



# PASS SUMMIT 2014

Gerhard Brueckl  
pmOne

## Deep-Dive into SSAS Security



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cell phones



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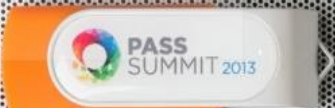
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# About Me

## Gerhard Brueckl

From Austria 

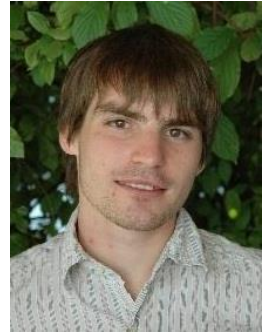
Working with Microsoft BI since 2006

Mainly focused on Analytics and Reporting

- Analysis Services / Reporting Services
- Power BI / O365

Blog: [blog.gbrueckl.at](http://blog.gbrueckl.at)

eMail: [gerhard@gbrueckl.at](mailto:gerhard@gbrueckl.at)



**SSAS**  
**MAESTRO**  
by Microsoft

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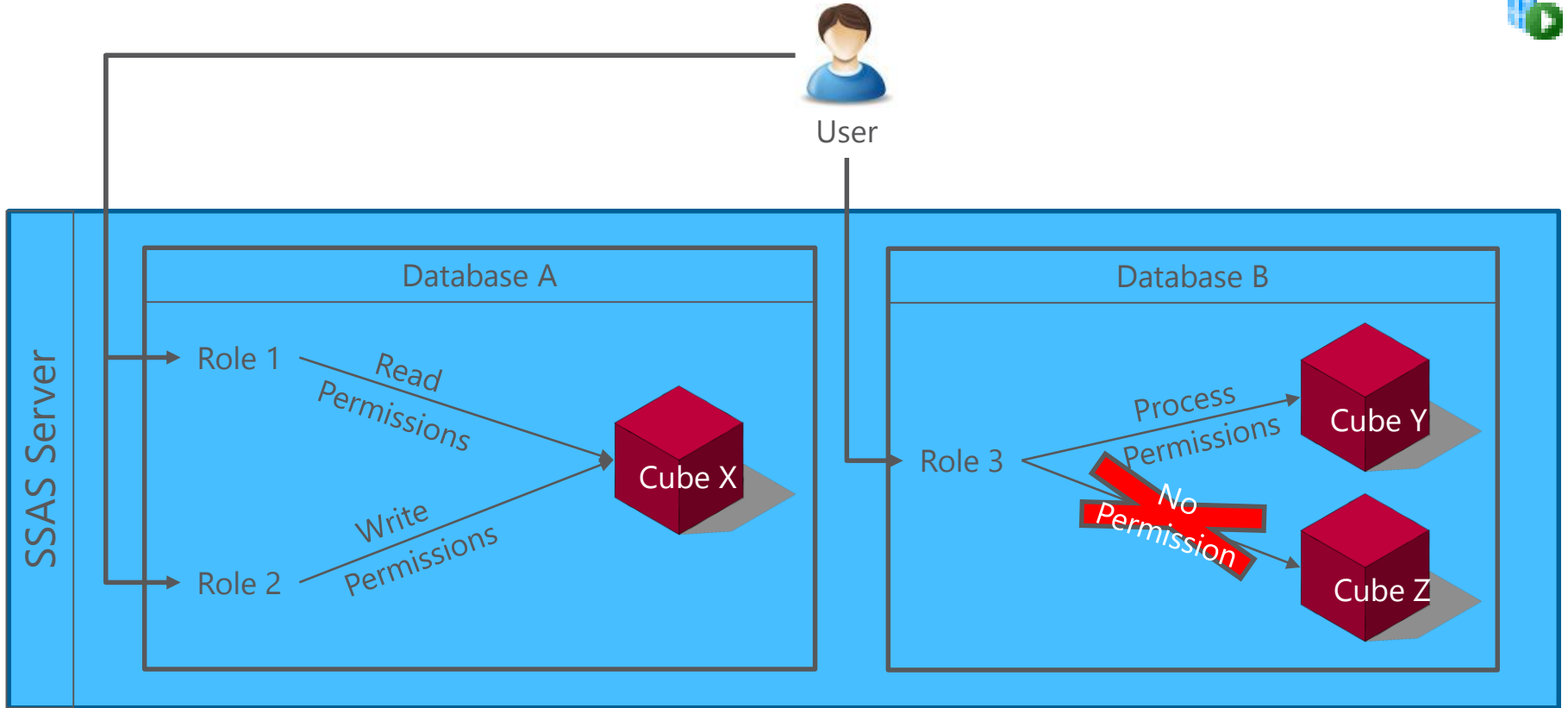
<http://www.pmone.com>

# Agenda

- General
- Multiple Roles / Permissions
- Evaluation
- Caching
- Dynamic Security / Assemblies
  
- Dealing with multiple Roles

**This Session only covers**  
**Analysis Services Multidimensional!**

# General



# User, Roles and Permissions



## Users and Groups

Active Directory or Local  
Are assigned to Roles

For Non-Active Directory Environments:

Using Local Users

msmdpump.dll via IIS and HTTP



# Demo

Access from other Domain



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# User, Roles and Permissions



## Roles

- Belong to Database
- Contains AD Users/Groups
- Defines Permissions

## Special Role

Server Administrator

The screenshot shows a software interface with a tabbed menu at the top: General, Membership (selected), Data Sources, Cubes, Cell Data, and Dimensions. Below the tabs, there is a text area with the text: "The database role defines a category of users and groups that have the same permissions on the c".

Below this text, there are two labels and input fields:

- Role name:** A text box containing "NorthAmerica".
- Role description:** A large empty text area.

Below the input fields, there is a section titled "Set the database permissions for this role:" followed by three checkboxes:

- Full control ( Administrator )
- Process database
- Read definition

# User, Roles and Permissions



## Permissions

Database

Data Sources

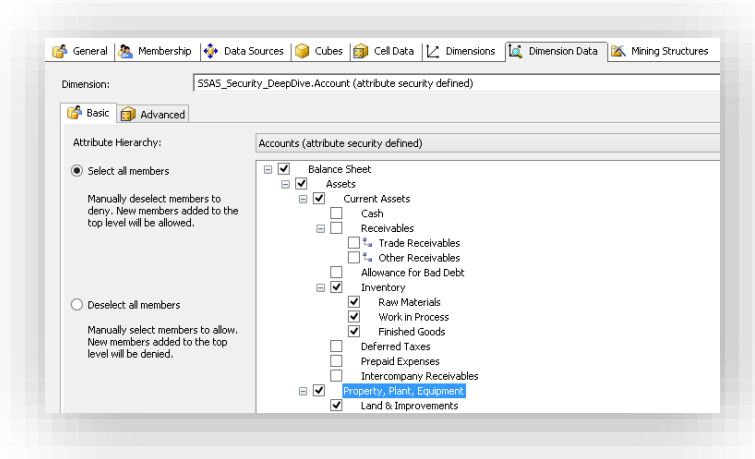
Cubes

(Cells)

Dimensions

Dimension Data

(Mining Models)



# User, Roles and Permissions



## Database Permissions

Is created in the background

No GUI

AMO / XMLA

Power Shell

Deny access without removing Role or User

# Demo

## Database Permissions



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# Multiple Roles and Permissions

# Multiple Permissions



Multiple Roles are complementary

You cannot “lose” permissions

Roles can be selected using Roles-parameter in the connection string

**“...;Roles=Role1, Role2;...”**

# Same Role – Same Dimension

## Secured on ...

same Attribute

→ Union / SQL OR

```
WHERE [Country] = 'United Kingdom'  
OR    [Country] = 'Germany'
```



different Attribute

→ Intersect / SQL AND

```
WHERE [Country] = 'United Kingdom'  
AND  [Region] = 'North America'
```



Use MDX Union() and Exists()



# Same Role – Different Dimensions

1. Security for “Same Dimension” applies
2. Facts get filtered on all secured dimension  
→ SQL AND

```
SELECT ...  
FROM [Facts]  
WHERE [Country] = 'United Kingdom'  
AND [ProductCategory] = 'Clothing'
```



# Multiple Roles – Same Dimension

## Secured on ...

same Attribute

→ Union / SQL OR

```
WHERE [Country] = 'United Kingdom'  
OR    [Country] = 'Germany'
```



different Attribute

→ Union / SQL OR

```
WHERE [Country] = 'United Kingdom'  
OR    [Region]  = 'North America'
```



# Multiple Roles – different Dimension

1. Security for "Same Dimension"
2. Final permission set is a combination of Roles  
→ UNION / SQL OR



```
SELECT ...  
FROM [Facts]  
WHERE [Country] = 'United Kingdom'  
OR [ProductCategory] = 'Clothing'
```

We are in a  
multidimensional world!

# Multiple Roles – different Dimension

Role	Sales Territory	Product
Clothing	No Restrictions	[Category] = 'Clothing'
UK	[Country] = 'United Kingdom'	No Restrictions
{Clothing, UK}	<b>No Restrictions</b>	<b>No Restrictions</b>

All Countries

	DE	UK	US
Bikes			
Clothing			
Accessories			

All Categories

	DE	UK	US
Bikes			
Clothing			
Accessories			

All Categories

	DE	UK	US
Bikes			
Clothing			
Accessories			



# Demo

## Multiple Roles



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# Evaluation of Security

# Evaluation of Security

## At first connect

- cached for subsequent requests

## Per Dimension

- Using all owned Roles

# Demo

Evaluation of Security



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# Evaluation of Security

## Evaluated per Dimension

- Security gets translated to all Attributes → AutoExists

EventClass	EventSubclass	TextData	Duration
Query Dimension	2 - Non-cache data	0100001	
Query Dimension	2 - Non-cache data	1100000	
Query Dimension	2 - Non-cache data	0110000	
Query Dimension	2 - Non-cache data	0101000	
Query Dimension	2 - Non-cache data	0100100	
Query Dimension	2 - Non-cache data	0100010	

- This can take some time!
- Especially for Big Dimensions!

# Evaluation of Security

## Several Issues

### AutoExists

- Remove Attributes / Rows
- Move secured Attributes to separate Dimension → no AutoExists

### Single-Threaded Evaluation

- Remove Attributes / Rows
- (Faster CPUs)

### Expensive Allowed/Denied Set

- Pre-Calculate
- Cache Sets (Assembly)

# Caching of Security

# Caching

## Global Scope Cache

- 1) User connects
  - 2) Determine User's Role(s)
  - 3) Check if Global Scope Cache exists for Role(s) **No** **Yes**
  - 4) Evaluate Security ←
  - 5) Evaluate MDX Script
  - 6) ...
  - 7) Execute Query ←
- 
- The diagram illustrates the flow of the Global Scope Cache process. It starts at step 3, 'Check if Global Scope Cache exists for Role(s)'. From this step, a blue arrow labeled 'No' points to step 4, 'Evaluate Security'. Another blue arrow labeled 'Yes' points from step 3 to step 7, 'Execute Query'.

# Caching

## Global Scope Cache

### For Static Roles:

Cache is shared among Users with same Role(s)

### For Dynamic Roles:

Cache is shared if:

- Same Role(s)
- Same UserName()
- Same CustomData()

**Beware of the cache size!**

# Demo

Caching of Security



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# Dynamic Security

# Dynamic Security

A Role is dynamic if ...

- USERNAME()
- CUSTOMDATA()

... is used

Security can be derived from ...

Mapping table

Assembly



# Dynamic Security

## Using a Mapping table

### Part of the Model

- MeasureGroup
- (Dimension)

Strongly tied to Model structures

Domain User	Company
DOM\User1	A
DOM\User1	B
DOM\User2	A
DOM\User3	C

# Dynamic Security

## Using an Assembly

Security is loaded from somewhere outside

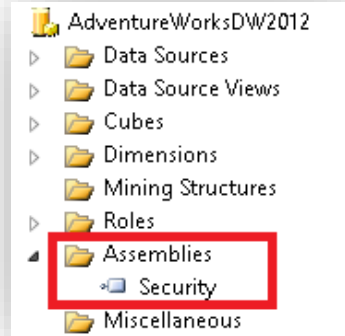
- SQL Table
- Web Service

## Complex Development

- C# / .Net

## Great flexibility

- Not tied to Model structures



# Dynamic Security

## Using an Assembly

```
public static AdomdServer.Set GetAllowedSet(  
    string dimension,  
    string attribute,  
    string username)  
{  
    // Connect to SQL/WebService/...  
    // Pass in Parameters (Username, CustomData, ...)  
    // Get ResultSet  
    // Convert ResultSet to MDX Set  
    // Return MDX Set  
}
```

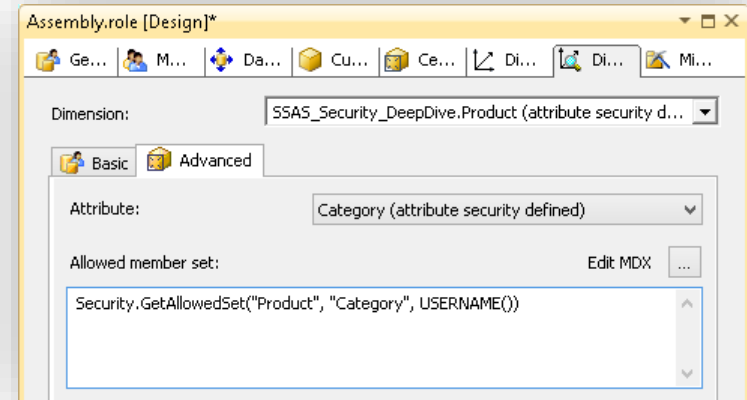
Compile the DLL

# Dynamic Security

## Using an Assembly

Add the DLL to the Project

Use the Assembly in the role's security definition



### **MDX Expression for Allowed member set:**

`Security.GetAllowedSet("Product", "Category", USERNAME())`

# Dynamic Security

## Using an Assembly

### Common Pitfalls

- Assembly throws an Error
- Using an Assembly slows down initial connect
- Security Settings

# Demo

## Assembly Error



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# Dynamic Security

## Using an Assembly

Initial Connect is slowed down

→ Assembly is called several times

Remember:

“Security gets translated to all Attributes → “AutoExists”

→ Assembly is called for each Attribute!

# Dynamic Security

## Using an Assembly

Single Result/Execution is not cached

→ Cache within Assembly

```
string uniqueToken = username + dimension + attribute;

if (!CachedSecuritySets.TryGetValue(uniqueToken, out s))
{
    s = new Set(...);
    CachedSecuritySets.Add(uniqueToken, s);
}

return s;
```



# Dynamic Security

## Visual Totals

Can be set on Attribute-Level

Can be controlled by Assembly

→ only via AMO, not via UI

```
oCubeAttributePermission.VisualTotals = "Security.GetVisualTotals(...)";
```

Enable Visual Totals

# Dealing with multiple Roles

# Dealing with Multiple Roles

## Multiple Roles secured on different Dimensions

### Combine secured dimensions

- Use Union() + Exists()
- Strongly tied to Data Model

### Use an Assembly and CustomData()

- "business role"
- Only one role at a time

# Dealing with Multiple Roles

## Assembly and CustomData()

What is a “business role”?

User can select his “business role” using CustomData()

- Connection String
- Custom UI

User has a default “business role”

- Used if no CustomData() was supplied

# Dealing with Multiple Roles

## Changing the default role

- 1) Update default role in SQL table
  - User must own new role
- 2) Clear Cache
  - XMLA
  - SSIS
- 3) Execute Query again

# Demo

Switching between Roles



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# Dealing with Multiple Roles

## Advantages

Only one business role at a time

Flexible, no need to change cube structure

Change default-role

- Server-side solution
- Applied to all client tools
- (SharePoint Web Part)

Maintained in SQL

# Key Takeaways

Analysis services offers a rich set of features to secure the cube

- Use Dimension Security if possible

Can be further extended by custom code/Assemblies

- But use with caution!

Keep evaluation and caching in mind

- Especially for big cubes/models

Be aware of the implications of Multiple Roles





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Thank You!



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