SAP How-to Guide Database & Technology Customer

SAP Realtime Database Platform

How To... Analyze ABAP Routines in SAP BW



Applicable Releases: SAP BW 3.5 or higher

Version 4.1 May 2016



The Best-Run Businesses Run SAP™

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Document History

Document Version	Description
1.0	SAP-internal release
1.5	First official release of this guide
1.6	Corrections and enhancements
2.0	Added analysis of routines in Business Planning
3.0	Added analysis of routines in APD, customer enhancements, and other code locations in BW
	New check for finding SELECT statements missing the ORDER BY clause
	Added check for OPEN CURSOR statements (same as SELECT statements)
3.2	Option to define custom exception list and custom logic to resolve dynamic object names and calls
3.3	Added check for functions related to database indexes (which might be platform dependent)
	Added check for system calls (which might be a security risk)
3.4	Added checks related to InfoCube dimension tables
3.5	Added recognition of locally buffered internal tables in field routines
4.0	Added links to SQL Performance and Runtime Check Monitors
	Improved "Missing ORDER BY" detection
4.1	Bug fixes

(See Version_History.html for details)



Typographic Conventions

Type Style	Description
Example Text	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
Example text	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.
Example text	User entry texts. These are words or characters that you enter in the system exactly as they appear in the documentation.
<example text></example 	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

lcon	Description
	Caution
	Note or Important
~ ?•]	Example
1	Recommendation or Tip



Table of Contents

1.	Busii	ness Scenario	1
2.	Back	ground Information	1
3.	Prere	equisites	2
4.	Step	-by-Step Procedure	3
	4.1	Installation	3
	4.2	Run	4
	4.3	General Documentation	11
	4.4	Design Guidelines	12
	4.5	Compatibility	12
	4.6	Migration	12
	4.7	Optimizing	13
	4.8	Communities	13
5.	Appe	endix	14
5.	Арре 5.1	endix Database Select Statements	14 14
5.	Appe 5.1 5.2	endix Database Select Statements Database DML Statements	14 14 18
5.	Appe 5.1 5.2 5.3	endix Database Select Statements Database DML Statements Internal Table Definitions	14 14 18 19
5.	Appe 5.1 5.2 5.3 5.4	endix Database Select Statements Database DML Statements Internal Table Definitions Internal Table Processing	14 14 18 19 19
5.	Appe 5.1 5.2 5.3 5.4 5.5	endix Database Select Statements Database DML Statements Internal Table Definitions Internal Table Processing Call Function/Method	14 14 18 19 19 20
5.	Appe 5.1 5.2 5.3 5.4 5.5 5.6	endix Database Select Statements Database DML Statements Internal Table Definitions Internal Table Processing Call Function/Method Programs	14 14 18 19 20 23
5.	Appe 5.1 5.2 5.3 5.4 5.5 5.6 5.7	endix Database Select Statements Database DML Statements Internal Table Definitions Internal Table Processing Call Function/Method Programs Other	14 14 18 19 19 20 23 23
5.	Appe 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8	endix Database Select Statements Database DML Statements Internal Table Definitions Internal Table Processing Call Function/Method Programs Other Parameters	14 14 18 19 20 23 23 24
5.	Appe 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9	andix Database Select Statements Database DML Statements Internal Table Definitions Internal Table Processing Call Function/Method Programs Other Parameters Messages	14 14 19 19 20 23 23 24 24
5.	Appe 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 5.10	endix Database Select Statements Database DML Statements Internal Table Definitions Internal Table Processing Call Function/Method Programs Other Parameters Messages Exception List	14 14 18 19 20 23 23 24 24 24
5.	Appe 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 5.10 5.11	Patabase Select Statements Database DML Statements Internal Table Definitions Internal Table Processing Call Function/Method Programs Other Parameters Messages Exception List Dynamic Object Names and Calls	14 14 18 19 20 23 23 23 24 24 25





1. Business Scenario

You are looking for ways to optimize custom ABAP routines in data flows. In particular, you are planning to migrate your BW system to SAP HANA and want to find ABAP statements that can potentially be optimized for SAP HANA. This document describes how to use the "SAP BW ABAP Routine Analyzer".

🚺 Note

The checks are not necessarily complete or intended to replace existing tools and checks (like ABAP Code Inspector). The goal is rather to automate and combine various checks that would have to be performed manually otherwise.

The tool can also be used for APO systems, Strategic Enterprise Management (SEM), Trade Promotion Management (TPM), Business Planning & Consolidation (BPC), or any other add-on for SAP BW.

2. Background Information

When staging data into or throughout an existing SAP BW system, you use transformations to consolidate, cleanse, and integrate data. Although a wide variety of predefined transformation rule types are included in the BW solution, in many cases customers define transformations using custom ABAP routines.

When processing low data volumes, these ABAP routines rarely lead to problems. However, when data volumes increase, not following best practice guidelines and using sub-optimal ABAP code, can create significant performance issues (or even cause system inconsistencies, for example when updating BW tables directly in the custom code). Migrating your BW system to the SAP HANA platform may present another challenge, since your ABAP code might perform differently on the SAP HANA database.

In an effort to avoid as many of such issues as possible, SAP BW Product Management has developed a program – the so called "ABAP Routine Analyzer" – that automates the check of best practice guidelines with a focus on ABAP optimization for SAP HANA.

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SAP BW ABAP Routine Analyzer ***	486	A *** SAD BW ABAD Poutine Analyzer ***	Dec
 	5	A ** Varsion: 4.0 (December 2015)	
♦ ♦ >>>> Disclaimer	4	Version, no (becamper 2019)	
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Process Chain: RMA CAL Process Chain (Sub-Process Chain) (ORMA_CAAT_FULL)	134	existing tools and checks tike AbAP rest coupling and code inspector), solid the tool automates	
Image: Solution of the second seco	62	and combines various checks that would have to be performed manually otherwise.	
Image: State St	69	Collecting Process chains	
 Operation (DTP_BT4YW4SI5FXAU800E92) 	1	Number of process chains: 21	
 >>>> Target: Agency Document for RMA (ORT_RMA_AB_01) 	26	** Process Chain: RMA CAL Process Chain (Sub-Process Chain) (0RMA_CAAT_FULL)	
 =>>>> Target: RMA Raw and Results Data (ORMA_DS01) 	18	>>>> Process Variant: 0LIV_DS01 -> 0RMA_DS01 (DTP_AC2WCABWO504111MUCPSJXSFF)	
 >>>> Target: RMA Raw Data InfoSource (ORT_RMA_01) 	23	>>>> Data Transfer Process: No description (DTP_AC2WCABWO5041I1MUCPSJXSFF)	
 O >>>> Summary 	2	>>>> Target: RMA Raw Data InfoSource (0RT_RMA_01)	
	10	>>> Source: Invoice Verification (0LIV_DS01)	
 >>>> Process Variant: Retail MAP: Run the APD for the size quota scale (ORMP) 	5	Click on details to edit Transformation (01WOT5XBUKGG4PPYSKEA9AOIPI6TA07P)	Q
 >>>> Process Variant: 0RMP_DS03 -> 0RMP_DS13 (DTP_9SBQGMJ7RSULQYLP 	2	Click on details to show code (See Program GP1PAFXACB0JG0UWP8GBF4HJTXH)	Q
 O >>>>> Summary 	2	Click on details to run Ext. Syntax Check (GP1PAFXACB0JG0UWP8GBF4HJTXH)	Q
 ** Process Chain: Check Report Data Availability (OTCTHC_CHECK_REP_DATA) 	8	Click on details to run Code Inspector (GP1PAFXACB0JG0UWP8GBF4HJTXH)	G
 B ** Process Chain: Central Hosting Transactional Data (OTCTHOS_AC) 	12	Global Declarations: (D3K1DNOMCWUGO1091UADZIPYI)	
 ** Process Chain: Admin Cockpit Clean Up (0TCT_ACCU_P01) 	8	No keywards found	
 ** Process Chain: OLAP Cache Statistics - Full (OTCT_C0_FULL_P01) 	8		
Process Chain: Query Runtime Statistics (0TCT_C0_INIT_DELTA_P01)	12	Source Partment double - (Distance Agent Astronomy March 1997) Source Partment (Dispon Astronomy March 1997)	
Image: Process Chain: Important Statistical Load-OTCT_C01 & OTCT_C21 (OTCT_C21_INI)	9		
 ** Process Chain: Database Volume Statistics (0TCT_C25_FULL_P01) 	8	S Begin of Kouche	
 Process Chain: Data Load Statistics (0TCT_C2_INIT_DELTA_P01) 	9	CALL METHOD LC_EXC->CONV_2_MSGLINE CHANGING XS_MSG = WA_MONITOR	

Example output of the ABAP Routine Analyzer



Highlights of the ABAP Routine Analyzer:

- One program for all 7.x and 3.x transformations as well as other BW components containing custom ABAP code
- Static code analysis based on ABAP token scan (instead of string search)
- Many common code patterns included in analysis
- Optional search for keywords and regular expressions
- · All check results are shown as application log with option to store log
- · Program provides a recommendation for each finding
- · Links to additional documentation, SAP notes, and how-to guides directly included in log
- Possibility to jump from log to display/edit of 7.x and 3.x transformations
- Ability to execute Extended Syntax Check as well as Code Inspector for any transformation
- Option to display all ABAP code on list which can also be downloaded

You can run the ABAP Routine Analyzer at any time during your implementation project. Then follow up on and eliminate proactively any issues found by the tool. As a first go, install and run the tool in your current BW system to get a quick assessment. Focus on the "red" issues highlighted by the tool.

In subsequent runs of the tool, we suggest looking at the most critical data staging processes and adjust the ABAP code according to the "yellow" issues mentioned in the log.

3. Prerequisites

This section lists the prerequisites that must be in place before you can use this how-to guide and the ABAP Routine Analyzer.

- Prerequisites for "BW 7.x Scenario":
 - i SAP BW release 7.0 or higher (including Enhancement Packages)
- Prerequisites for "BW 3.x Scenario":
 - i SAP BW release 3.5

Upgrade from previous versions:

CAUTION

Implementing a new version of the ABAP Routines Analyzer via cut & paste will **overwrite any modifications** you made to the previous solution! If you made any modifications, backup the custom coding before implementing the new version.

Limitations:

- The ABAP Routines Analyzer is available in English only
- The tool can display a limited set of runtime statistics for 3.x transfer and update rules as well as for 7.x transformations. It is recommended to use standard tools like SQL Monitor and SQL Worklist Tool to perform a more detailed analysis i.e. how many times certain code is executed and how long the execution takes.



4. Step-by-Step Procedure

In this section, we show how to install and run the ABAP Routine Analyzer. You will find the documentation of the individual checks and help for interpreting the check results in the appendix.

4.1 Installation

 Download the latest version of the tool from SAP Note <u>1847431</u>. (Login to SAP Service Marketplace required.)

The tool is continuously updated (about once a month). Please check back regularly.

2. The tool comes in two versions. Implement the version corresponding to the release of your BW system. All code is contained in a single ABAP program in order to make the implementation as easy as possible. A simple "cut & paste" and "activate" in transaction *SE38* will do the trick.

ZBW_ABAP_ANALYZER (fc ZBW_ABAP_ANALYZER_3X (fc

(for BW 7.x and higher) (for lower BW releases)

3. Usually it's sufficient to use the analyzer in your development system (assuming the code is transported to downstream systems).



4.2 Run

1. Start the ABAP Routine Analyzer using transactions *SA38* or *SE38*. The following selection screen will appear:

This program will Planning for state	scan custom ABAP routines used in ments that can potentially be optim	lata flows or business zed for SAP HANA.		
G ^a Checks	Chains Transformation	Transfer Rules	🗙 Update Rules 🛛 🎯 Plannir	ng SAPD
Select which ch	ecks you want to perform. For best	results, select all and		
lesolve all Teu	issues and implement all yellow rec	oninendacions.		
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2. On the first tab, you can select which checks should be performed. Even if all checks are selected the total runtime is usually just a few minutes. However, you might want to pick only one check set and/or limit the scope on the following tabs to speed up the processing or to focus on specific areas only.



3. The second tab allows you to select specific process chains. This is a great way to limit the scope of the analysis and focus on high priority business processes.

Generation Chains Transform	nation 🛛 🗮 Transfer Rules	Update Rules 🛛 🖗 Planning 🖓 APD
Select which process chains you want to anal	/ze.	
Specify the selection criteria.		
Brazzar Chain		
ABAP Process Variant	to	
DTP Process Variant	to	\$

4. Similarly, you can restrict the analysis for transformations, transfer, update rules, business planning, and analysis processes on the next tabs:

6 Checks	Chains	Transformation	Transfer Rules	Update Rules	Planning 🖗	S APD	
Select which 7.>	x transformatio	ons you want to analyze.					
Either specify ID	os directly or e	nter some selection crite	eria.				
Source Type			to				
Source Name			to	\$			
Target Type			to				
Target Name			to	(₽			
Transformation 1	ID		to	<u>\$</u>			
6 Checks	Chains Chains	Transformation	Transfer Rules	Update Rules	Planning	S APD	1.00
Select which 3.)	x transfer rule:	s you want to analyze.					
	ction criteria						
Specify the sele	recion cheenar						
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Specify the sele InfoSource			to	\$ 4			
Specify the sele InfoSource DataSource			to to	\$			



Select which 3.x update ru	les you want to analyze.			
Specify the selection criteri	а.			
InfoCube		to		
InfoCube InfoObject		to to	\$ \$	

elect which BW-IP or BW-BP	S obiects you want to a	analvze.			
specify the selection criteria.					
	21				
Characteristic Relationship		to	\$		
Data Slice		to	\$		
Planning Function Type		to	\$		
Funct. Module Called by FOX		to	\$		
Planning Area		to	-		
Planning Level		to	\$		
		to			

Select which analysis proces	sses you want to analyze.	
Spacify the selection criteric	a.	
Specify the selection cheele	•	
Specify the selection thread		

5. On the "Find" tab, you can specific which type of ABAP statements you want to analyze (see Appendix for details). You also have the opportunity to enter keywords (or regular expressions) to perform a full text search of your custom ABAP routines.



Select which types of st or enter some keywords	atements to search for (regular expressions al	lowed).			
Search Terms		Þ			
✓ Ignore Case			л(с		
Database SELECT Sta	ements				
Database Missing ORD	ER BY				
✓ Database DML Statem	ents				
Function/Method Calls					
Internal Table Definition	ons				
Internal Table Process	ing				
BW Design Rules					

Optionally, limit scope of checks to customer objects only (relevant for database tables, function modules, ABAP object classes, and enhancements).

6. On the final tab, you find a few options for adapting the output of the analysis:

Transformation	🙀 Transfer Rules 🛛 🕅 Update Ru	ules 🛛 🖗 Planning 🖓 APD 🛛 🛗 Find 🖉 Options	••
Choose if you want to sl (in addition to the check	now all selected ABAP coding	Version 4.0	
	(result overview).		
B	Documentation		
Display Technical Nam	es		
Display Coding as List			
Use Runtime Statistics			
Ignore Unused Routin	es		
Show Routines Witho	ut Code		
Ignore Master Data Lo	ads		
Ignore Technical Cont	ent		
Additional Information	in Log		



7. As a default, the tool displays technical names. One option is to display the complete ABAP coding in list format, which provides an easy way to download and document all selected ABAP routines.

SAP Ne	tWeaver BW ABAP Routine Analyzer	
Options		
Target:	Material Stocks/Movements (as of 3.0B)	(0IC_C03)
Source 🏈	ce: 2LIS_03_BF_TR	(2LIS_03_BF_TR)
0 c:	lick here to edit transformation	
6	Global Declarations:	(7KU37C7IG3T7ANNMPXPCGIYTC)
Į.	Global Implementations:	(7KU37C7IG3T7ANNMPXPFGNMZY)
000001 *	migration tool version 19.02.2009	
000003	BEGIN OF _ty_s_SC_1_full,	
000004 *	InfoObject: OSTORNO Reversal indicator.	
000005	STORNO TYPE /BI0/OISTORNO,	
000006 *	InfoObject: ORT_PROMO Promotion.	
000007	RT_PROMO TYPE /BIO/OIRT_PROMO,	
000008 -	INICODJECT: UVAL_CLASS VALUATION CLASS.	
000010 *	InfoObject: ODOC DATE Document Date	
000011	DOC DATE TYPE /BIO/OIDOC DATE.	
000012 *	InfoObject: OSTOCKTYPE Stock type.	
000013	STOCKTYPE TYPE /BI0/OISTOCKTYPE,	
000014 *	InfoObject: OSTOCKCAT Stock Categories.	
000015	STOCKCAT TYPE /BI0/OISTOCKCAT,	
000016 *	InfoObject: OPSING_DATE Posting date in the document.	
000017	PSING_DATE TYPE /BI0/OIPSING_DATE,	

If you select the "Use Runtime Statistics" option, the tool with read the runtimes for the transformations and display them in the log together with some calculated averages. As a default, the statistics of the past 30 days are used (up to 100,000 records based on data sources OTCT_DS22 and OTCT_DS23). For more details see http://help.sap.com/saphelp_nw73/helpdata/en/cd/33a243d43f44f7896a4c8cdf5d082a/cont ent.htm?frameset=/en/bb/b424ce937d4d2a81acd6f7b35f91df/frameset.htm).

You can also ignore routines that have not been used i.e. have no recorded runtime statistics.

As a default, transformations, transfer rules, and update rules are displayed in the log only if at least one custom ABAP routine is found. You can select an option to also display transformations without any custom routines.

Finally, you can select to ignore master data loads. This option is helpful in order to focus on transaction data loads which typically process much higher data volumes and are more critical from a business point of view.

9. You can save results to the application log for later viewing. If you schedule the checks to run as a batch job, the results will always be saved in the application log (transaction *SLG1*, object *RSD*, sub-object *MIGRATION*).

Clicking the "Documentation" button, opens a browser to show SAP Note <u>1847431</u> which contains the most recent documentation (i.e. this how-to guide).

10. Run the analysis using *Program à Execute*.



11. After the analysis is completed, the system will display the results:

SAP BW ABAP Routine Analyzer			
📅 Display as Table 📋 Display as List 🛛 🎯 🈚 Technical Information 👔			
Overview	Nu	(4) 人 マ (4) 次 下, ※, ※, 上 (2, 2, 4), ●0 (4) ▲ 486	
2015-11-19 11:05:29 ZBW_ABAP_ANALYZER	486 486 5	Ty. Message Text: • • • • • • • • • • • • • • •	Det.
Concerns Process Chains: Number of process chains: 21 Process Chains: 21 Process Chain: RNA CAL Process Chain (Sub-Process Chain) (ORMA_CAAT_FULL)	2 1 134	>>>> becamer >>> the checks provided by this tool are not necessarily complete or intended to replace > existing tools and checks (like ABAP Test Cockpit and Code Inspector). Still the tool automates	
	62 69 1	and combines various checks that would have to be performed manually otherwise. "" Collecting Process Chains Number of process chains 21 " " Exponse Chains 24A CAL Brocease Chain (Sub Brocease Chain) (OBMA CAAT EIIII.)	
W >>>> Target: Agency Document for MMA (UK I_MMA_AB_U1) W >>>> Target: RMA Raw and Results Data (ORMA_D501) W >>>> Target: RMA Raw Data InfoSource (ORT_RMA_01) O >>>>> Summary	26 18 23 2	 Process Joint Interview Colores Unit (Vocess Unit (Vocess)))))))))))))))))))))))))))))))) >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	
 ◆ ** Process Chain: Retail MAP: Calculate and post the size quota scal (ORMP_DSO_QUC) ◆ >>>>> Process Variant: Retail MAP: Run the APD for the size quota scale (ORMP_ ◆ ◇>>>> Process Variant: ORMP_DS03 -> ORMP_DS13 (DTP_9SBQGMJ7RSULQYLP ◆ ◇>>>> Summary 	10 5 2 2	>>>> Source: Invoice Verification (0LIV_D501) Cick on details to edit Transformation (0LIV/D580LK664PPYSKEA9A0PJ6TA07P) Cick on details to show code (See Program GP1PAFAXCB010G0UWP86BF4HJTXH) Cick on details to nun Ext. Svintax (Nerk (GP1PAFXACB010G0UWP86BF4HJTXH)	g g
 ♦ ** Process Chain: Check Report Data Availability (OTCTH-C_CHECK_REP_DATA) ** Process Chain: Cantral Hosting Transactional Data (OTCTHOS_AC) ♦ ** Process Chain: Admin Cockpit Clean Up (OTCT_ACOL_P01) ** Process Chain: CAP Cache Statistics - Full (OTCT_C_0_FUL_P01) ** Process Chain: CAP Cache Statistics (OTCT_C_0_FUL_P01) ** Process Chain: Important Statistica (Load-OTCT_C01 & OTCT_C21 (OTCT_C21_BNI) ** Process Chain: Important Statistica Load-OTCT_C01 & OTCT_C21 (OTCT_C21_BNI) ** Process Chain: Important Statistica (OTCT_C_01 & OTCT_C21 (OTCT_C21_BNI) ** Process Chain: Database Volume Statistics (OTCT_C_20T_DBT_P01) ** Process Chain at Load Statistics (OTCT_C_100 BTA) 	8 12 8 8 12 9 8 9		

The left half of the screen will display the results in a tree structure grouping the checks according to the data flows mentioned on the selection screen.

By double clicking on a line in the left section, you can show the corresponding section in a list in the right half of the screen. If you clicked on the root, then the complete log will be shown in the lower half. This makes it easy for example, to print or download all or only specific parts of the results. You can also search and filter in the results quickly.

12. The recommended download format is "HTML" because it includes status icons and is easy to view on various devices. However, HTML download for long results (>2,000 messages) can take a long time. In such case it's better to download to a local text file.

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B	Ty	Message Text	Local File De	
	0	*** SAP BW ABAP Routine Analyzer ***	Send	
	0	** Version: 4.0 (December 2015)	CADeffine Folders	
	0	>>>> Disclaimer	SAPOTICE Folders	
	0	The checks provided by this tool are not necessarily con	HTML download	
	0	existing tools and checks (like ABAP Test Cockpit and Code Inspector). Still the tool automates		
	\diamond	and combines various checks that would have to be performed manually otherwise.		
	0	** Collecting Process Chains		
		Number of process chains: 21		
	0	** Process Chain: RMA CAL Process Chain (Sub-Process Chain) (ORMA_CAAT_FULL)		
	0	>>>>> Process Variant: 0LIV_DS01 -> 0RMA_DS01 (DTP_AC2WCABW05041I1MUCPSJXSFF)		
	0	>>>> Data Transfer Process: No description (DTP_AC2WCABW0504111MUCPSJXSFF)		



- 13. The output of the program is self-descriptive (see also the appendix). Each check results in a "green", "yellow" or "red" status.
 - Successful checks are indicated with green lights

No further action necessary

General findings are indicated with yellow lights

It is recommended to follow the suggested action

- Critical findings are indicated with red lights
 - It is highly recommended to follow the suggested action and adjust the ABAP code.

Information messages are indicated with grey icons

For all "yellow" and "red" issues, the result will contain recommendations to help address the identified issue.

14. You can jump to the display/maintenance of transformations as well as transfer and update rules, by clicking on the icon in the "Details" column:

《··· 봄 〒 () () [], ※·· [] () (2 · (1 · (1 · (1 · (1 · (1 · (1 · (1 ·				
	Τ	Message Text	Det.	
	\diamond	>>>> Target: Material Stocks/Movements (as of 3.0B) (OIC_CO3)		
	\diamond	>>> Source: Material Stocks (7.0) (2LIS_03_BX_TR)		
	\diamond	Click on details to edit Transformation (01G07ROHQZD23GEZ476VHD19F6ES1LNG)		
	\diamond	Click on details to run Ext. Syntax Check (GP007PNLM1202D2QW50PD8V349Y)		
	0	Click on details to run Code Inspector (GP007PNLM1202D2QW50PD8V349Y)		
	\diamond	Global Declarations: (7KU37C7IG3T5KC3NYC1OICOBF)		
	\diamond	Global Implementations: (7KU37C7IG3T5KC3NYC1RNUJJF)		

"Details" are also available for the following items:

- SAP Note (launches Browser to display SAP Note)
- · SAP Help (launches Browser to display online documentation)
- Programs, function modules, ABAP classes (displays corresponding ABAP code)
- Transactions (starts corresponding ABAP transaction)
- Transformations, transfer rules, update rules (display corresponding BW object)
- Extended syntax check, code inspector (launch the ABAP code analysis)



15. If you select "Additional information in log" on the Options tab, then at the end of the log, links to additional resources are displayed. You can also find them in the following chapters.

(manufacture)			
Вт	Гу	Message Text	Det.
	\diamond	** Additional Information	
	0	>>> General Documentation	
	0	Routines in 7.x Transformations (See SAP Help 4a/489a4b826114d1e10000000a42189c)	
	\diamond	Routines in 3.x Transformations (See SAP Help 4e/50fd7d968a4f4ae10000000a42189e)	
	\diamond	Currency Conversion in Transformations (See SAP Help 4a/27af0d81661d10e10000000a42189b)	
	\diamond	Unit of Measure Conversion in Transformations (See SAP Help 4a/27ac1481661d10e10000000a42189b)	
	\diamond	Quick Reference: SAP NetWeaver Interface Overview (See SAP Help 4c/22135610cc5791e10000000a15822b)	
	\diamond	>>> Design Guidelines	
	\diamond	Design rules: Adding records to the start routine (See SAP Note 1258089)	
	\diamond	Design rules: Adding records to end routine (See SAP Note 1223532)	
	\diamond	Design rules: Guidelines for expert routine (See SAP Note 1227667)	
	\diamond	How to avoid "Package contains duplicate entries" error in DTP on SAP HANA (See SAP Note 1851875)	
	\diamond	>>> Compatibility	
	\diamond	ABAP customer code migration for SAP HANA (See SAP Note 1912445)	
	0	BW 7.40 changes and customer-specific programs (See SAP Note 1823174)	
	\diamond	Differences between SAP HANA and Oracle in SQL (See SAP Note 1969815)	
	\diamond	>>> Migration	
	\diamond	Migration of 3.x Transfer and Update Rules (See SAP Help 4e/cf67e543403352e10000000a42189b)	
	\diamond	Migration a Data Flows (See SAP Help 8d/6b1b58cc1744e1bce7898a50e19368)	
	\diamond	Migrating Transfer Rules and Update Rules (See SAP Note 1052648)	
	\diamond	ABAP code migration for SAP HANA - recommendations and Code Inspector variants for SAP HANA migration (See SAP Note 1912445)	
	\diamond	Runtime Check Monitor - FOR ALL ENTRIES/MISSING ORDER BY (See SAP Help /3b/2280619cbd4305bd14aeb3c8f71337)	
	\diamond	SAP HANA: Parameter setting for SELECT FOR ALL ENTRIES (See SAP Note 1987132)	
	\diamond	>>> Optimizing	
	\diamond	Best Practice Guide - Considerations for Custom ABAP Code During a Migration to SAP HANA (See http://scn.sap.com/docs/DOC-46714)	
	\diamond	Optimizing Custom ABAP Code for SAP HANA - The New ABAP SQL Monitor (See http://scn.sap.com/docs/DOC-47444)	
	\diamond	How to SELECT in SAP BW Transformations (See http://scn.sap.com/docs/DOC-27601)	
	\diamond	Optimizing select with FOR ALL ENTRIES in SAP HANA (See SAP Note 1662726)	
	\diamond	Interesting facts about RSDRI_INFOPROV_READ (See SAP Note 1828877)	
	\diamond	SQL Performance Monitoring (See SAP Help /1e/c2329419b64f3992a9c342437d3a0f)	
	\diamond	>>> Communities	
	\diamond	ABAP for SAP HANA Community (See http://scn.sap.com/community/abap-for-hana)	
	\diamond	ABAP and developing on BW on SAP HANA (See http://www.saphana.com/docs/DOC-2090)	
	\diamond	ABAP and SAP HANA (See http://www.saphana.com/docs/DOC-2929)	

4.3 General Documentation

Routines in 7.x Transformations (See SAP Help)

Routines in 3.x Transformations (See SAP Help)

Currency Conversion in Transformations (See SAP Help)

Unit of Measure Conversion in Transformations (See SAP Help)

Quick Reference: SAP NetWeaver Interface Overview (See SAP Help)



4.4 Design Guidelines

Design rules: Adding records to the start routine (See SAP Note 1258089)

Design rules: Adding records to end routine (See SAP Note 1223532)

Design rules: Guidelines for expert routine (See SAP Note 1227667)

How to avoid "Package contains duplicate entries error" in DTP on SAP HANA (See SAP Note 2119480)

4.5 Compatibility

ABAP customer code migration for SAP HANA (See SAP Note 1912445)

BW 7.40 changes and customer-specific programs (See SAP Note 1823174)

Differences between SAP HANA and Oracle in SQL (See SAP Note 1969815)

4.6 Migration

Migration of 3.x Transfer and Update Rules (See SAP Help)

Migration a Data Flows (See SAP Help)

Migrating Transfer Rules and Update Rules (See SAP Note 1052648)

ABAP code migration for SAP HANA - recommendations and Code Inspector variants for SAP HANA migration (See SAP Note <u>1912445</u>)

Runtime Check Monitor - FOR ALL ENTRIES/MISSING ORDER BY (See SAP Help)

SAP HANA: Parameter setting for SELECT FOR ALL ENTRIES (See SAP Note 1987132)



4.7 Optimizing

Best Practice Guide - Considerations for Custom ABAP Code During a Migration to SAP HANA (See http://scn.sap.com/docs/DOC-46714)

Optimizing Custom ABAP Code for SAP HANA - The New ABAP SQL Monitor (See http://scn.sap.com/docs/DOC-47444)

How to SELECT in SAP BW Transformations (See http://scn.sap.com/docs/DOC-27601)

Optimizing select with FOR ALL ENTRIES in SAP HANA (See SAP Note 1662726)

Interesting facts about RSDRI_INFOPROV_READ (See SAP Note 1828877)

SQL Performance Monitoring (See SAP Help)

4.8 Communities

ABAP for SAP HANA Community (See http://scn.sap.com/community/abap-for-hana)

ABAP and developing on BW on SAP HANA (See http://www.saphana.com/docs/DOC-2090)

ABAP and SAP HANA (See http://www.saphana.com/docs/DOC-2929)



5. Appendix

The appendix lists all current code pattern detected by the ABAP Routine Analyzer and lists corresponding messages and recommendations.

5.1 Database Select Statements

* SELECT...

#114 – Error:Database access inside field routine> Move statement to start routine

* SELECT * * SELECT SINGLE *

#100 – Warning:Reading all columns (*) on big tableSpecify only the columns you need

No warning for tables in row store or tables with less than or equal to 10 fields. You can change the number of fields using parameter g_max_tablefields.

#123 – Warning:Reading all columns (*)> HANA row-store table (for optimal performance specify only the required columns)

#130 – Information: Reading all columns (*) on small table

* SELECT (dynamic_columns)

#119 – Error:Native SQL> Manual analysis required (Check compatibility with SAP HANA)

* ... FROM

#103 – Error: Missing FROM clause > Check syntax of select statement



#104 – Error:

Incomplete FROM clause

- > Check syntax of select statement
- * ... FROM table
- * Master data tables
- * InfoCube tables
- * InfoSet tables

* DataStore Object tables

* Other tables (check if buffering is on)

#110 – Warning:

Reading master data table or view

> Try to replace with standard functionality using rule type "Read master data" or better, try using navigational attributes of the source object

#111 – Error:

Reading InfoCube table

> Replace with standard API for InfoCube lookup (RSDRI_INFOPROV_READ)

#112 – Error:

Reading InfoSet table

> Replace with standard API for InfoSet lookup (RSDRI_INFOPROV_READ)

#113 – Warning:
Reading DataStore Object table
> Try to replace with standard functionality using rule type "Read from DataStore Object"

#116 – Warning (global routine):Database access to unbuffered table> Check if table can be buffered (See Transaction SE11)

#117 – Error (field routine): Database access inside field routine

> Move statement to start routine (and check if table can be buffered)

#118 – Warning (field routine):

Database access to buffered table inside field routine

> Check if buffer settings are appropriate or move statement to start routine



#126 – Warning:
Reading InfoCube dimension table
> Dimension tables do not exist for HANA-optimized InfoCubes
> Manual analysis required

* ... FROM (dynamic_table)

#105 – Warning: Dynamic SQL for FROM clause > Manual analysis required

* ... FROM join

#106 – Warning: Complex SQL (joins, etc.) > Manual analysis required

* ... FOR ALL ENTRIES

#101 - Warning: Reading with "FOR ALL ENTRIES" > Specify database hint for SAP HANA

* ... no WHERE clause

#102 - Warning: Missing WHERE clause on big table > Select only the data you need

#124 - Information: No WHERE clause on small table

As a default, tables with more than 10,000 records are considered "big". You can use parameter g_max_table_count to define which tables are considered "big" vs. "small".

* ... HINT

#122 – Warning:Database hint is used> Manual analysis required (Check compatibility with SAP HANA)



#127 – Information: Database hint is used for SAP HANA

* ...ORDER BY...

#125 – Warning:Missing ORDER BY clause> Check if explicit sorting of the SQL query is required

#128 – Error:Missing ORDER BY clause> Explicit sorting of SQL result is required (ORDER BY or SORT itab)

#129 – Information:Missing ORDER BY clause> Internal table of type sorted or explicitly being sorted

* ... INTO/APPENDING TABLE...

The typical pattern to buffer database selections using global or static internal tables inside field routines is now detected and does not lead to the error #117:

IF <internal_table> IS INITIAL.
 SELECT ... INTO TABLE <internal_table>
ENDIF.

* Any EXEC_SQL

#119 – Error:Native SQL> Manual analysis required (Check compatibility with SAP HANA)

#116 – Warning (global routine):

Database access to unbuffered table

> Check if table can be buffered (See Transaction SE11)



5.2 Database DML Statements

- * INSERT INTO table VALUES
- * INSERT table FROM
- * DELETE FROM table
- * DELETE table FROM
- * UPDATE table SET
- * UPDATE table FROM
- * MODIFY table FROM

#109 – Error:

Changing BW tables

- > It is not supported to update BW generated tables directly
- > Avoid completely or use direct-update DSO with API (RSDRI_ODSO_*)

#115 – Warning:

Changing database table

> It is discouraged to update tables inside routines

#120 – Warning:

Changing direct-update DSO table

- > It is not supported to update BW generated tables directly
- > Replace with API for DSO updates (RSDRI_ODSO_*)

#121 – Warning:

Changing standard or write-optimized DSO table

- > It is not supported to update BW generated tables directly
- > Replace with direct-update DSO and use API for DSO updates (RSDRI_ODSO_*)



5.3 Internal Table Definitions

* ... TYPE TABLE

- * ... TYPE STANDARD TABLE
- * ... TYPE SORTED TABLE
- * ... OCCURS ...

#300 – Warning:Standard or sorted table definition> Replace standard table with hashed table for fastest lookups

5.4 Internal Table Processing

* LOOP AT ... INTO ...

#400 – Warning:

Processing with "INTO work area"

> Replace with "ASSIGNING <field symbol>". ASSIGN is typically faster for table width > 100 or when table lines are changed frequently

* READ TABLE ... INTO ...

#400 – Warning: Processing with "INTO work area" > Replace with "ASSIGNING <field symbol>". ASSIGN is typically faster for table width > 100 or when table lines are changed frequently

* ... BINARY SEARCH ...

#401 – Warning: Processing with "BINARY SEARCH" > Replace standard table with hashed table for fastest lookups

#402 – Error: Error processing "LOOP/ENDLOOP"

#403 – Error: Error processing "AT/ENDAT "



5.5 Call Function/Method

* CALL FUNCTION

#503 – Warning: Dynamic function call > Manual analysis required

#504 – Error (functions RSDRC_* / RSDPL_* / RSDPR_*):
SAP-internal query interface
> Manual analysis required
> Replace with standard API for InfoProvider lookup (RSDRI_INFOPROV_READ)

#505 – Warning (functions RSCRM_* / RSCRMBW_*): SAP-internal CRM interface > Manual analysis required

#506 – Warning (functions RSDRI_ODSO_*):DSO data changes> It is discouraged to update DSOs inside transformations

#507 – Warning (functions RSAU_READ_MASTER_DATA / RSD_MASTER_DATA_QUERY / RSD_CHA_GET_VALUES / RSD_CHAVL_GET_ALL):

Master data access

> Replace with standard functionality using rule type "Read master data"

> or better, try using navigational attributes of the source object

#508 – Warning (functions UNIT_*CONVERSION*):Unit of measure conversion> Replace with standard functionality for unit conversion

#509 – Warning (functions RSW_*CUR*TRANSLATION* / CONVERT_TO_*_CURRENCY): Currency conversion

> Replace with standard functionality for currency conversion

#510 – Warning (functions RSDRI_INFOPROV_READ* / BAPI_ODSO_READ_DATA* in global routine): InfoProvider access

> Manual analysis required



#511 – Error (functions RSDRI_INFOPROV_READ* / BAPI_ODSO_READ_DATA* in field routine): InfoProvider access in field routine > Move function call to start routine

#512 – Information (functions CONVERSION_EXIT*INPUT): Conversion to internal value

#513 – Information (functions CONVERSION_EXIT*OUTPUT): Conversion to external value

#529 – Warning (functions RSD*DIME*):
Function call for InfoCube dimension tables
> Dimension tables do not exist for HANA-optimized InfoCubes
> Manual analysis required

#530 – Warning (functions RRX_*, RSSB_*):

Call to obsolete function module

> Remove or replace function call (See SAP Note 1823174)

> Manual analysis required

* CALL FUNCTION (RFC)

#526 – Warning: Remote Function Call (RFC) > Manual analysis required

* CALL CUSTOMER-FUNCTION

#501 – Warning: User exit call > Manual analysis required

* CALL METHOD

Limitations:

• Determining the class name for method call is based on a heuristic and therefore not always possible. For example, the tool is not able to analyze methods with stacked calls like object->method1->method2.

#518 – Warning: Dynamic class method call > Manual analysis required



#519 – Warning: Unable to determine super class > Manual analysis required

#520 – Warning: Call based on interface > Manual analysis required

#521 – Warning: Unable to determine implementation class > Manual analysis required

#524 – Warning (classes CL_SQL_* / CL_RSDRS_SQL_* / CL_RSR_SQL_* / CL_TREX_SQL*): Native SQL interface > Manual analysis required

#525 – Warning (classes CL_RS*QUERY*):
SAP-internal query interface
> Manual analysis required
> Replace with standard API for InfoProvider lookup (RSDRI_INFOPROV_READ)

#522 – Information (method NEW_RECORD_END_ROUTINE): Adding records in end routine according to design rules > (See SAP Note 1223532)

#523 – Warning:Unable to determine implementation (ref to class variable or local class implementation)> Manual analysis required

* CALL 'SYSTEM'

#528 – Warning: System call > Security risk. Manual analysis required



5.6 Programs

* SUBMIT Program (from Process Chain)

#550 - Info: ST-A/PI BW Tools > Analysis of SAP code skipped

#551 - Info: ST/PI BW Tools > Analysis of SAP code skipped

5.7 Other

#001 – Warning: Too many recursive calls > Manual analysis required

Default setting is to analyze code up to a call depth of 3. If this is not sufficient for your environment, please increase the value of parameter g_max_calldepth accordingly.

#022 – Comment: Object ignored (custom exception list)

#023 – Comment: Object name replaced (custom dynamic list)

#025 – Comment: Object not in customer namespace

#600 – Warning: Adding records in routine > Check design rules for start/end/expert routines



5.8 Parameters

You can adapt the program to your specific requirements by editing the following parameters (located at the end of the coding):

Location	Parameter	Description
FORM get_parameters	g_max_calldepth = 3	Number of recursive calls for "CALL FUNCTION/METHOD" check
	g_max_tablefields = 10	Number of fields for "SELECT *" check
	g_max_table_count = 10000	Number of records for "SELECT" without "WHERE" clause
	g_stats_source = 0	Read runtime statistics from DataSource (0) or InfoCube (1)
	g_stats_logsys = '*'	Value or pattern for source system to limit selection of runtime statistics
	g_stats_max_days = 30	Number of days used for runtime analysis
	g_stats_max_recs = 100000	Number of records used for runtime analysis
	g_print_funct_all = false	Print global data or functions modules only
	g_print_class_all = false	Print full ABAP class definitions or methods only

5.9 Messages

If you want to change the priority of certain messages raised by the program or suppress certain messages completely, you can adapt the program easily (located at the end of the coding):

Location	Parameter	Description
FORM get_message	e_type = ' '	Comment (gray icon)
	e_type = 'I'	Info (green icon)
	e_type = 'W'	Warning (yellow icon)
	e_type = 'E'	Error (red icon)
	e_type = 'X'	Ignore (don't show message in log)



5.10 Exception List

In some cases you might want to suppress checks of certain objects for example because the tool is raising messages that you consider not relevant. You can define an exception list using the CUSTOM_EXCEPTIONS form routine at the end of the program.

Location	Parameter	Descriptio	on
FORM	is_param	Header:	Description of check
custom_exception		Unit:	Program unit being checked
		Ref:	Concatenated value of object reference
			7.x Transformations:
			TF/Target Type/Target/Source Type/Source
			3.x Transfer Rules:
			TR/InfoSource/Transfer Rule ID
			3.x Update Rules:
			UR/Data Target/InfoSource
		Global:	TRUE ('X') for global routines
			FALSE (' ') for field routines
		Level:	Call depth
	i_obj_type	Type of o TABLE, F	bject: UNCTION, CLASS, METHOD, or PROGRAM
	i_obj_name	Object na	ime
	e_ignore	Set to TR	UE ('X') to ignore object

5.11 Dynamic Object Names and Calls

In general the tool is not able to resolve dynamic object names for example if you specific the name of a called function module using a variable. Using the CUSTOM_DYNAMIC_NAME form routine, you can implement your own logic to convert the variables into object names.

Location	Parameter	Description
FORM custom_dynamic_name	i_obj_type	Type of object: TABLE, FUNCTION, CLASS, METHOD, or PROGRAM
	i_obj_name	Object name
	cs_param	See is_param above
	c_status	Current check status
	e_obj_name	New object name
	e_ignore	Set to TRUE ('X') to ignore further processing



5.12 Missing ORDER BY

Search problematic statements for unsorted results of SELECT or OPEN CURSOR statements:

The tool searches for the following statements where the internal table is the result of a SELECT statement without ORDER BY clause. Without ORDER BY clause or other sorting measures the result of the select statement may be unsorted. So the statements may not work properly.

🚺 Important

For the check to work properly, both "Database SELECT Statements" and "Internal Table Processing" options must be turned "on" on the "Find" tab (which is the default).

For the following statements, the error message can be suppressed via the pseudo comment "#EC CI_SORTED

READ TABLE itab ... BINARY SEARCH DELETE ADJACENT DUPLICATES FROM itab LOOP AT itab. AT ENDAT. ENDLOOP. PROVIDE ... ENDPROVIDE

For the following statements, the error message can be suppressed via the pseudo comment "#EC CI_NOORDER

READ TABLE itab ... INDEX ... LOOP AT itab ... FROM ... TO ... MODIFY itab INDEX ... DELETE itab INDEX ... DELETE itab FROM ... TO ... LOOP AT itab. EXIT/RETURN/LEAVE. ENDLOOP. CONCATENATE LINES OF itab INTO string FIND string IN TABLE itab REPLACE string1 IN TABLE itab WITH string2 SEARCH itab FOR string

What you can do:

- · Add an ORDER BY clause to the select statement (for STANDARD internal tables)
- · Add a SORT statement for the internal table (for STANDARD internal tables)
- Use an internal table of type SORTED
- · If no problem exists, add the specified pseudo comment

If the issue was corrected in any of the four ways, then the tool will in case of a missing ORDER BY clause only show an Information message in the log.

For more details, see SAP Note <u>1912445</u>.



