126,639.31
			Budget	3,889,000.00	3,711,900.00			7,600,900.00	7,600,900.00
			Budget Revision 1.0			8,000,000.00			
		Operating Expenses	Actual	2,042,274.30	2,305,854.04	3,717,024.07	3,625,965.79	11,691,118.20	11,691,118.20
			Budget	1,858,350.00	2,074,890.00			3,933,240.00	3,933,240.00
			Budget Revision 1.0						

Dimension Writeback

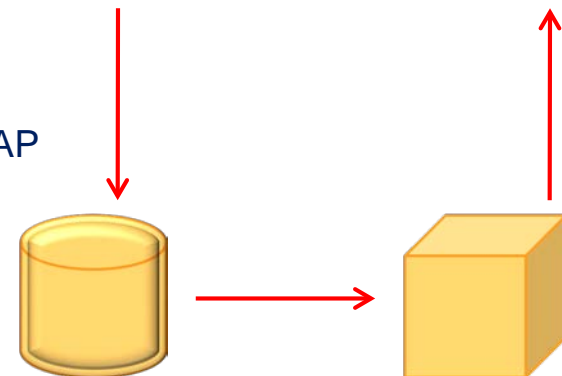
Enterprise Edition
Only

Cell Writeback

Dim Table



ROLAP



Business Logic & Query Layer

- Calculations
- User Experience in Client Tools

Calculations

Multidimensional

MDX

- Calculated Measures
- Custom Members
- Named Sets
- KPIs
- MDX Script

- Calculations
- Measures
- KPIs

MDX Calculated Measures



New Calculated Member

Name:

Parent Properties

Parent hierarchy:

Parent member:

[Change](#)

Expression

`([Measures].[Reseller Sales Amount]-[Measures].[Reseller Cost])
/
[Measures].[Reseller Sales Amount]`

Named Sets



New Named Set

Name:
[Top 10 Products]

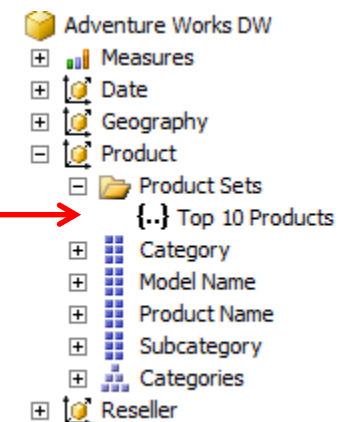
Expression

```
TopCount  
(  
    [Product].[Product].[Product].Members,  
    10,  
    [Measures].[Reseller Sales Amount]  
)
```

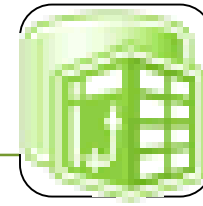
Additional Properties

Type: Dynamic

Display folder:

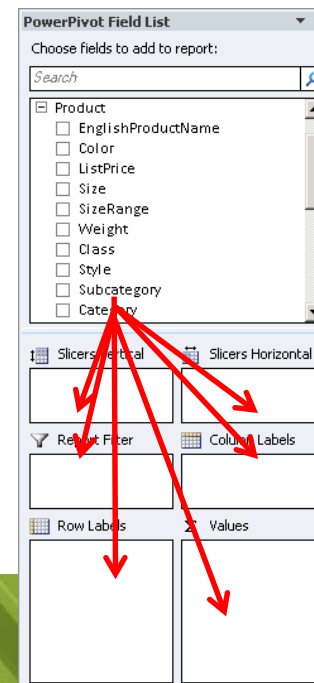


DAX Calculations



[Subcategory]		=RELATED(Subcategory[EnglishProductSubcategoryName])					
Product...	ProductAlternateKey	ProductSubcategory...	EnglishProductName	Size	EnglishDescription	Subcategory	Category
223	CA-1098	19	AWC Logo Cap		Traditional style wit...	Caps	Clothing
224	CA-1098	19	AWC Logo Cap		Traditional style wit...	Caps	Clothing
225	CA-1098	19	AWC Logo Cap		Traditional style wit...	Caps	Clothing
212	HL-U509-R	31	Sport-100 Helmet, Red		Universal fit, well-ve...	Helmets	Accessories
213	HL-U509-R	31	Sport-100 Helmet, Red		Universal fit, well-ve...	Helmets	Accessories

- Perform lookup (decode)
- Derive new value
 - Break out column values
 - Combine column values



DAX Measures



Measure Settings

Table name: ResellerSales

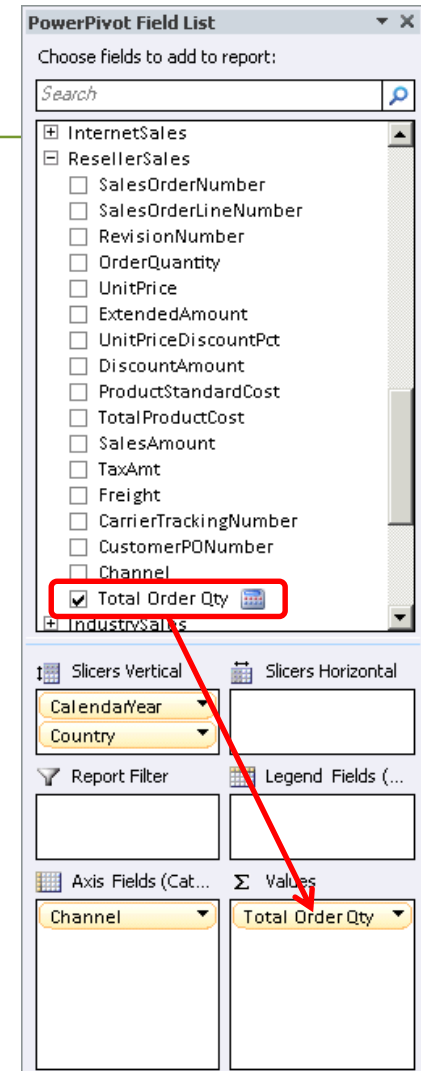
Measure Name (All PivotTables): Total Order Qty

Custom Name (This PivotTable): Total Order Qty

Formula:

`=sum(InternetSales[OrderQuantity]) + sum(ResellerSales[OrderQuantity])`

OK Cancel



`=SUM(InternetSales[OrderQuantity]) + SUM(ResellerSales[OrderQuantity])`




Multidimensional KPIs



Browser View

Set the date context in the Filter Pane

Dimension	Hierarchy	Operator	Filter Expression
Date	Calendar	Equal	{ 2008 }
<Select dimension>			

Display Structure	Value	Goal	Status	Trend
 Gross Profit Margin	-0.08%	-0.01		

Tabular KPIs

Model.bim* X

[SalesAmount] f_x GrossMarginPct:=[Sum of SalesAmount]-[Sum of TotalProductCost]/[Sum of SalesAmount]

ProductStandardCost	TotalProductCost	SalesAmount	TaxAmt	Freight	CarrierTrackingNumber	CustomerPONumber	OrderDate	DueDate
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/1/2003 12:...	8/13/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/2/2003 12:...	8/14/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/4/2003 12:...	8/16/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/4/2003 12:...	8/16/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/5/2003 12:...	8/17/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/7/2003 12:...	8/19/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/7/2003 12:...	8/19/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/8/2003 12:...	8/20/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/8/2003 12:...	8/20/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/8/2003 12:...	8/20/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/9/2003 12:...	8/21/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/9/2003 12:...	8/21/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/10/2003 12:...	8/22/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/11/2003 12:...	8/23/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/13/2003 12:...	8/25/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/13/2003 12:...	8/25/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/14/2003 12:...	8/26/2003 .
\$1.87	\$1.87	\$4.99	\$0.40	\$0.12			8/15/2003 12:...	8/27/2003 .
Sum of TotalProduct...		Sum of SalesAm...						
		GrossMarginPct:...						

Customer Date Geography Product Category Subcategory Internet Sales

Record: 1 of 60,398

KPI base measure (value): GrossMarginPct

KPI Status

Define target value:

Measure:

Absolute value: 5

Define status thresholds:

0.2 0.45

Target

Select icon style:

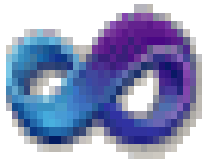
Descriptions

OK Cancel

User Experience

Multidimensional

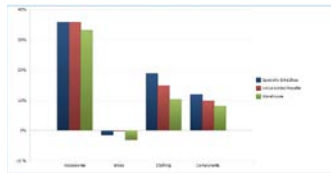
MDX



SSRS



Excel



PerformancePoint



Power View

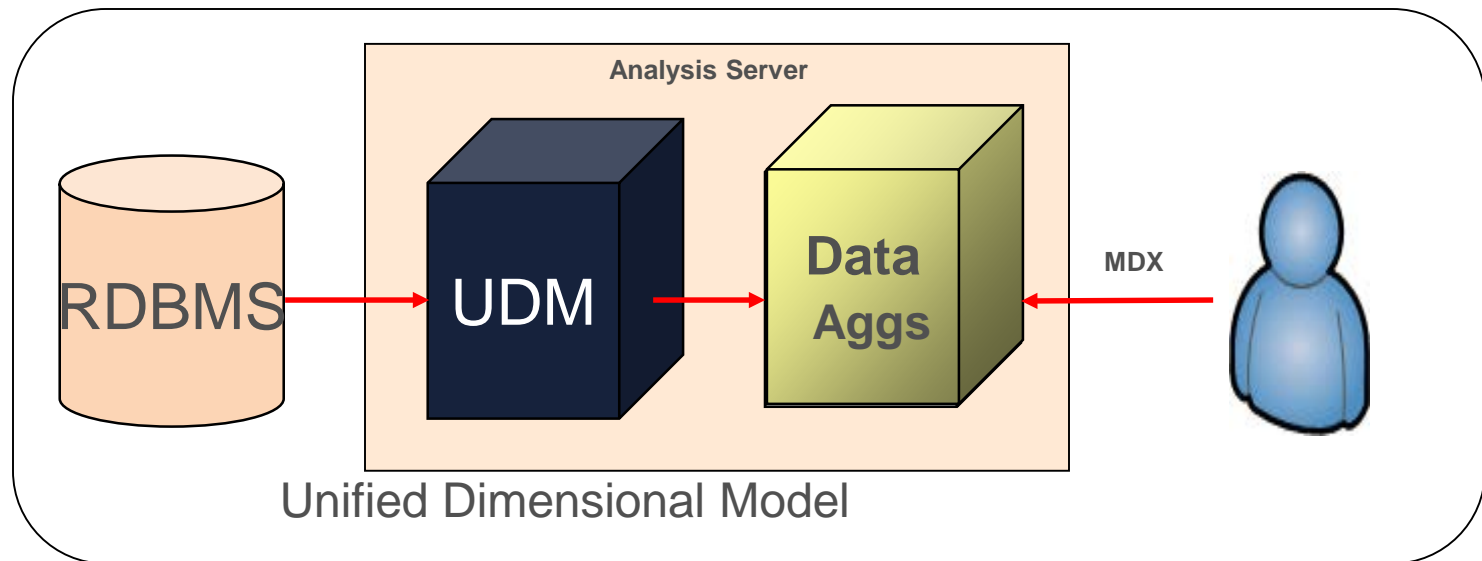


PowerPivot

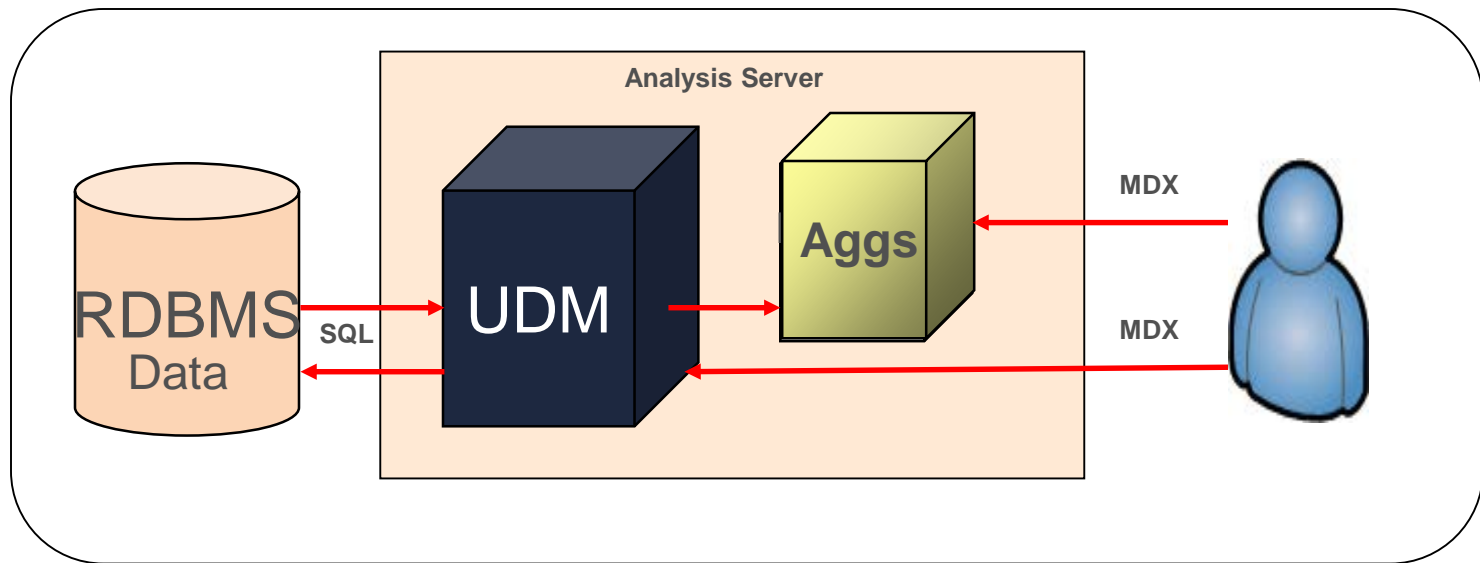
Data Access Layer

- MOLAP, HOLAP, or ROLAP
- In-Memory versus Direct Query
- Security

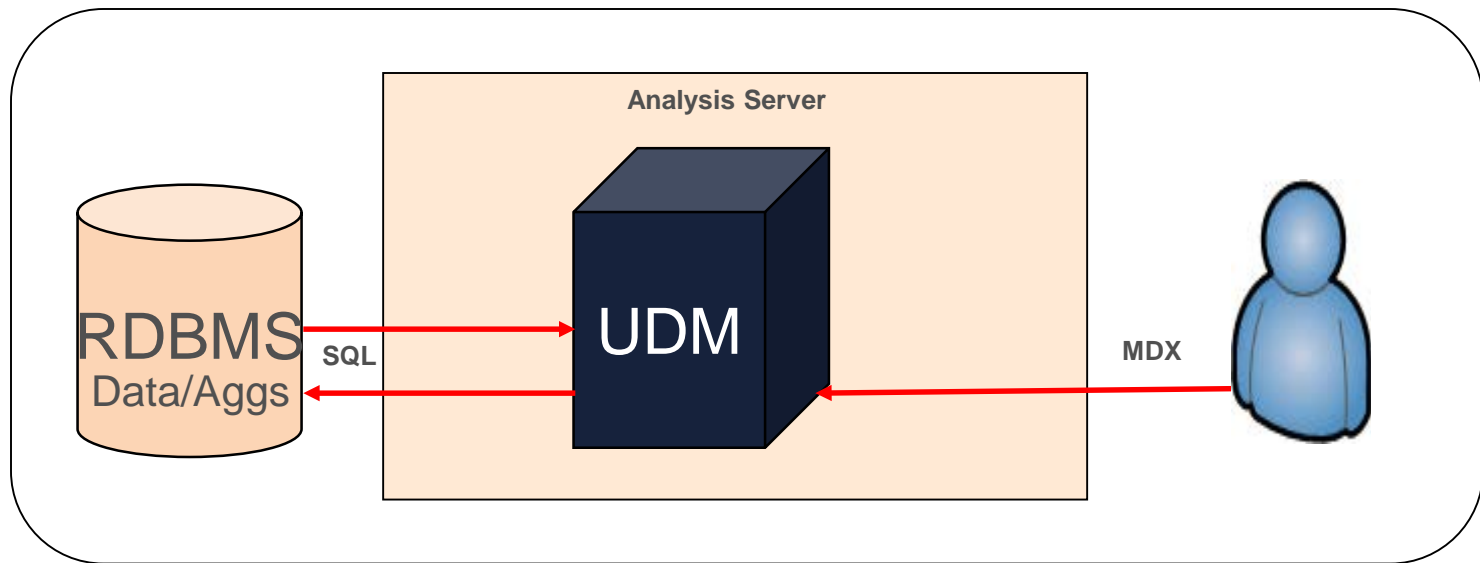
MOLAP



HOLAP

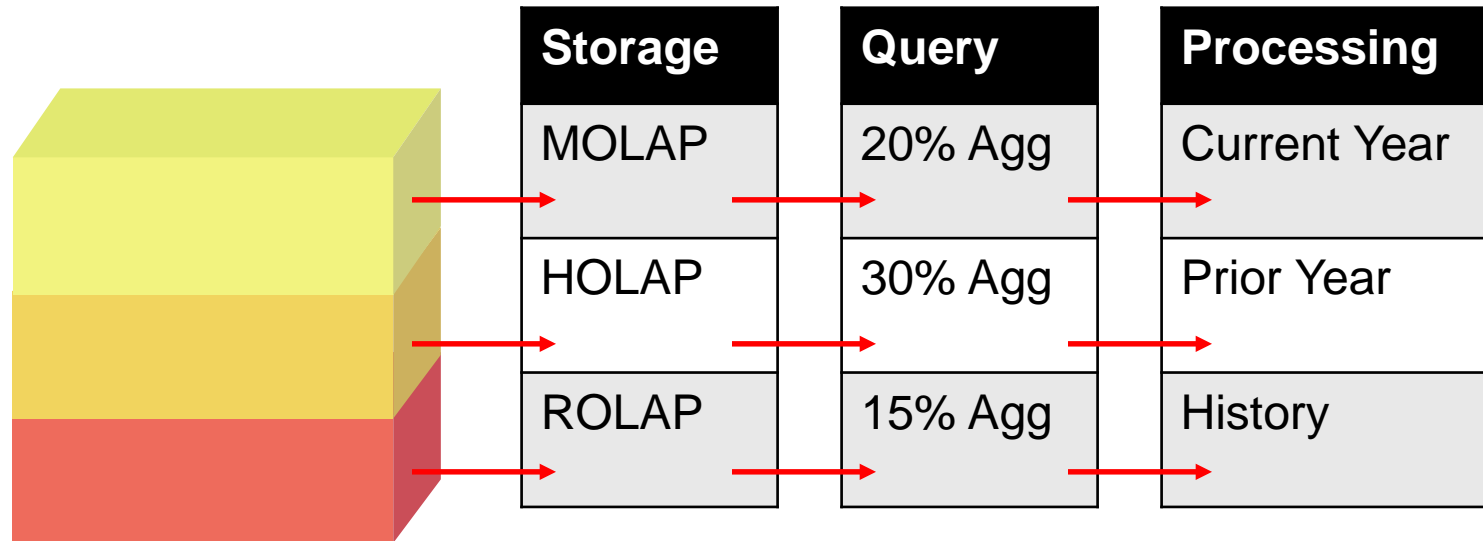


ROLAP



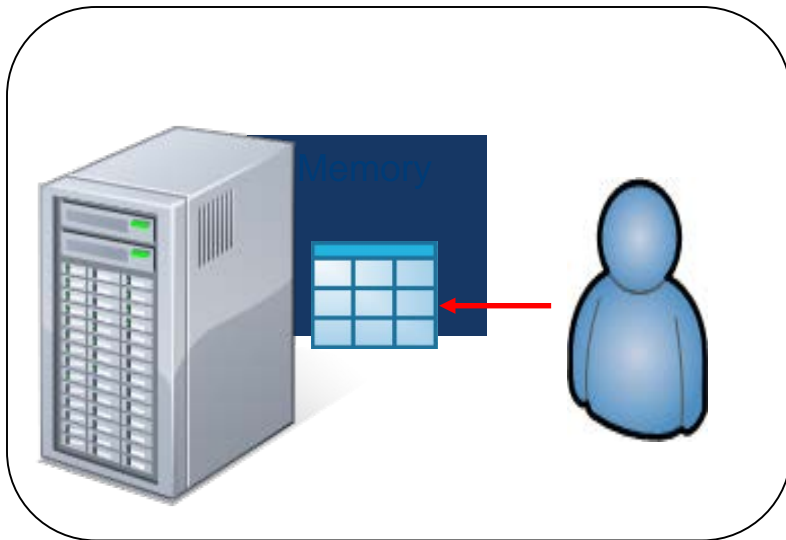
Multidimensional Partitioning

- Enables scalability
- Boosts query performance
- Optimizes processing

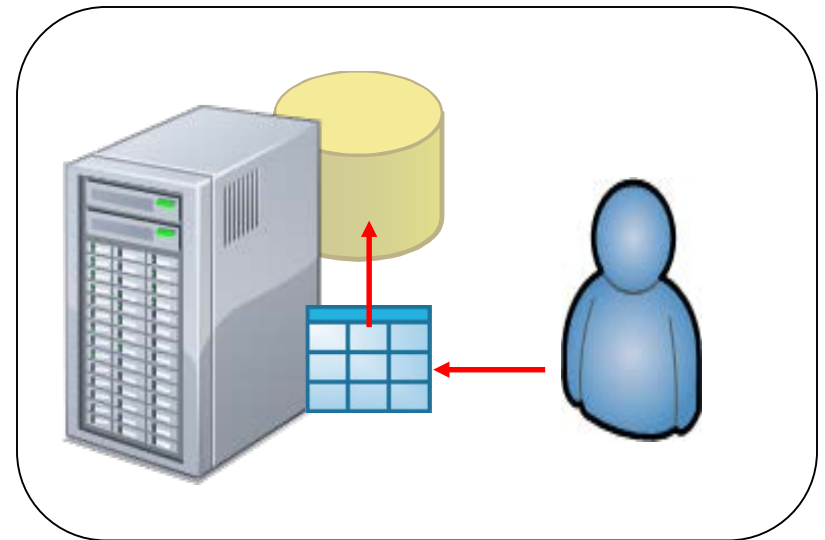


In-Memory versus Direct Query

In-Memory
(xVelocity)



Direct Query

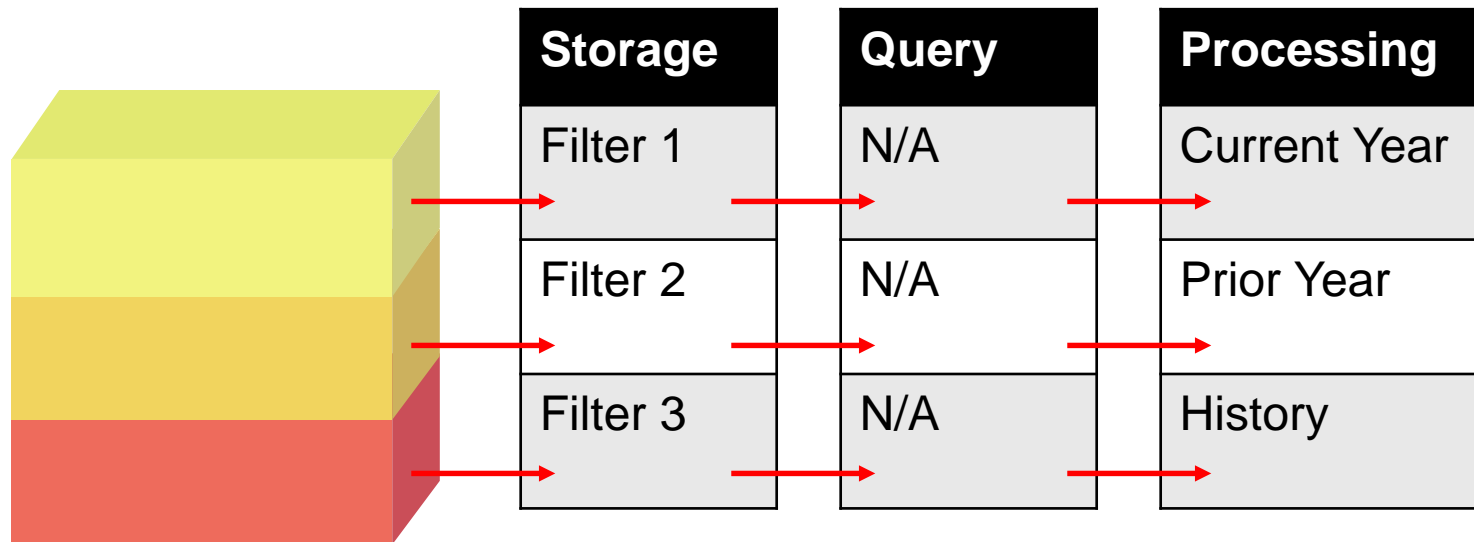


In-Memory versus Direct Query

Feature	In-Memory	DirectQuery
Data Sources	Relational database Analysis Services Reporting Services report Azure DataMarket dataset Data feed Excel file Text file	SQL Server 2005 or later
Calculations	Measures KPIs Calculated columns	Measures KPIs
DAX	Fully functional	Time intelligence functions invalid Some statistical functions evaluate differently
Security	Analysis Services roles	SQL Server permissions
Client tool support	SSMS Power View Excel	SSMS Power View

Tabular Models Storage: Partitioning

- Enables scalability
- Optimizes processing



Security

Multidimensional

- Role-based
 - Dimension-level
 - Cell-level
- Dynamic security support

Tabular

SSAS Tabular

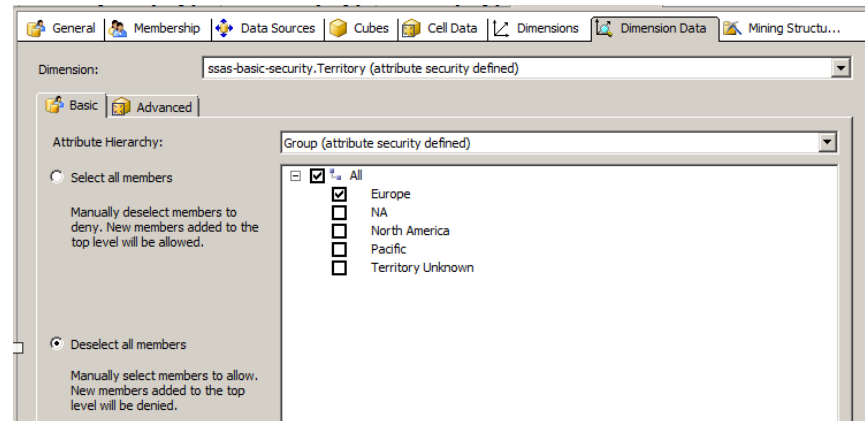
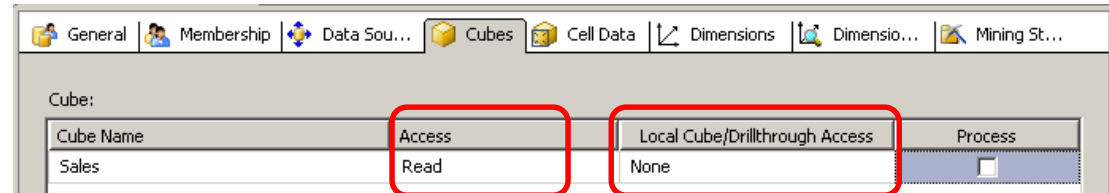
- Role-based
 - Row-level
- Dynamic security support

PowerPivot

- File-level

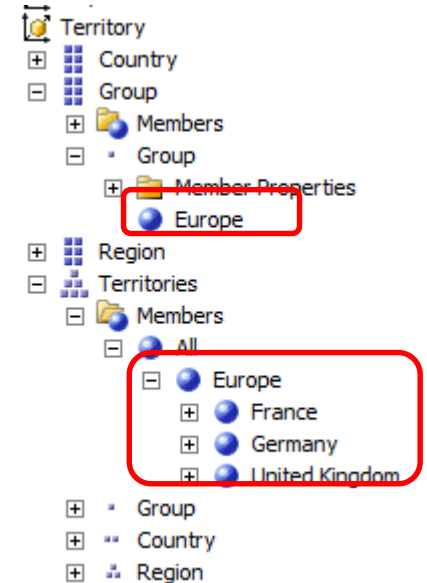
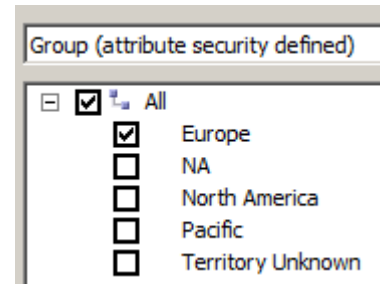
Multidimensional User Security

- Add security roles to cube using Windows groups
- Grant permissions
 - Cube
 - Drill-through
 - Creation of local cube
- Apply granular security, if necessary
 - Dimension level
 - Cell level



Multidimensional Dimension Security

- Allowed set or denied set
 - Restricts access to members
- Default member
 - Automatic filter
- Visual totals
 - Filters grand total when enabled



Group ▼	Sales Amount
Europe	\$19,800,577.06
Grand Total	\$109,809,274.20

☐ Enable Visual Totals

Group ▼	Sales Amount
Europe	\$19,800,577.06
Grand Total	\$19,800,577.06

☒ Enable Visual Totals

Multidimensional Cell Security

General Membership Data Sources Cubes Cell Data Dimensions Dimension Data Mining Structu...

Cube: Sales [Test cube security](#)

☒ Enable read permissions

Allow reading of cube content: Edit MDX: ...

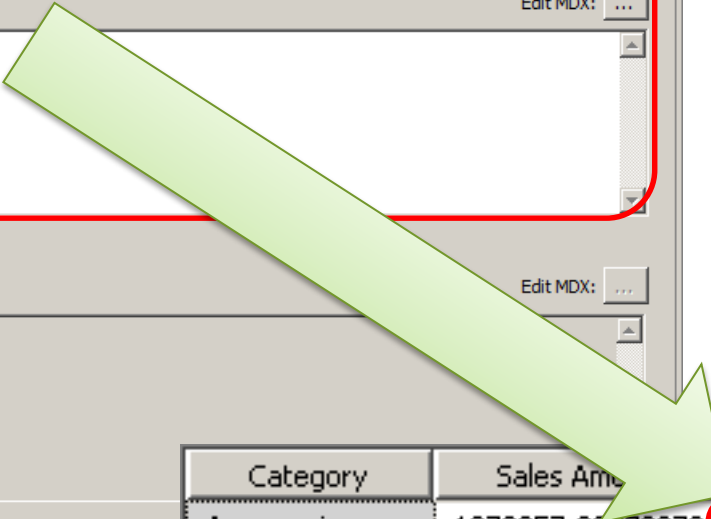
NOT [Measures].CurrentMember IS [Measures].[Cost]

☐ Enable read-contingent permissions

Allow reading of cell content contingent on cell security: Edit MDX: ...

☐ Enable read/write permissions

Allow reading and writing of cube content:



Category	Sales Amount	Cost	Sales Growth
Accessories	1272057.88779978	(null)	1272057.88779978
Bikes	94620526.2076939	(null)	94620526.2076939
Clothing	2117613.44909996	(null)	2117613.44909996
Components	11799076.6584	(null)	11799076.6584
Unassigned P...	(null)	(null)	(null)
Other Products	15188747.9952997	(null)	15188747.9952997

Tabular Models Security

Model roles

Row-level
filters

📁 Databases

📁 AdventureWorks Tabular Model SQL 2012

📁 Connections

📁 Tables

📁 Roles

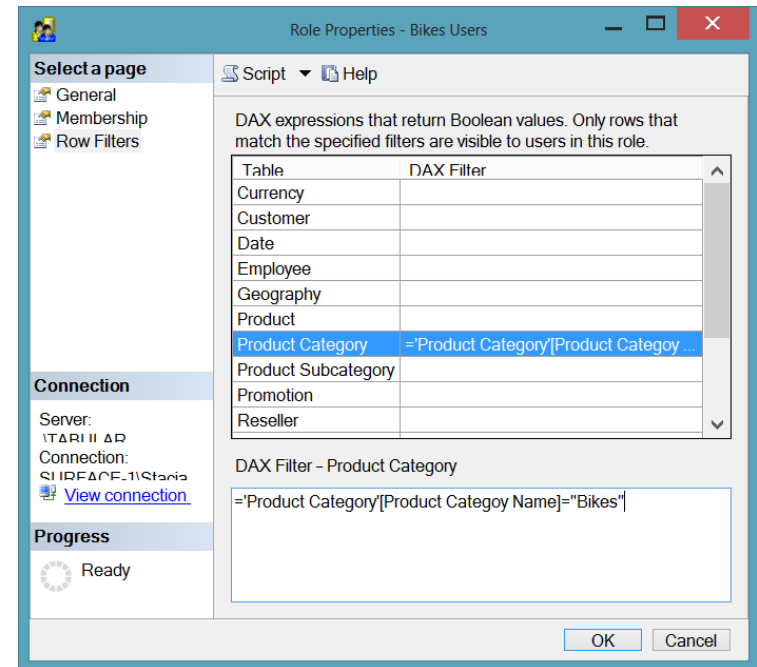
👤 Admins

👤 Analysts

👤 Operators

👤 Users

👤 Bikes Users



Power Pivot Workbooks Security

File-Level

SharePoint permissions
for uploaded workbooks

A screenshot of the SharePoint interface. The 'Document Permissions' link in the 'Library Tools' ribbon is highlighted with a red box and a red arrow. The interface shows a document titled 'Adventure Works Sales' with a bar chart and a table of data. The table has columns for 'Salesperson', 'Sales', 'Profit', and 'Salesperson'. The data is as follows:

Salesperson	Sales	Profit	Salesperson
1000	1000	1000	1000
1001	1001	1001	1001
1002	1002	1002	1002
1003	1003	1003	1003
1004	1004	1004	1004
1005	1005	1005	1005
1006	1006	1006	1006
1007	1007	1007	1007
1008	1008	1008	1008
1009	1009	1009	1009

Conclusion?

Multidimensional Restrictions and Limitations

- Source data must be relational, ideally star schema
- Processing a dimension object requires reprocessing of dependent cube
- No migration path to tabular or Power Pivot is available

Tabular Restrictions and Limitations

- No migration path to multidimensional
- No translation support
- No writeback support
- No custom rollups
- Hierarchies don't aid performance, just navigation
- Serial partition processing takes longer
- Single partition in DirectQuery mode
- Custom aggregations require more calculated measures in workbook

PowerPivot Restrictions and Limitations

- No migration path to SSAS Multidimensional
- No translation support
- No writeback
- No custom rollups
- No partitioning
- Hierarchies don't aid performance, just navigation
- Custom aggregations require more calculated measures in workbook
- SharePoint upload must be less than 2 GB
- Sharing online via Power Pivot for SharePoint only

Feedback

Your feedback is important to us
& there will be a feedback prize draw @

<http://www.sql.ie/feedback>

15:10 - Next Session ...

- Lady Windermere (Charlemont #1)
 - Kevin Kline – Convince Me – Persuasion Techniques That Get Things Done
- Dorian Gray (Charlemont #2)
 - Klaus Aschenbrenner – Plan Caching in SQL Server
- Intentions (Charlemont #3)
 - Simon Sabin – Storing of sensitive data in SQL Server – Meeting the PCI Data Security Standards
- Ideal Husband (Charlemont #4)
 - James R Jones – Migrating to APS
- Lord Arthur Saville (Charlemont #5)
 - Andre Kamman – How to write professional Powershell scripts