Going Beyond 3D: Reporting in Multi-Dimensional Data Cube

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• What is and why use MDX?
• MDX main concepts
• Report context
Multidimensional Expressions (MDX) is a query language for online analytical processing (OLAP) using a database management system.
Multi-dimensional data model

Multi-dimensional “data cube”

Dimensions
Hierarchies and levels

Measures

- Issues created
- Issues due
- Issues resolved
eazyBI report

MDX query

```sql
1 select NON EMPTY Crossjoin([Measures].Issues due), [Status].[All Statuses], [Status].[All Statuses].Children) ON COLUMNS,
2   NON EMPTY Generate(NonEmptyCrossJoin([Assignee].[User].Members, [Measures].DefaultMember)), [Assignee].CurrentMember) ON ROWS
3 from [Issues]
4 where [Priority].[Critical]
```

SQL query

```sql
1 [select 'jira_priorities'.id as 'id', 'jira_priorities'.id as 'ci', sum('jira_issues_measures'.issue_due) as 'm0' from
2   'jira_priorities' as 'jira_priorities', 'jira_issues_measures' as 'jira_issues_measures', 'jira_statuses' as 'jira_statuses' where
3   'jira_issues_measures'.priority_id = 'jira_priorities'.id and 'jira_issues_measures'.status_id = 'jira_statuses'.id'] group by 'jira_priorities'.id, 'jira_statuses'.id]
2 [select 'jira_priorities'.id as 'id', sum('jira_issues_measures'.issue_due) as 'm0' from 'jira_priorities' as 'jira_priorities', 'jira_issues_measures' as 'jira_issues_measures' where 'jira_issues_measures'.priority_id = 'jira_priorities'.id and 'jira_issues_measures'.status_id = 'jira_priorities'.id]
3 [Assignee].[User]: executing sql [select 'jira_assignees'.name as 'cn', 'jira_assignees'.display_name as 'cj',
4   'jira_assignees'.email as 'c5', 'jira_assignees'.user_key as 'c6'] from 'jira_assignees' as 'jira_assignees' group by
5   'jira_assignees'.name, 'jira_assignees'.display_name order by ISNULL('cj', 'ASC', 'c5', 'ASC')
1 [select 'jira_assignees'.name as 'cn', 'jira_priorities'.id as 'id', sum('jira_issues_measures'.issue_due) as 'm0' from 'jira_assignees' as 'jira_assignees', 'jira_issues_measures'.priority_id = 'jira_priorities'.id and 'jira_issues_measures'.status_id = 'jira_statuses'.id]
2 [select 'jira_assignees'.name as 'cn', sum('jira_issues_measures'.issue_due) as 'm0' from 'jira_assignees' as 'jira_assignees', 'jira_issues_measures'.priority_id = 'jira_priorities'.id and 'jira_issues_measures'.status_id = 'jira_statuses'.id]
3 [select 'jira_assignees'.name as 'cn', sum('jira_issues_measures'.issue_due) as 'm0' from 'jira_assignees' as 'jira_assignees', 'jira_issues_measures'.priority_id = 'jira_priorities'.id and 'jira_issues_measures'.status_id = 'jira_statuses'.id]
4 [select 'jira_assignees'.name as 'cn', sum('jira_issues_measures'.issue_due) as 'm0' from 'jira_assignees' as 'jira_assignees', 'jira_issues_measures'.priority_id = 'jira_priorities'.id and 'jira_issues_measures'.status_id = 'jira_statuses'.id]
```
eazyBI report

MDX query

SQL query
MDX advantages

- eazyBI creates MDX queries automatically
- Users can extend reports with MDX calculated members
- Mondrian stores results in cache
- Mondrian runs SQL query when there are no cached results
MDX through sample
Multi-dimensional data cube 'Simpsons'

Dimension ‘Family' has one hierarchy

CurrentMember could be any member based on the context
Dimension can have several hierarchies defining category grouping

**by skill**
- All Occupations
  - Skill level
    - Actual occupations

**by seniority**
- All Occupations
  - Seniority level
    - Actual occupations

**by name**
- All Occupations
  - Actual occupations

Levels
- All
- Category
- Sub-category

CurrentMember could be any member based on the context
<table>
<thead>
<tr>
<th>Name:</th>
<th>Simpsons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address:</td>
<td>742 Evergreen Terrace, Springfield, United States</td>
</tr>
<tr>
<td>First appearance:</td>
<td>April 19, 1987</td>
</tr>
</tbody>
</table>

[Family].[Simpsons].Get('Address')
[Family].[Simpsons].[Marge]
Name: Marge
Occupation: Housewife
Characteristics: Matriarch of the Simpson family with distinctive blue beehive hairstyle

[Family].[Simpsons].[Homer]
Name: Homer
Occupation: Safety Inspector at the Springfield Nuclear Power Plant
Characteristics: a decent man and fiercely devoted to his family
Dimensions, Measures, Properties

- **Dimensions** categorize your data
- Dimensions use **hierarchical** structure to organise members
- **Measures** glue dimensions together
- **Properties** are attributes for **Members**
Gender

Occupation

Adult/child

Human/animal

Human

Measures.[count] = 1

Measures.[count] = 1

Measures.[count] = 1

Measures.[count] = 1

Measures.[count] = 1

picture from: wikipedia
Tuple

• Tuple is a way of addressing a cross-join of dimensions

• Tuple works within and can override existing report context
\[
[\text{Measures}].[\text{count}] = 2
\]

\[
[\text{Measures}].[\text{children}] = 1
\]
$[\text{Measures}].[\text{count}] = 2$

Occupation

$[\text{Human/animal}].[\text{Human}]$

$[\text{Measures}].[\text{family members}] = \text{DefaultContext}(([\text{Measures}].[\text{count}], [\text{Human/animal}].[\text{Human}], [\text{Family}].\text{CurrentMember}))$

$[\text{Gender}].[\text{Male}]$

$[\text{Family}].[\text{Simpsons}]$

$[\text{Adult/child}]$

$[\text{Measures}].[\text{family members}] = 5$
Reports, Tuples, Sets

- Any **Measure** works in report context

- When using a **Member** there is always a **Measure** (default Measure if no measure specified)

- With a **Tuple** you could override report context

- **Set** has no context to report, use measures to get the context
Sum it up

- MDX query and MDX calculated members
- Measures glue dimensions together
- CurrentMember represents a member in report / set context
- There is no such object as CurrentSet
- Tuple takes into account report context and you could modify this
- Set does not take into account report context, use measure over Set as a filter
Questions?

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Thank you!

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