Data security in SAS OLAP cubes and reports

Dec 2012
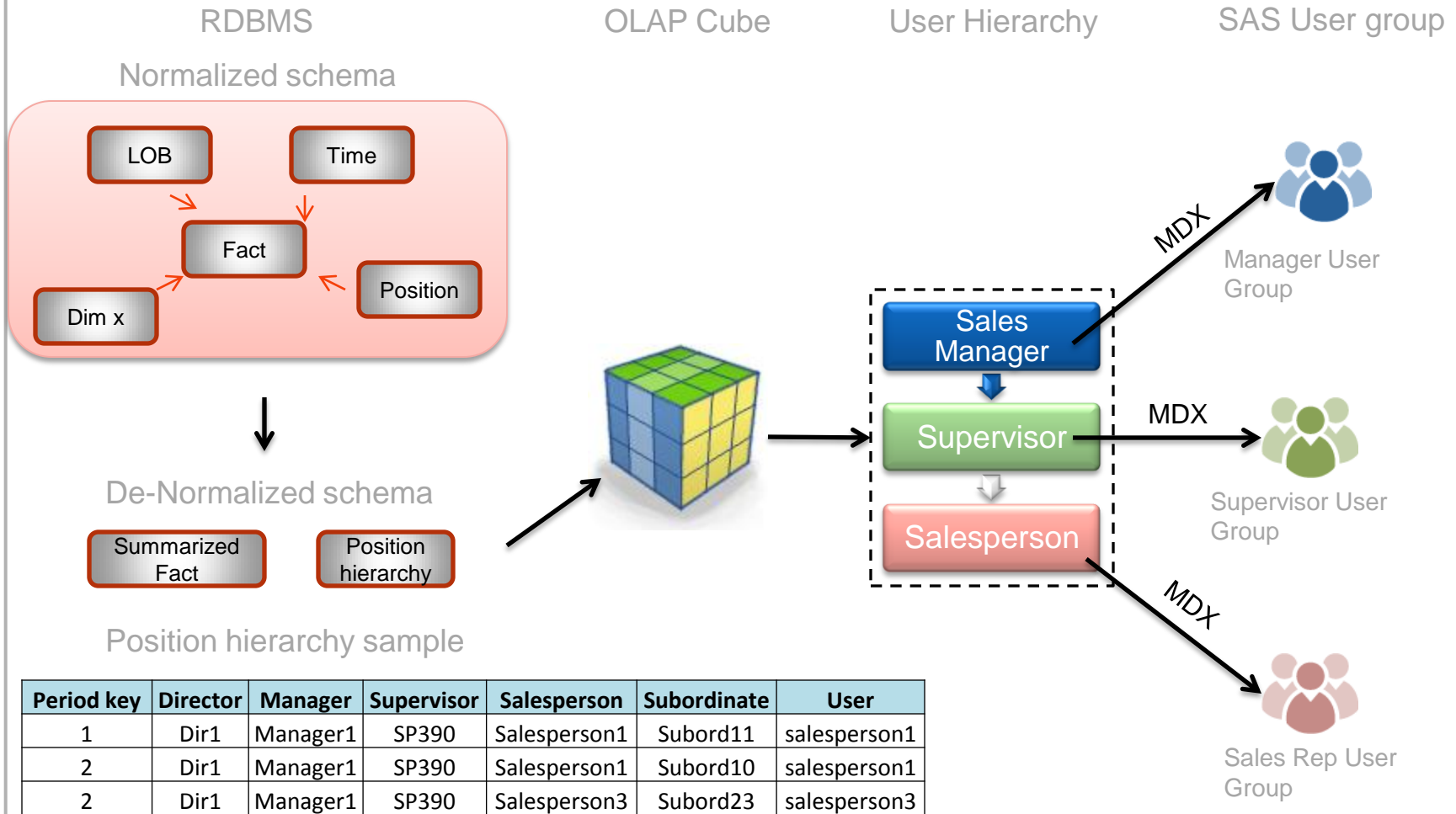
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Scenario

- » User should view its own data and its sub-ordinates' data if available.
- » If there are multiple levels in the user hierarchy, all levels need to be visible once authorized.
- » Handle user hierarchy changes based on Time dimension.
- » Multiple lines of business in a single view.
- » Dynamic data in the reports based on Period granularity.
- » Single report when viewed by different users will present data which they are authorized to view.
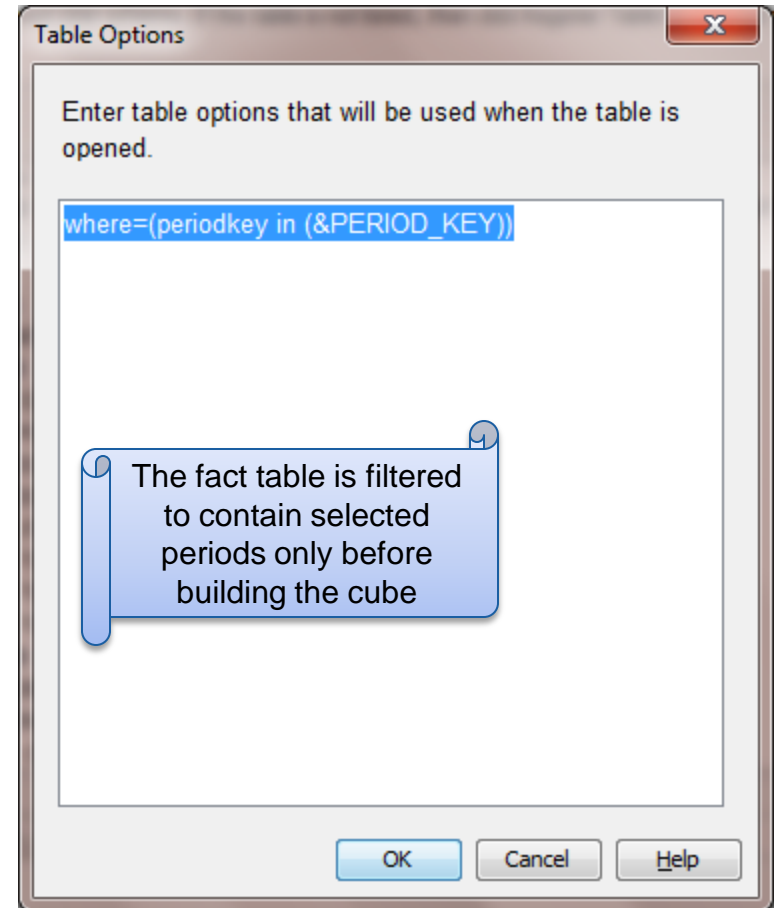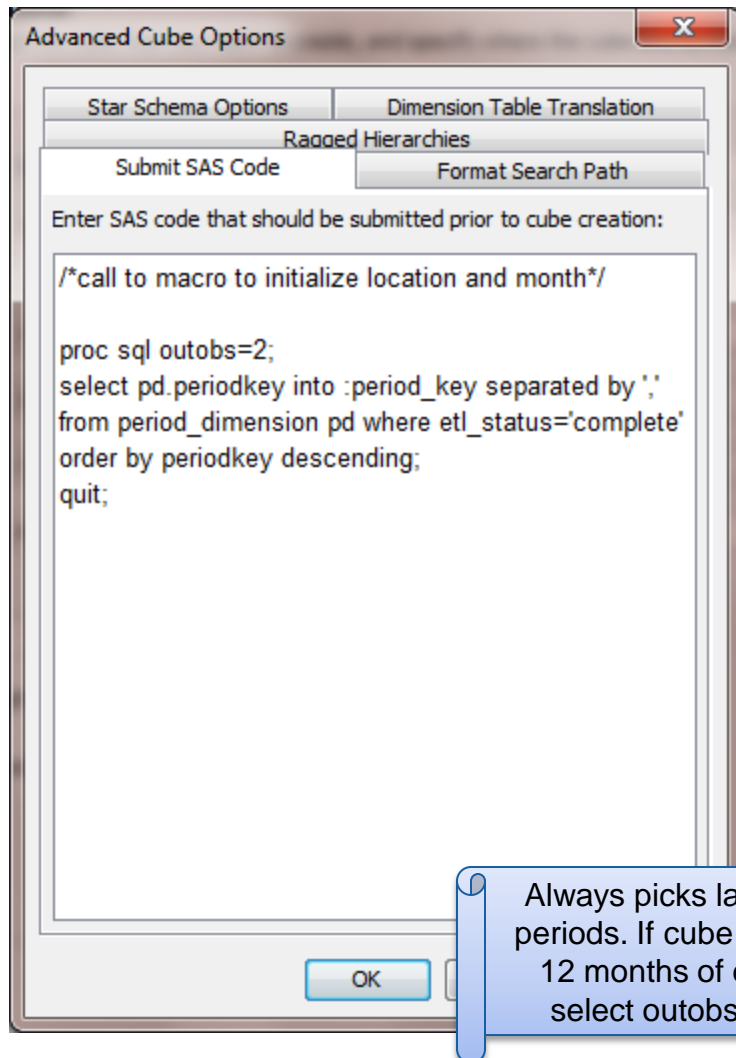
Solution – part 1 – Cube

RDBMS OLAP Cube User Hierarchy SAS User group

Normalized schema

LOB   Time

Fact

Dim x   Position

De-Normalized schema

Summarized Fact   Position hierarchy

Sales Manager

Supervisor

Salesperson

Manager User Group

Supervisor User Group

Sales Rep User Group

MDX

MDX

MDX

Position hierarchy sample

Period key	Director	Manager	Supervisor	Salesperson	Subordinate	User
1	Dir1	Manager1	SP390	Salesperson1	Subord11	salesperson1
2	Dir1	Manager1	SP390	Salesperson1	Subord10	salesperson1
2	Dir1	Manager1	SP390	Salesperson3	Subord23	salesperson3

Cube Components

» Data model for reporting tables.
  - Plan the table structure to be used for OLAP cubes.
  - Summarized fact table to have all dimensions with unique identifier per position and Time.
  - Position hierarchy built upon position dimension which has the same unique identifier as mentioned above.
  - Have a column which has SAS users mapped across positions.
» OLAP cube.
  - Cube built using a star schema.
» SAS code to select Time periods.
  - Add code to save the x values of Time dimension into a macro variable and use this in table options.
» Dimensions, levels, hierarchies and Measures.
  - Dimensions – In addition to Time, Geo etc, define 2 position dimensions one (on user column) for MDX and the other (on position column) for Metadata security.
  - Define Levels – Manager, supervisor, sales person.
  - Define hierarchies and measures as needed.

Cube components – Time selection

Advanced Cube Options

Tabs: Star Schema Options | Dimension Table Translation | Ragged Hierarchies | Submit SAS Code | Format Search Path

Enter SAS code that should be submitted prior to cube creation:

```
/*call to macro to initialize location and month*/

proc sql outobs=2;
select pd.periodkey into :period_key separated by ','
from period_dimension pd where etl_status='complete'
order by periodkey descending;
quit;
```

OK

> Always picks latest 2 periods. If cube needs 12 months of data, select outobs=12

Table Options

Enter table options that will be used when the table is opened.

```
where=(periodkey in (&PERIOD_KEY))
```

> The fact table is filtered to contain selected periods only before building the cube

OK | Cancel | Help

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Supervisor – MDX and metadata security

Build Formula

Expression Text:

```
{Descendants(Filter(POSITION_USER_DIMENSION.POSITION_USER_DIMENSION.SUPERVISOR_
USERID.Members,POSITION_USER_DIMENSION.POSITION_USER_DIMENSION.CurrentMember.
Name="SUB::SAS.PersonName").Item(0))}
```

| + | - | * | / | ** | | AND | OR | NOT | | = | <> | < | <= | > | >= | | : | {_} | (_) | , |

Undo   Redo   Validate Expression   ↑ Add to Expression

Functions   Data Sources

Categories: Functions:
- All Functions
- Array Functions
- Date Functions
- Dimension Functions
- Hierarchy Functions
- Level Functions
- Logical Functions
- Member Functions
- Numeric Functions
- Other Functions
- Set Functions
- String Functions

OK

Applying the MDX on Supervisor User group selecting Position user dimension

User groups should be denied Readmetadata to parent Levels in Position Dimension

Access Control Templates   Properties

Effective Permissions:

Permissions	Grant	Deny
ReadMetadata		☑
WriteMetadata		☑
Read	☑	
Administer		☑

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Cube Components contd..

» Metadata user groups.

- Create SAS user groups i.e. Manager, Supervisor, Sales person.

» MDX for user security.

{Descendents (Filter (<Dimension_name>.<Hierarchy_name>.<Level_name>.Members,
<Dimension_name>.<Hierarchy_name>.Currentmember.Name
="SUB::SAS.PersonName").**Item(0))}**

- Text marked in Green: The global variable SAS.PersonName stores the Username/User ID of the person logged into the Web portal. The statement loops through each of the values in the particular level specified and compares it against the value of the logged in user.

- Text marked in Red: The second parameter to the filter statement would then be reduced to a particular value of the level. Filter statement then filters all the rows of the cube which has the matching value.

- Text marked in Blue: Filter statement will return all the rows matched, which can be more than one row (based on the data in cube). Item(0) ensures that a single value is passed on as parameter to the descendents function.

- Text marked in Brown: Descendents function, as the name suggests, will return all the children of the particular value of level parameter

Cube Components contd..

» Security on metadata.
- In OLAP cube studio, under Inventory tab, open the Position Dimension (user) and apply the MDX on all 3 user groups. (In Authorization tab, select Edit Authorization). If the user group doesn't exist, contact administrator to add the same.
- Open the Position Dimension (Position) and apply the metadata security for every level i.e.
  o For Manager level, Check Deny readmetadata for Supervisor and Sales person user group.
  o For Supervisor level, Check Deny readmetadata for Sales person user group.
  o For Sales person level, there is no need to deny readmetadata.
» Web report.
- The security applied on the Cubes will be applicable for any report built over this Cube.

» At this stage, the security setup is complete. Any user when accesses the cube will only see authorized data.

Cube example – login as salesperson1 in EG

» A Manager can see its own data along with Supervisors under it and Sales persons under their respective Supervisors.

» A Supervisor cannot see Manager's view i.e. peer information is not available to view. But it can see its data along with Sales persons under it if it has any.

» A sales person cannot view its Supervisor's or its Manager's or its peer's data but can view only its data. It doesn't have any sub-ordinates.

View 1 ▾	📊 View 2 ▾
Roles Show Columns Rows	

	Year	⊞🔽 2012
	MEASURES	MEASURE2
DIRECTOR ▼		
⊞🔽 MANAGER9		
⊞🔽 MANAGER8		
⊞🔽 MANAGER7		6451.00
⊞🔽 MANAGER6		
⊞🔽 MANAGER5		
⊞🔽 MANAGER4		
⊞🔽 MANAGER3		
⊞🔽 MANAGER2		
⊞🔽 MANAGER18		
⊞🔽 MANAGER17		
⊞🔽 MANAGER16		
⊞🔽 MANAGER15		
⊞🔽 MANAGER14		
⊞🔽 MANAGER13		
⊞🔽 MANAGER12		
⊞🔽 MANAGER11		
⊞🔽 MANAGER10		

📁 View 1 ▾	📊 View 2 ▾
Roles Show Columns Rows Filters Highlights	

	Year		⊟🔽 2012		
	Quarter	2012	⊟🔽 12:2		
	Month		12:2	MAY12	JUN12
	MEASURES	MEASURE2	MEASURE2	MEASURE2	MEASURE2
DIRECTOR ▼					
⊞🔽 MANAGER9					
⊞🔽 MANAGER8					
⊞🔽 MANAGER7		6451.00	6451.00	3074.50	3376.50
⊞🔽 MANAGER6					
⊞🔽 MANAGER5					
⊞🔽 MANAGER4					
⊞🔽 MANAGER3					
⊞🔽 MANAGER2					
⊞🔽 MANAGER18					
⊞🔽 MANAGER17					
⊞🔽 MANAGER16					
⊞🔽 MANAGER15					
⊞🔽 MANAGER14					
⊞🔽 MANAGER13					
⊞🔽 MANAGER12					
⊞🔽 MANAGER11					
⊞🔽 MANAGER10					

Cube example contd..

			Year			□⏬ 2012	
			Quarter	**2012**		□⏬ 12:2	
			Month		**12:2**	MAY12	JUN12
			MEASURES	MEASURE2	MEASURE2	MEASURE2	MEASURE2
DIRECTOR ▼	MANAGER	SUPERVISOR					
	⊞⏬ SP383						
	⊞⏬ SP384						
	⊞⏬ SP385						
	⊞⏬ SP386						
	⊞⏬ SP387						
	⊞⏬ SP388						
	⊞⏬ SP389						
	⊞⏬ SP39						
⊟⏬ MANAGER7	**SP390**			6451.00	6451.00	3074.50	3376.50
	⊟⏬ SP390	⊞⏬ SALESPERSON1		6451.00	6451.00	3074.50	3376.50
		⊞⏬ SALESPERSON2					
		⊞⏬ SALESPERSON3					
		⊞⏬ SALESPERSON4					
	⊞⏬ SP391						
	⊞⏬ SP392						

Salesperson1 can view only its info and its sub-ordinates' info if available

Cube example – login as salesperson3

Cube example – login as manager7

Cube example – login as a Director

Solution – part 2 – Reports

» Create an information map selecting the cube as the source.

» Add dimensions and measures as needed

» Add filters and prompts on the dimensions if necessary.

» Connect to Web report studio and create a new report selecting the information map.

» Create a table and select dimensions across x and y axes. Add column totals / sub-totals if necessary

» For all the values of the Time dimension, based on the user logged in, the results will be displayed based on the MDX and Metadata security set on the group to which the user belongs to.

Report examples – login as salesperson 1 and 3

Report examples – login as a Director

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Advantages

» Data security with ease.

» Solution can be leveraged for multiple hierarchy levels.

» Can cater to multiple users with a single cube and a single report.

» With a supported batch process, report gets refreshed data dynamically.

» Limited number of SAS user groups.

Notes

» OLAP cube studio, Information map studio and Web report studio used to build the solution.

» Enterprise Guide and Web report studio used to view data.

Thank you

» Contact:

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» References:

- http://support.sas.com/documentation/cdl/en/olapug/59574/HTML/default/viewer.htm#a003212399.htm
- SAS OLAP Server: MDX Guide
- http://support.sas.com/documentation/cdl/en/olapug/59574/HTML/default/viewer.htm#a003212372.htm