



# **How to... Optimize the runtime of Bookmarks and Workbooks with hierarchies**

**Applicable Releases:**

**SAP NetWeaver BW 7.00 and higher**

**Topic Area:**

**Data Warehousing**

**Version 1.1**

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## Document History

Document Version	Description
1.00	First official release of this guide
1.10	Enhanced details. Fixed typos.

## Typographic Conventions

Type Style	Description
<i>Example Text</i>	Words or characters quoted from the screen. These include field names, screen titles, pushbuttons labels, menu names, menu paths, and menu options. Cross-references to other documentation
<b>Example text</b>	Emphasized words or phrases in body text, graphic titles, and table titles
Example text	File and directory names and their paths, messages, names of variables and parameters, source text, and names of installation, upgrade and database tools.
<b>Example text</b>	User entry texts. These are words or characters that you enter in the system exactly as they appear in the documentation.
<b>&lt;Example text&gt;</b>	Variable user entry. Angle brackets indicate that you replace these words and characters with appropriate entries to make entries in the system.
EXAMPLE TEXT	Keys on the keyboard, for example, F2 or ENTER.

## Icons

Icon	Description
	Caution
	Note or Important
	Example
	Recommendation or Tip



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## 1. Scenario

This tutorial works for both, bookmarks of SAP Business Explorer Web and workbooks of SAP BusinessObjects Analysis, edition for Microsoft Office (AfO). Both Frontends use BICS as Interface, so behavior is similar, which means the Best Practices are also valid for workbooks and bookmarks.

The analysis of bookmarks/workbooks described in this guide does not work for BEx Analyzer. Nevertheless the technical behavior is identical. The Best Practices provided in this guide are applicable for BEx Analyzer. This guide is created for bookmarks/workbooks that contain hierarchies. Bookmarks/workbooks without hierarchies have a different behavior, thus this guide would not change the performance.

The screenshots are taken on BEx Web, but screenshots of AfO would be similar.

Depending on the bookmark/workbook the performance can be improved by factor 10 but it is more likely to be less. We have seen that it improved the runtime by factor 2-3. In case your bookmark is already optimal, you will not see an improvement. This How To paper is designed for people with some experience in BW Reporting. They should also be familiar with hierarchies in SAP BW.

## 2. How Bookmarks/Workbooks work

Bookmarks and Workbooks allow a user to save their current navigational state and resume later. It is also possible to modify a WebTemplate to your needs (apply filter, do drill operations) and save this view. When opening the bookmark/workbook again, the saved state will be retrieved directly. It is **not important how** this state was reached.

-  Example 1: You run your initial query first. Then you add a characteristic and remove the same again. When you save the workbook now, only one request will be triggered but the characteristic which has been added and removed will be ignored
  
-  Navigating through a hierarchy works differently. Not the final state but the steps will be saved.

Sometimes it is required to use display hierarchies in bookmarks/workbooks. From a user point of view, the behavior of bookmarks/workbooks does not change when navigating through hierarchies. Technically there is a difference. Each step which has been performed in this hierarchy will be saved. Therefore it is **important how** the state was reached. This can be done suboptimal which then leads to performance issues.

-  **Best Practice 1**  
*Do not reuse old bookmarks/workbooks; start with the initial web template or workbook if possible.*

Important remark: If you modify the underlying query of bookmarks/workbooks it can lead to unforeseen behavior. It is possible that the bookmark does not work at all.

**↑ Best Practice 2:**

*Do not use bookmarks/workbooks which queries were changed. Create new bookmarks/workbooks.*

### 3. How to optimize the performance of bookmarks with hierarchies

As the steps of how the state of the hierarchy has been achieved is important for workbooks/bookmarks with hierarchies the optimal steps need to be identified.

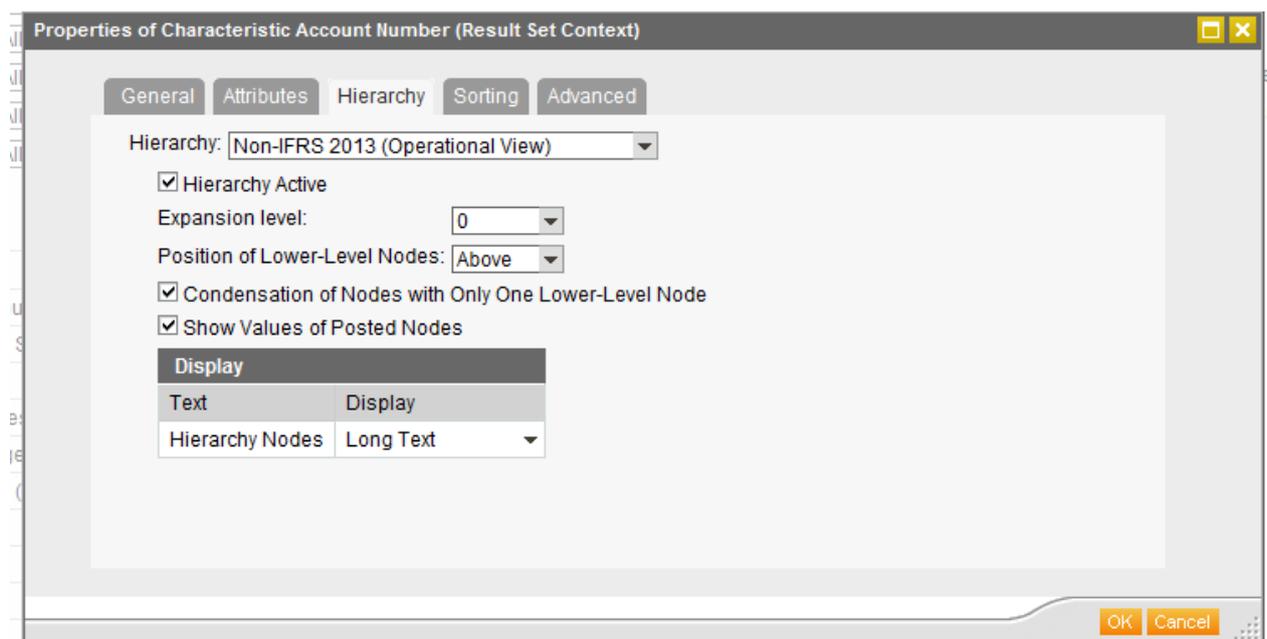
There are three “steps” which are available.

1. Initial request at a certain expanding level of the hierarchy
2. Expanding a hierarchy node
3. Collapsing a hierarchy node

What needs to be figured out for hierarchies is, to which level your hierarchy should be loaded initially and which nodes should be expanded further. Expanding a hierarchy is time consuming, whereas collapsing a hierarchy node does not cost hardly any time. Collapsing is just a frontend based hiding. Expanding a node (if it has not been expanded before) means reloading data from the backend which is time costly. In order to “reset” your hierarchy and avoid unnecessary steps, the first step when creating a bookmark is collapsing the whole hierarchy.

**↑ Best Practice 3:**

*In case of an active hierarchy in the drilldown: When creating a bookmark, “Reset” hierarchies by setting Expansion level to 0. This can be achieved via the context menu of the hierarchy node.*

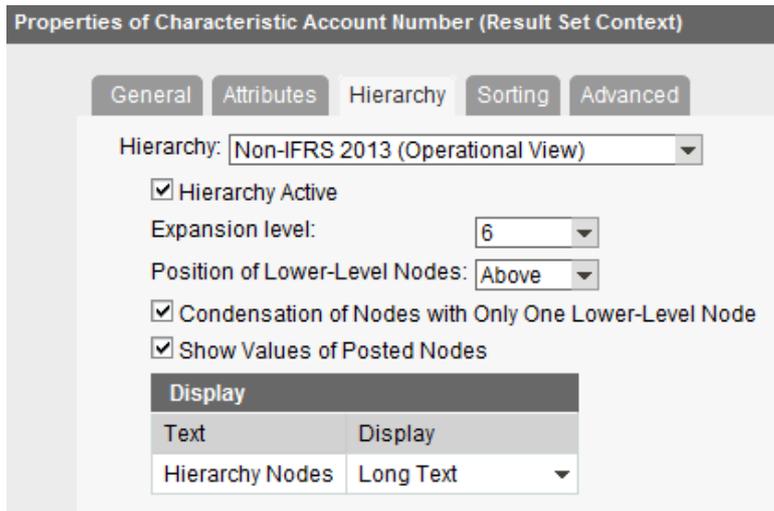


- For the explanation of the next steps, there is a simple example. You want your hierarchy in the following state:  
 All nodes shall be expanded to level six except of 2 nodes. Node A shall have expansion level 8 and node B shall be on level 9.

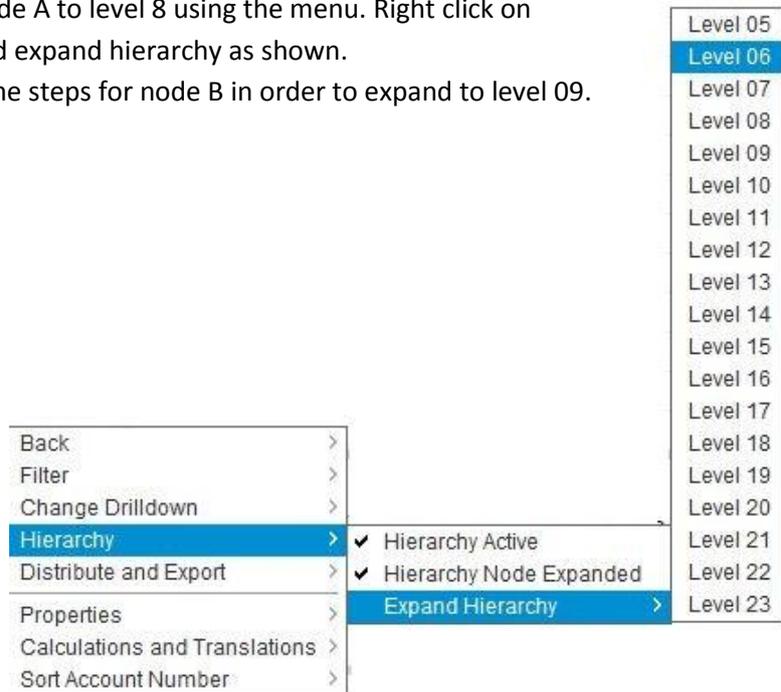
There are 3 possibilities to get to the required state that should be looked at.

**Possibility 1:**

- Expand whole hierarchy to level 6. Use the characteristics properties like on the screenshot.



- Expand node A to level 8 using the menu. Right click on node A and expand hierarchy as shown.
- Do the same steps for node B in order to expand to level 09.



**Possibility 2:**

1. Expand the whole hierarchy to expansion level 8. Use the characteristics properties like above.
2. Expand the sub nodes of node B by right clicking on node B and choose "Hierarchy->Expand Hierarchy->Level 09 (as seen on the screenshot above)
3. Collapse all that you do not want to have expanded (where level 6 is required).

**Possibility 3:**

1. Expand the whole hierarchy to expansion level 9. Use the characteristics properties like above.
2. Collapse sub nodes from node B to level 8.
3. Collapse all that you do not want to have expanded (where level 6 is required).

Depending on the hierarchy one of the possibilities will be faster than the others. The table shows a fictional example (Times in seconds). The collapse operations are not in the table as they are not noticeable.

	Possibility 1	Possibility 2	Possibility 3
Initial Read	8	10	15
Expand Node A	3	0	0
Expand Node B	4	2	0
Overall Runtime	15	12	15

In this example the second possibility is the fastest. On one hand reading the initial result set takes more time as expanding to level 8 requires more data compared to level 6. On the other hand, the single expands are much more time costly compared to the data size. Expanding the Nodes A and B in Scenario 1 costs 7 seconds compared to 2 seconds in the second scenario.

 **Best Practice 4**

*Use "Expand All" Function rather than expanding each node manually. For the first expand the Expansion Level Parameter in the characteristics properties should be used.*

 **Best Practice 5**

*Expanding to a high level can be useful even if not all data is needed. Collapsing does not cost any time, whereas expanding single nodes is very expensive.*

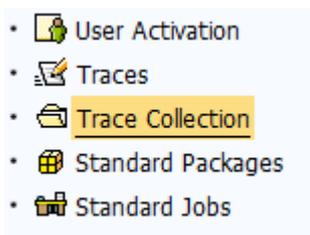
There is no automated bookmark optimizer. These possibilities need to be compared manually. If you are unsure about the optimal steps there is no alternative to tests.

## 4. How to analyze Workbooks/Bookmarks with RSTT Traces

If an end user complains about a bookmark performance you should analyze the RSTT Trace, before optimizing it. Else you cannot identify if it is even worth optimizing. The bad performance could be due to a badly designed query or other non-bookmark related issues.

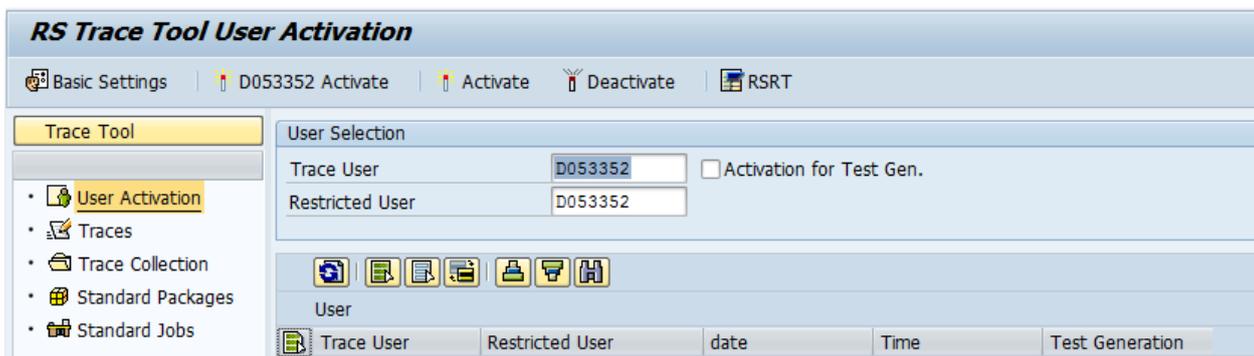
### 4.1 How to create a RSTT Trace in BEx Web:

1. First you should execute the bookmark once.
2. Then execute it again and add "&TRACE=X" at the end of the bookmark URL. The RSTT Trace will be automatically started. Only this session will be traced, other activities are not affected.
3. Finally execute a third time with "&TRACE=" so the trace will be switched off.
4. Analyze the trace in your BW System in transaction RSTT. You can find it under Trace Collection



### 4.2 How to create a RSTT Trace in BEx Analyzer or Analysis for Office:

1. Open transaction RSTT in the BW system
2. Run your workbook once
3. Activate the User that shall be traced



4. Run the workbook again. Meanwhile do not perform any actions on the BW System. Every action of the activated user will be traced and should not be mixed up.
5. Deactivate the user
6. Analyze the trace in your BW System in transaction RSTT

## 4.3 Analyzing a RSTT Trace

A full explanation of the BICS statements is not covered in this paper. For Optimizing Bookmarks, the following statements are important:

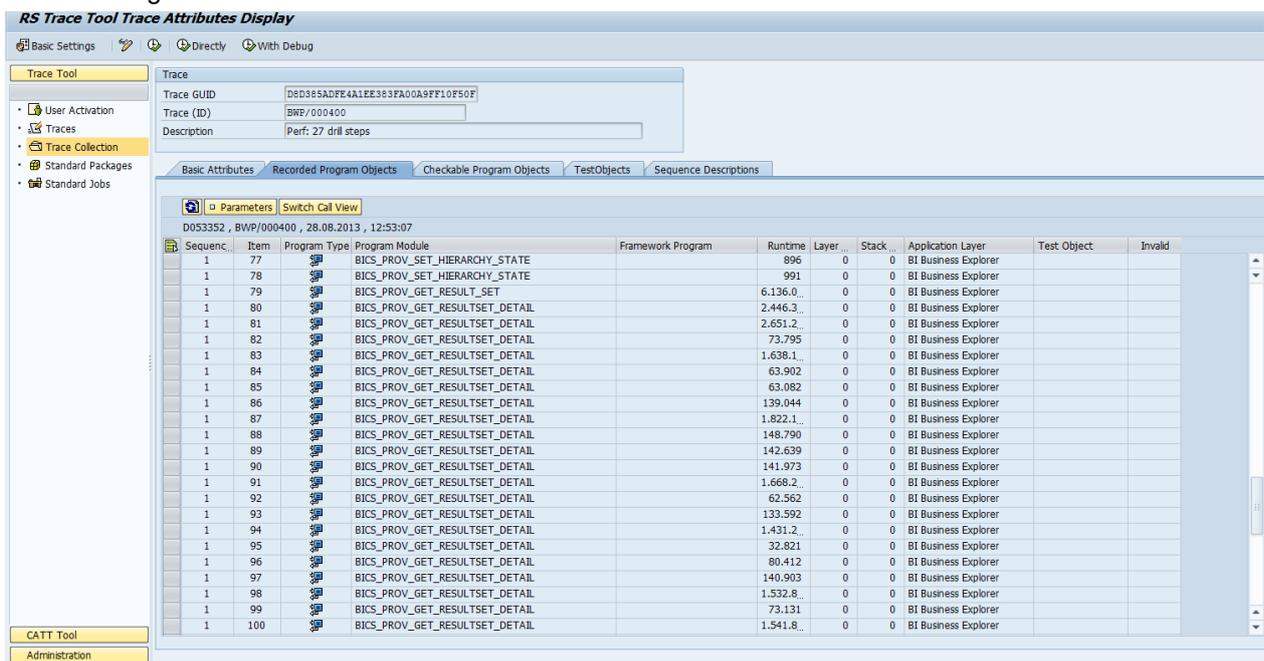
**BICS\_PROV\_GET\_RESULT\_SET:** This module reads the initial drilldown of a query. It only appears once per query, if a workbook/ web template has more than one query, there will be the according number of these call. This module can read a lot of data in a short time, especially when you are running SAP BW on HANA.

**BICS\_PROV\_GET\_RESULTSET\_DETAIL:** This module reads details, which are required but not read with the initial drill down. Example: You add a new characteristic to the drill down. More than one call can appear per query. This call is time costly; even if only a small set of data needs to be read, the runtime is high. These calls will always belong to the same query as the **BICS\_PROV\_GET\_RESULT\_SET** above.

If there is only little time spent on these two calls, the performance issue cannot be solved by optimizing the bookmark. In such case, review the query design and try to optimize the query itself.

If a trace contains a lot of **BICS\_PROV\_GET\_RESULTSET\_DETAIL** it is an indicator, that optimizing the workbook/bookmarks will boost your performance whereas if you only have **BICS\_PROV\_GET\_RESULT\_SET** you will most likely not be able to improve your performance with the steps suggested in this tutorial.

The following screenshot shows the Trace of a slow bookmark.



Sequenc.	Item	Program Type	Program Module	Framework Program	Runtime	Layer	Stack	Application Layer	Test Object	Invalid
1	77		BICS_PROV_SET_HIERARCHY_STATE		896	0	0	BI Business Explorer		
1	78		BICS_PROV_SET_HIERARCHY_STATE		991	0	0	BI Business Explorer		
1	79		BICS_PROV_GET_RESULT_SET		6.136.0	0	0	BI Business Explorer		
1	80		BICS_PROV_GET_RESULTSET_DETAIL		2.446.3	0	0	BI Business Explorer		
1	81		BICS_PROV_GET_RESULTSET_DETAIL		2.651.2	0	0	BI Business Explorer		
1	82		BICS_PROV_GET_RESULTSET_DETAIL		73.795	0	0	BI Business Explorer		
1	83		BICS_PROV_GET_RESULTSET_DETAIL		1.638.1	0	0	BI Business Explorer		
1	84		BICS_PROV_GET_RESULTSET_DETAIL		63.902	0	0	BI Business Explorer		
1	85		BICS_PROV_GET_RESULTSET_DETAIL		63.082	0	0	BI Business Explorer		
1	86		BICS_PROV_GET_RESULTSET_DETAIL		139.044	0	0	BI Business Explorer		
1	87		BICS_PROV_GET_RESULTSET_DETAIL		1.822.1	0	0	BI Business Explorer		
1	88		BICS_PROV_GET_RESULTSET_DETAIL		148.790	0	0	BI Business Explorer		
1	89		BICS_PROV_GET_RESULTSET_DETAIL		142.639	0	0	BI Business Explorer		
1	90		BICS_PROV_GET_RESULTSET_DETAIL		141.973	0	0	BI Business Explorer		
1	91		BICS_PROV_GET_RESULTSET_DETAIL		1.668.2	0	0	BI Business Explorer		
1	92		BICS_PROV_GET_RESULTSET_DETAIL		62.562	0	0	BI Business Explorer		
1	93		BICS_PROV_GET_RESULTSET_DETAIL		133.592	0	0	BI Business Explorer		
1	94		BICS_PROV_GET_RESULTSET_DETAIL		1.431.2	0	0	BI Business Explorer		
1	95		BICS_PROV_GET_RESULTSET_DETAIL		32.821	0	0	BI Business Explorer		
1	96		BICS_PROV_GET_RESULTSET_DETAIL		80.412	0	0	BI Business Explorer		
1	97		BICS_PROV_GET_RESULTSET_DETAIL		140.903	0	0	BI Business Explorer		
1	98		BICS_PROV_GET_RESULTSET_DETAIL		1.532.8	0	0	BI Business Explorer		
1	99		BICS_PROV_GET_RESULTSET_DETAIL		73.131	0	0	BI Business Explorer		
1	100		BICS_PROV_GET_RESULTSET_DETAIL		1.541.8	0	0	BI Business Explorer		

A lot of drill steps in this trace were performed but where not necessary. After optimizing the bookmark only 2 instead of 27 **BICS\_PROV\_GET\_RESULTSET\_DETAIL** were performed.

### Multiple Queries in Workbooks

In workbooks it is possible to have multiple queries. In this case it is necessary to identify which query causes the long runtime. If you are not sure which query has long running **BICS\_PROV\_GET\_RESULT\_SET** and **BICS\_PROV\_GET\_RESULTSET\_DETAIL**, you need to debug your trace. Unfortunately there is no other possibility so far. The first **BICS\_PROV\_OPEN** does not necessarily belong to the first **BICS\_PROV\_GET\_RESULT\_SET**.

**Identifying/matching statements:**

Double click on a BICS\_PROV\_OPEN. It will open the debugger. It will run through the whole RSTT Trace to the call you double clicked. This might take a while!

Check the return variable E\_DATA\_PROVIDER\_HANDLE. This will be a four-digit number (e.g. 0003). This will be later reused in the other calls.

To find this variable press F6 until you reach the following function call:

```
CALL FUNCTION n_pobjnm
  PARAMETER-TABLE
  n_ts_parmbind
  EXCEPTION-TABLE
  n_th_excpbind.
```

Enter the function module with F5. Enter E\_DATA\_PROVIDER\_HANDLE in the variable field. It will be 0000 as is has not been initialized yet. Keep Pressing F6 until the variable is filled. The E\_DATA\_PROVIDER\_HANDLE is the HANDLE\_ID which will be used for the further calls. If you check the I\_DATA\_PROVIDER\_HANDLE of e.g. a BICS\_PROV\_GET\_RESULT\_SET you will see the I\_DATA\_PROVIDER\_HANDLE.

The screenshot shows the SAP debugger interface. On the left, the source code for the function `initialize_variable_handler` is visible, with line 170 highlighted. On the right, the 'Variables' window shows the variable `E_DATA_PROVIDER_HANDLE` with a value of 2167. Below this, the 'Parameters' window shows a list of parameters for the `BICS_PROV_GET_RESULT_SET` function, with item 600 selected. On the far right, the 'RS Trace Tool' window displays an XML snippet where `<I_DATA_PROVIDER_HANDLE>2167</I_DATA_PROVIDER_HANDLE>` and `<I_APPLICATION_HANDLE>0001</I_APPLICATION_HANDLE>` are visible.



It is possible, that BICS\_PROV\_SUBMIT\_VARIABLES does change the DATA\_PROVIDER\_HANDLE-ID. In this case it is necessary to debug the BICS\_PROV\_SUBMIT\_VARIABLES.

## 5. Summary of Best Practices

This documents Best Practices in a nutshell:

### *Best Practice 1*

*Do not reuse old bookmarks/workbooks; start with the initial web template or workbook if possible.*

### *Best Practice 2*

*Do not use bookmarks/workbooks which queries were changed. Create new bookmarks/workbooks.*

### *Best Practice 3*

*In case of an active hierarchy in the drilldown: When creating a bookmark, "Reset" hierarchies by setting Expansion level to 0. This can be achieved via the context menu of the hierarchy node.*

### *Best Practice 4*

*Use "Expand All" Function rather than expanding each node manually. For the first expand the "Expansion Level Parameter" in the characteristics properties should be used.*

### *Best Practice 5*

*Expanding to a high level can be useful even if not all data is needed. Collapsing does not cost any time, whereas expanding single nodes is very expensive.*

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