

MDX: From WITH To WHERE

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Richmond SQL Server Users Group
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About Jessica M. Moss

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- Microsoft SQL Server MVP
- Business Intelligence Architect with Ironworks Consulting
- MCDBA, MCTS, MCITP
- Mid-Atlantic Regional Mentor and active member of SQL PASS
- Author of *Microsoft SQL Server 2008 Integration Services: Problem, Design, Solution*
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Agenda

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- 10,000 Foot View
- Analysis Services
- MDX Glossary
- Syntax
- Functions
- Calculated Measures
- Business Scenario
- References
- Questions

The 10,000 Foot View

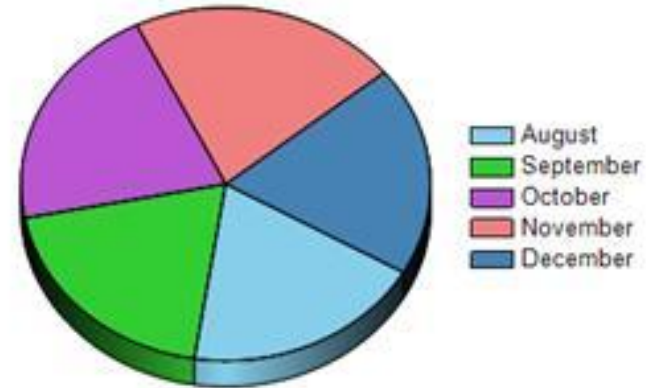
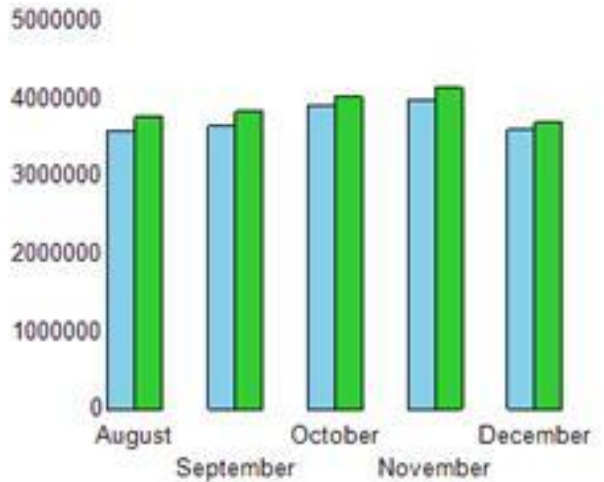
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Reports

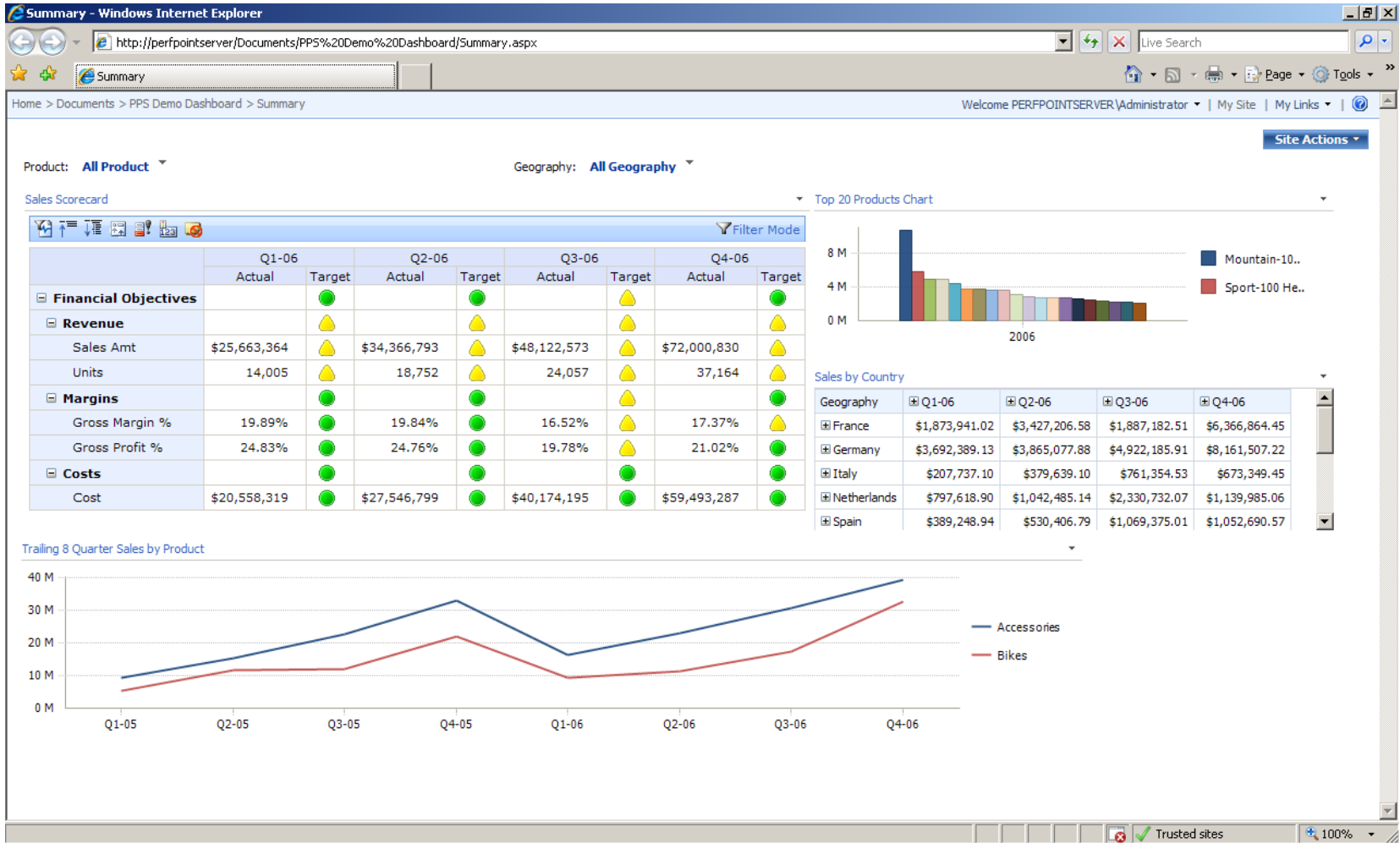
Monthly Store Inventory

	August	September	October	November	December
DC On Order Qty	2,601,032	1,525,420	1,449,824	1,449,824	1,489,753
Total DC Qty	3,750,619	4,013,408	4,138,997	4,138,997	3,691,450
DC Days In Stock	491,313	525,645	511,167	511,167	483,326
Available Qty	3,570,236	3,905,314	3,971,964	3,971,964	3,589,906



Dashboards

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Ad-hoc Analysis Demo

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The screenshot shows the Microsoft Excel 2010 interface. The ribbon is set to the 'Data' tab. The 'From Other Sources' dropdown menu is open, displaying the following options:

- From SQL Server**
Create a connection to a SQL Server table. Import data into Excel as a Table or PivotTable report.
- From Analysis Services** (highlighted)
Create a connection to a SQL Server Analysis Services cube. Import data into Excel as a Table or PivotTable report.
- From XML Data Import**
Open or map a XML file into Excel.
- From Data Connection Wizard**
Import data for an unlisted format by using the Data Connection Wizard and OLEDB.
- From Microsoft Query**
Import data for an unlisted format by using the Microsoft Query Wizard and ODBC.

The background shows the Excel grid with cell A1 selected. The ribbon also includes 'From Access', 'From Web', and 'From Text' options. Other ribbon groups visible include 'Connections', 'Refresh All', 'Sort', and 'Filter'.

SQL Server Analysis Services

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- SSAS is an Online Analytical Processing (OLAP) tool
- SSAS provides:
 - ▣ Pre-aggregation of data across multiple dimensions
 - ▣ A layer to store business requirements, including names and additional logic
 - ▣ A queryable mechanism for retrieving data
 - ▣ Calculated values, such as time analysis

SQL Server Analysis Services

- SSAS databases contain the following objects:
 - ▣ Cubes: the objects that stores aggregated values in a star schema containing facts and dimensions
 - ▣ Dimensions: the shared objects that are included in the cube
 - ▣ Data sources: links to the underlying data used in the cubes and dimensions

Slicin' and Dicin' Demo

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Glossary

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- MDX: Multidimensional Expressions
- SSAS query language
- Most OLAP tools use a version of MDX
- Can create queries or expressions



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Glossary

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- Cube

- Cell

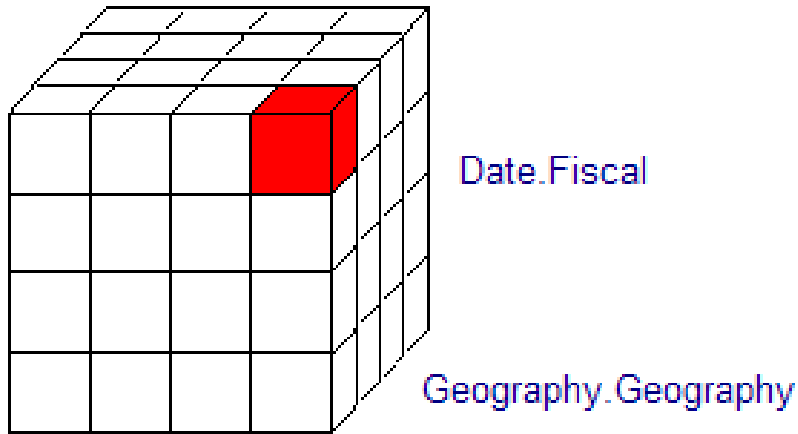
- Measure / fact

- Dimension

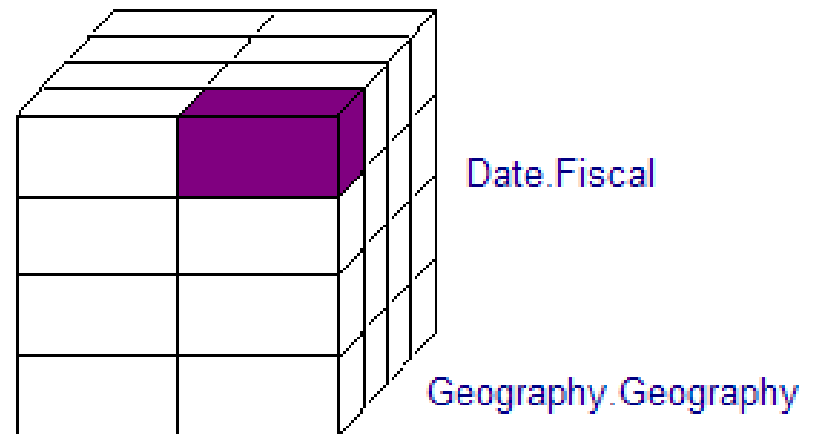
- Member

- Level

- Hierarchy



Product Categories.Product



Product Categories.Subcategory

Glossary

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□ Axes

- Column

- Row

- Page

- 3

- 4

- 5

□ Slicer

```
SELECT
```

```
    {column set} on COLUMNS ← Axis
```

```
    , {row set} on ROWS ← Axis
```

```
FROM cube
```

```
WHERE {slice set} ← Slicer
```

Glossary

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□ Tuple

- ▣ Intersection of dimensions that results in one cell
- ▣ Uses one member from each dimension

```
([Product].[Hitch Rack - 4-Bike]  
 , [Date].[Fiscal Year].[FY 2005])
```

Glossary

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□ Set

- ▣ Collection of tuples with same dimensionality
- ▣ One tuple is also a set

```
{ ([Product].[Hitch Rack - 4-Bike]
    , [Date].[Fiscal Year].[FY 2005])
,
    ([Product].[Hitch Rack - 4-Bike]
    , [Date].[Fiscal Year].[FY 2004])
}
```

Tuple or Set?

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```
([Product].[Hitch Rack - 4-Bike], [Date].[Fiscal Year].[FY 2005])
```

TUPLE

```
{ ([Product].[Hitch Rack - 4-Bike], [Date].[Fiscal Year].[FY 2005])  
, ([Product].[Hitch Rack - 4-Bike], [Date].[Fiscal Year].[FY 2004]) }
```

SET

```
([Product].[Hitch Rack - 4-Bike])
```

TUPLE

```
([Product].[Hitch Rack - 4-Bike], [Date].[Fiscal Year])
```

TUPLE

```
{ ([Product].[Hitch Rack - 4-Bike], [Date].[Fiscal Semester].[H1 FY 2005])  
, ([Product].[Hitch Rack - 4-Bike], [Date].[Fiscal Semester].[H2 FY 2005]) }
```

SET

```
{ ([Product].[Hitch Rack - 4-Bike])  
    , ([Date].[Fiscal Year].[FY 2005])  
    , ([Date].[Fiscal Year].[FY 2004]) }
```

NEITHER

Basic Syntax

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```
SELECT { [Measures].[Reseller Sales Amount] } ON COLUMNS
      , [Product].[Product Model Categories].[Subcategory] ON ROWS
FROM [Adventure Works]
WHERE [Product].[Subcategory].&[2]
```

Advanced Syntax

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```
WITH MEMBER [Reseller Ratio to Parent Product] AS
Case
    When [Product].[Product Model Categories].
        CurrentMember.Level.Ordinal = 0
    Then 1
    Else [Measures].[Reseller Sales Amount] /
        ( [Product].[Product Model Categories].
            CurrentMember.Parent,
            [Measures].[Reseller Sales Amount] )
End
SELECT { [Reseller Ratio to Parent Product]
        , [Measures].[Reseller Sales Amount] } ON COLUMNS
    , DESCENDANTS([Product].[Product Model Categories].
        [Subcategory]) ON ROWS
FROM [Adventure Works]
WHERE [Product].[Subcategory].&[2]
```

Functions - Standard

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- **Sum**
 - Called on: Set
 - Returns: Number
- **Count**
 - Called on: Set
 - Returns: Number
- **Avg**
 - Called on: Set
 - Returns: Number
- **Tail**
 - Called on: Set
 - Returns: Set
- **Max**
 - Called on: Set
 - Returns: Number
- **Min**
 - Called on: Set
 - Returns: Number

Functions - Family Ties

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□ CurrentMember

- Called on: Dimension

- Returns: Member

□ PrevMember

- Called on: Member

- Returns: Member

□ Children

- Called on: Member

- Returns: Set

□ Parent

- Called on: Member

- Returns: Member

□ Siblings

- Called on: Member

- Returns: Set

Functions - Timing

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□ YTD

- Called on: Dimension

- Returns: Set

□ ParallelPeriod

- Called on: Level or Member

- Returns: Member

Functions - Advanced

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- **CrossJoin (*)**
 - Called on: Set
 - Returns: Set
- **Non Empty**
 - Called on: Set
 - Returns: Set
- **NonEmptyCrossJoin**
 - Called on: Set
 - Returns: Set
- **NonEmpty**
 - Called on: Set
 - Returns: Set

Calculated Members & Sets

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- Evaluate a condition based on other dimensions and measures in the cube
- Can be built within the cube or can be query scoped
- Examples:

```
WITH MEMBER [Internet Gross Profit] AS
    [Measures].[Internet Sales Amount]
    - [Measures].[Internet Total Product Cost]
```

```
WITH SET [Large Resellers] AS
    Exists (
        [Reseller].[Reseller].[Reseller].Members,
        [Reseller].[Number of Employees].[Number of Employees].[81 -
        100]
    )
```

Calculated Members & Sets

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- Power of calculated members becomes apparent when using current members
- Example:

```
WITH MEMBER [Reseller Ratio to Parent Product] AS
```

```
Case
```

```
  When [Product].[Product Model Categories].
```

```
    CurrentMember.Level.Ordinal =
```

```
    0
```

```
  Then 1
```

```
  Else [Measures].[Reseller Sales Amount] /
```

```
    ( [Product].[Product Model Categories].CurrentMember.Parent,  
      [Measures].[Reseller Sales Amount] )
```

```
End
```

Business Scenario

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- Business wants to discover trends in past internet sales
- Moving averages will be useful to hide anomalies in the data
- Must be able to decide over how many time periods the data will be averaged
- Must have the ability to determine time period and number of periods independently

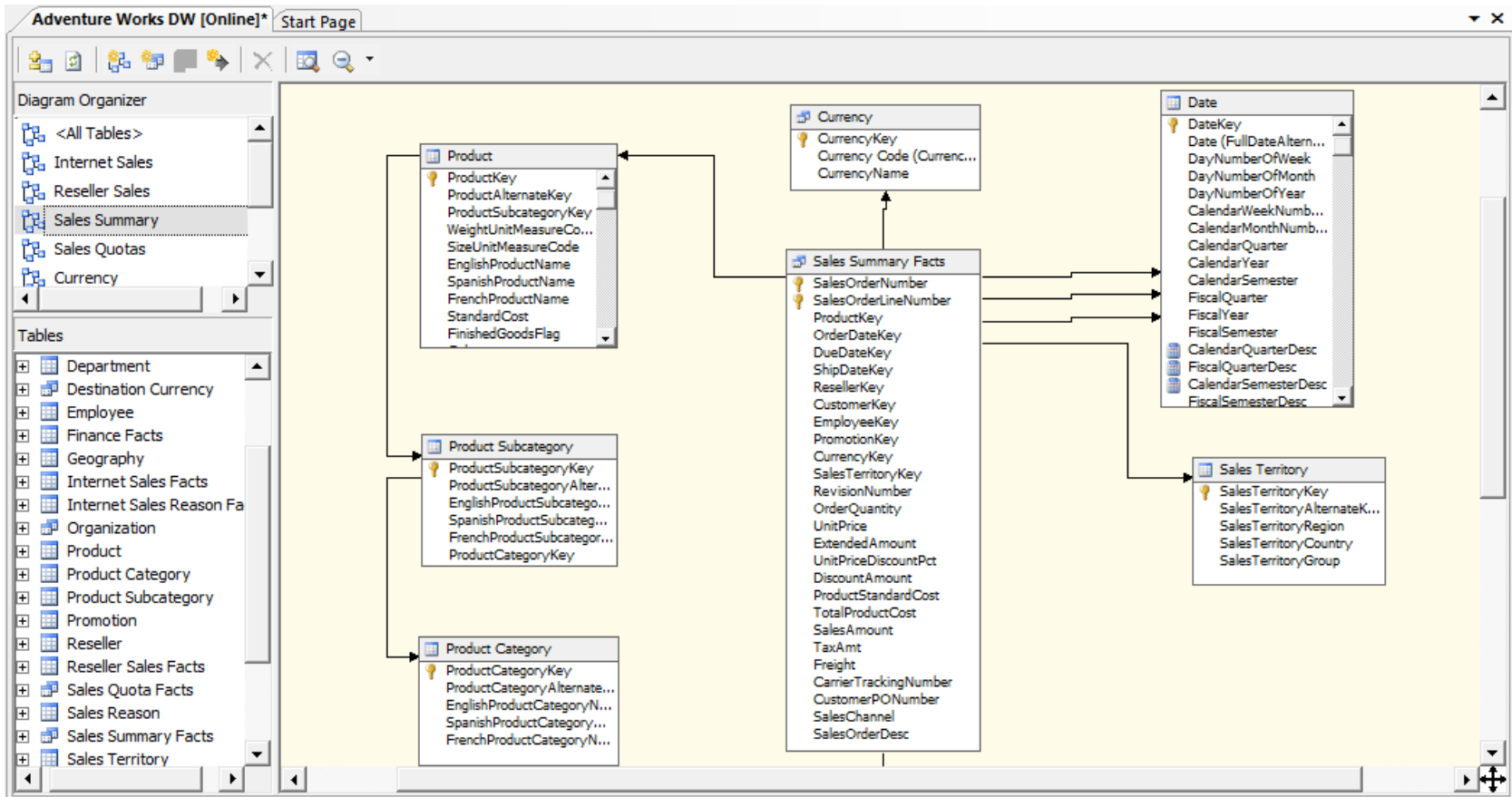
Cube Overview

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- ❑ Database: Adventure Works DW 2008
- ❑ Cube: Adventure Works
- ❑ Measures: Sales, Orders, Targets
- ❑ Dimensions: Customer, Date, Employee, Product, etc.

Cube Overview

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References

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- Fast Track to MDX
 - Whitehorn, Zare, Pasumansky

- MDXStudio
 - <http://www.mosha.com/msolap/mdxstudio.htm>

Questions

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