



RDP302

Understanding SAP HANA Database Performance

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You and SAP HANA

- SAP HANA is, amongst other things, first and foremost a database management system.
- Or short: **it's the DB system for your application.**
- As that it takes care about storing and retrieving your data safely and efficiently.
- That means:
You don't have to care about that – SAP HANA offers this as a service to you, the application developer.
- Focus on your application code and let SAP HANA figure out how to deal with your data.

Performance dilemma

But how to care about performance if the DB is handling all the data handling for me?

- Use funny SQL coding tricks? (*WHERE 1=1 AND 1 IS NOT NULL...*)
- Put optimizer hints into the SQL? (*/*+ INDEXACCESS ... */*)
- Set DB parameters? (*force_fast_query_processing = true*)



- This kills **your** productivity
- This makes **your** system hard to maintain and operate
- This prevents **your** SQL code to benefit from the improvements in SAP HANA revisions

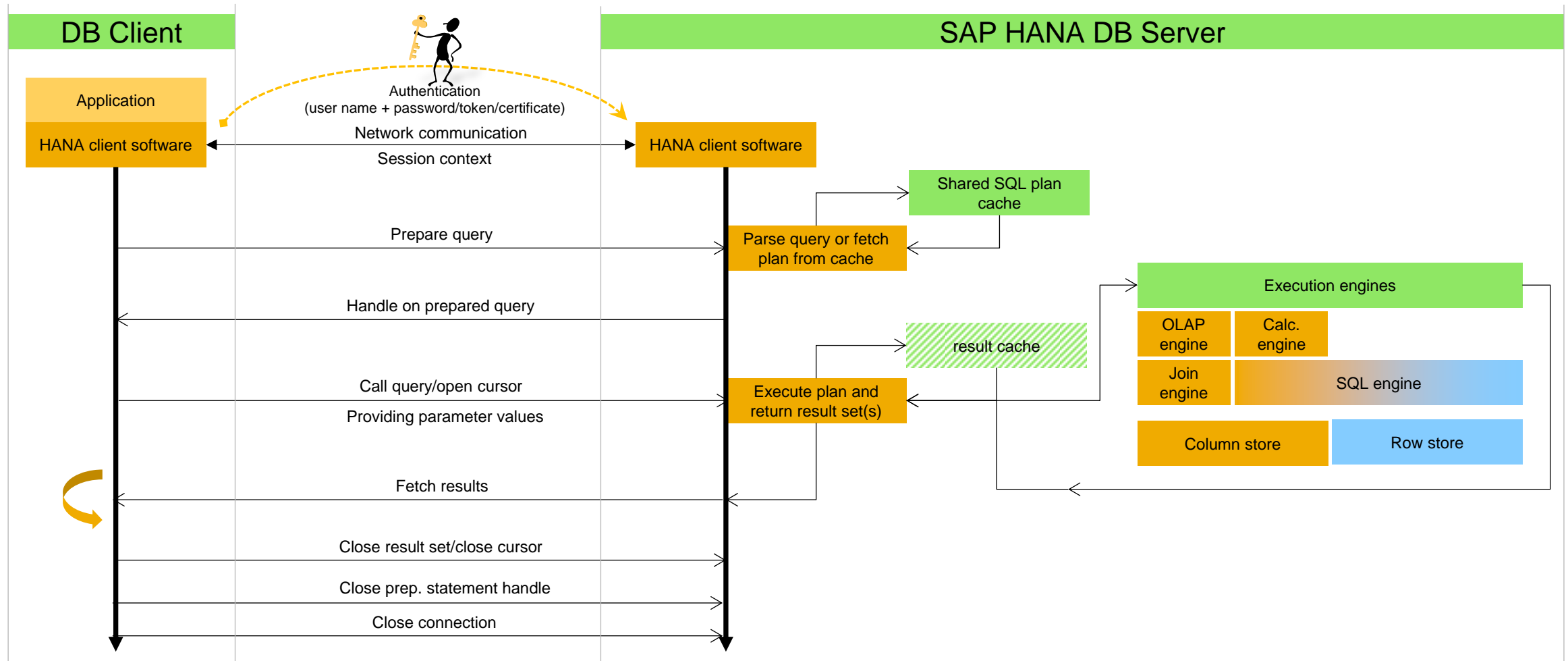
Performance dilemma – EXIT

(because system performance is still your responsibility)

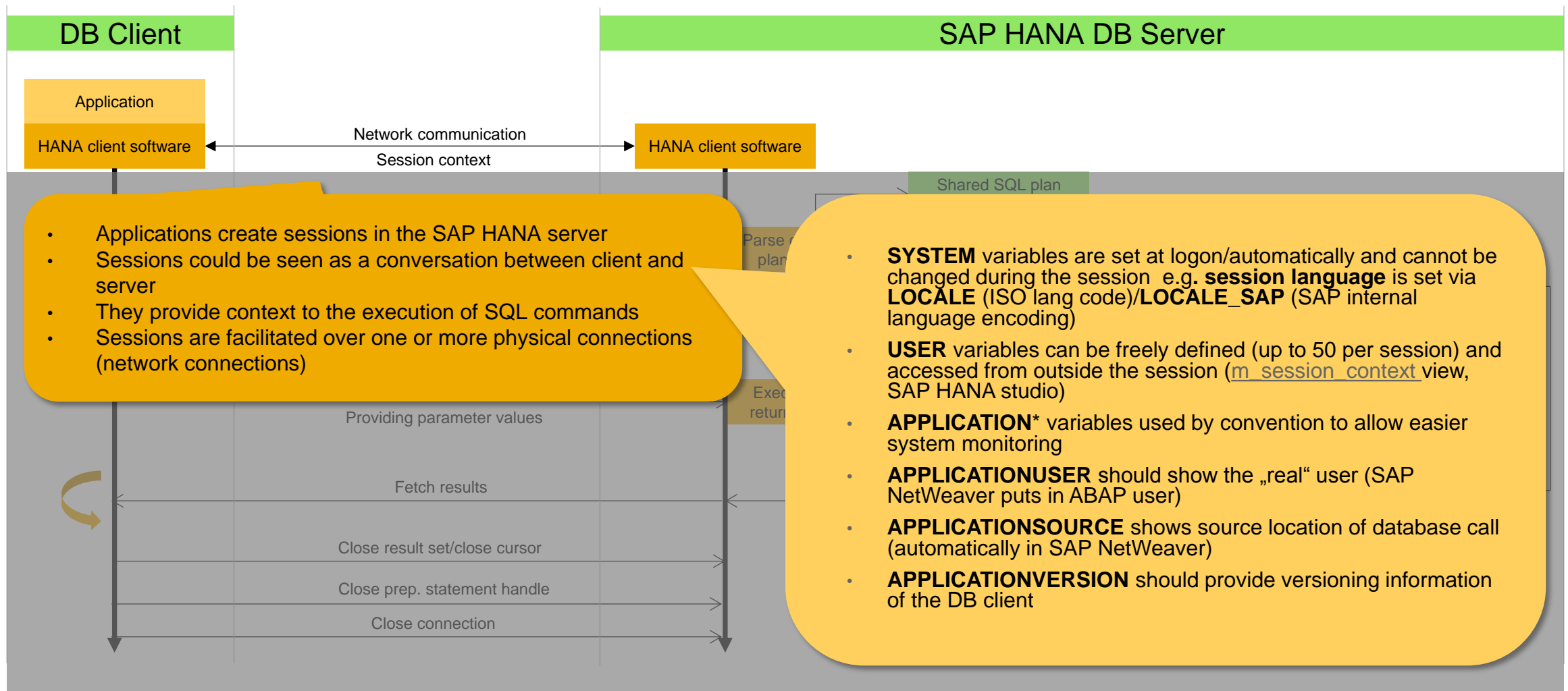
- **Don't** treat SAP HANA as a black box!
- Understand how it works and use SAP HANA based on that!
- Because: “Garbage in, garbage out” is still true in a client/server situation.
- So, let's see what SAP HANA does with your queries and how you can find out about it...

The rise and fall of your SQL commands

or the lifetime of a session in SAP HANA



Lifetime of a SAP HANA session



Session context variables

SQL

Result

select * from m_session_context where connection_id = current_connection

	HOST	PORT	CONNECTION_ID	KEY	VALUE	SECTION
1	ld9506	30.003	220.329	PROTOCOL_VERSION	4.1 (1, 4)	SYSTEM
2	ld9506	30.003	220.329	LOCALE	de	SYSTEM
3	ld9506	30.003	220.329	LOCALE_SAP	D	SYSTEM
4	ld9506	30.003	220.329	APPLICATIONVERSI...	1.0.64.201309030448	SYSTEM
5	ld9506	30.003	220.329	APPLICATION	HDBStudio	SYSTEM
6	ld9506	30.003	220.329	APPLICATIONSOUR...	run(SQLExecuteFormEditor.java:847);	SYSTEM
7	ld9506	30.003	220.329	APPLICATIONUSER	I028297	SYSTEM

Session context variables – used for monitoring

- **APPLICATION***-variables provide additional meta data for monitoring and answers questions like:
- Which ABAP module runs a statement?
- Which SAP HANA Studio versions are used?
- ...

Overview

Landscape

Alerts

Performance

Threads

Sessions

Blocked Transactions

Enter your filter

Visible rows: 109/109

Add filter

Save as file

n ID	12	...	12	Logical Connection...	AB	Application	AB	Appl. Source	AB	Appl. Version	Appl. User	AB	Database User	AB	Client Host	12	Client Process ID	AB	Current Stmt
	0			200.691	NULL			NULL	NULL	NULL	NULL		SAPWRN		dewdfgwp00399		9.752		NULL
	0			200.690	NULL			NULL	NULL	NULL	NULL		SAPWRN		dewdfgwp00399		5.424		NULL
	0			200.683	NULL			SAPLSFUNCTION...	NULL	NULL	SAPSYS		SAPWRN		dewdfgwp00399				NULL
	0			200.689	NULL			NULL	NULL	NULL	NULL		SAPWRN		dewdfgwp00399				NULL
	0			200.687	NULL			NULL	NULL	NULL	NULL		SAPWRN		dewdfgwp00399				NULL
	0			200.684	NULL			NULL	NULL	NULL	NULL		SAPWRN		dewdfgwp00399				NULL
	0			200.686	NULL			SAPMSSY2:14480	NULL	NULL	DDIC		SAPWRN		dewdfgwp00399				NULL
	0			219.243				csns.admin.trace...		1.50.0.201309060832	d020788		SYSTEM		WDFN00287523...				NULL
	0			219.221				csns.bi.dataprevi...		1.50.0.201309060832	d020788		SYSTEM		WDFN00287523...				NULL
	0			219.272				csns.admin.com...		1.50.0.201309060832	d020788		SYSTEM		WDFN00287523...				NULL
	0			219.216				csns.catalog.inter...		1.50.0.201309060832	d020788		SYSTEM		WDFN00287523...		16.376		NULL
	0			220.329	HDBStudio			run(SQLExecuteF...		1.0.64.201309030448	I028297		I028297		VIEN60239482A....		3.328		NULL
	0			219.520	HDBStudio			call(Administrati...		1.0.64.201309030448	I028297		SYSTEM		VIEN60239482A....		3.328		SELECT TOP 5001...
	0			220.363	HDBStudio			call(Authorizatio...		1.0.64.201309030448	I043007		JULIE		WDFN00272919...		8.580		NULL
	0			219.094	HDBStudio			call(BackupConn...		1.0.60.201306271550	I817291		SYSTEM		10.7.105.8		7.940		NULL
	0			219.227	HDBStudio			run(SQLExecuteF...		1.0.64.201309030448	I028297		I028297		VIEN60239482A....		3.328		NULL

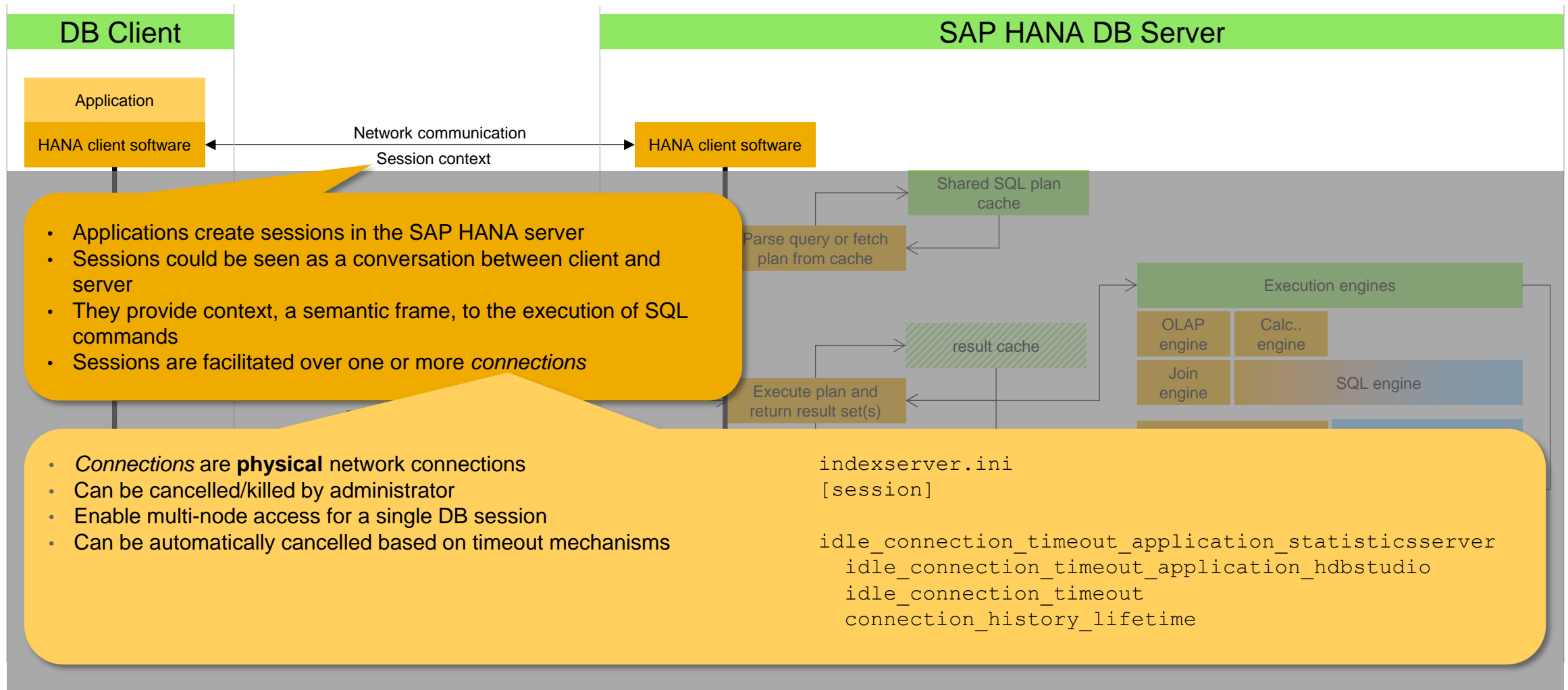
for monitoring and answers questions like:

- Which ABAP module runs a statement?
- Which SAP HANA Studio versions are used?
- ...

- Which user is running the session?
- DB user ≠ OS user
- DB user ≠ SAP NetWeaver user
- APPLICATIONUSER** provides this information

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- DB user ≠ SAP NetWeaver user
- **APPLICATIONUSER** provides this information

Lifetime of SAP HANA session



Connection information – SQL

SQL

Result

```
select connection_id, transaction_id
      , client_host, client_pid, connection_status, user_name
      , start_time
      , round(seconds_between (start_time, current_timestamp)/60/60, 2) as connection_time_h, own
from m_connections
where port = 30003 and connection_type not like '%History%'
order by connection_status desc, start_time desc
```

	CONNECTION_ID	TRANSACTION_ID	CLIENT_HOST	CLIENT_PID	CONNECTION_STATUS	USER_NAME	START_TIME	CONNECTION_TIME_H	OWN
1	219.227	251	VIEN60239482A.sap.corp	3.328	RUNNING	I028297	09.09.2013 14:14:15.910266	1,43	TRUE
2	219.300	256	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:33:59.675323	1,1	FALS
3	219.297	260	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:33:44.520618	1,11	FALS
4	219.272	254	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:24:56.102833	1,25	FALS
5	219.246	258	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:17:49.634763	1,37	FALS
6	219.243	255	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:17:30.143633	1,38	FALS
7	219.221	241	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:10:06.447062	1,5	FALS
8	219.216	250	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:09:28.48022	1,51	FALS
9	219.204	264	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:07:53.84067	1,54	FALS
10	219.199	263	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:07:28.413746	1,54	FALS
11	219.198	259	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:07:28.037596	1,54	FALS
12	219.197	257	WDFN00287523A.sap.corp	16.376	IDLE	SYSTEM	09.09.2013 14:07:27.987721	1,54	FALS
13	219.094	253	10.7.105.8	7.940	IDLE	SYSTEM	09.09.2013 13:46:07.664354	1,9	FALS
14	219.062	249	WDFN30002408A.dhcp....	9.172	IDLE	SYSTEM	09.09.2013 13:36:52.686686	2,05	FALS
15	219.060	248	WDFN30002408A.dhcp....	9.172	IDLE	SYSTEM	09.09.2013 13:36:52.433565	2,05	FALS
16	219.030	246	WDFN30002408A.dhcp....	9.172	IDLE	SYSTEM	09.09.2013 13:36:44.515192	2,06	FALS
17	218.988	247	WDFN30002408A.dhcp....	9.172	IDLE	SYSTEM	09.09.2013 13:26:48.799087	2,22	FALS

Connection information – DBACockpit

Connections

Full Screen On/Off Refresh

System Co System WRN

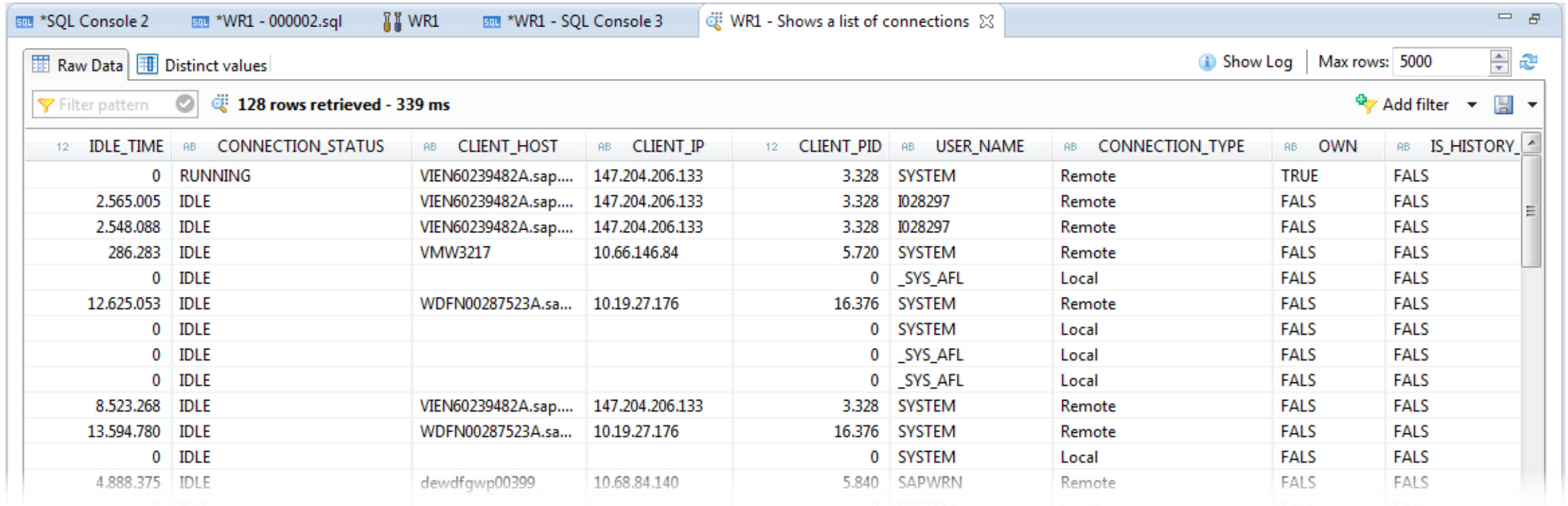
SAP HANA database: Database Ad...

- Heap Usage
- Backup Catalog
- Locks
- liveCache Objects
- System Information
 - **Connections**
 - Connection Statistics
 - Transactions
 - Caches
 - Large Tables
 - Memory Configuration and Usage
 - SQL Workload
 - License
 - Others
- Documentation
 - SAP HANA database in SAP Library
 - SAP HANA database in SDN
- System Landscape
 - System Configuration
 - Database Connections
 - Central Calendar

Connections

Host	Port Number	Connection ID	Transaction ID	Start Time	Idle Time	Connection Status	Client Host	Client IP	Client PID	User Name	Conn
ld9506	30.004	500.027	13	09.09.2013 17:08:15	0	IDLE			0	SYSTEM	Local
ld9506	30.005	308.312	73	09.09.2013 18:00:41	90.979	IDLE	dewdfgwp00399	10.68.84.140	3.536	SAPWRN	Remote
ld9506	30.005	308.296	12	09.09.2013 17:58:11	244.962	IDLE	dewdfgwp00399	10.68.84.140	9.136	SAPWRN	Remote
ld9506	30.005	300.191	7	08.09.2013 21:22:41	0	IDLE			0	SYSTEM	Local
ld9506	30.003	220.507	225	09.09.2013 18:00:06	129.754	IDLE	VMW3217	10.66.146.84	5.720	SYSTEM	Remote
ld9506	30.003	220.504	216	09.09.2013 18:00:06	130.105	IDLE	VMW3217	10.66.146.84	4.460	SYSTEM	Remote
ld9506	30.003	220.486	155	09.09.2013 17:59:08	68.550	IDLE	dewdfgwp00399	10.68.84.140	3.536	SAPWRN	Remote
ld9506	30.003	220.483	18	09.09.2013 17:58:21	145.963	IDLE	dewdfgwp00399	10.68.84.140	9.136	SAPWRN	Remote
ld9506	30.003	220.466	234	09.09.2013 17:50:36	699.745	IDLE	dewdfgwp00399	10.68.84.140	1.644	SAPWRN	Remote
ld9506	30.003	220.389	231	09.09.2013 17:44:32	921.070	IDLE	WDFN00272876A.sap.corp	10.87.86.234	9.832	SYSTEM	Remote
ld9506	30.003	220.377	24	09.09.2013 17:43:46	1.042.470	IDLE	WDFN00272876A.sap.corp	10.87.86.234	9.832	SYSTEM	Remote
ld9506	30.003	220.329	228	09.09.2013 17:21:53	2.391.559	IDLE	VIEN60239482A.sap.corp	147.204.206.133	3.328	I028297	Remote
ld9506	30.003	220.316	23	09.09.2013 17:20:22	2.452.038	IDLE	VIEN60239482A.sap.corp	147.204.206.133	3.328	I028297	Remote
ld9506	30.003	220.308	179	09.09.2013 17:19:40	2.408.476	IDLE	VIEN60239482A.sap.corp	147.204.206.133	3.328	I028297	Remote
ld9506	30.003	220.306	177	09.09.2013 17:19:38	2.426.900	IDLE	VIEN60239482A.sap.corp	147.204.206.133	3.328	I028297	Remote
ld9506	30.003	220.209	238	09.09.2013 17:04:29	0	IDLE			0	_SYS_AFL	Local
ld9506	30.003	220.208	237	09.09.2013 17:04:29	0	IDLE			0	SYSTEM	Local
ld9506	30.003	220.194	235	09.09.2013 17:00:54	0	IDLE			0	_SYS_AFL	Local

Connection information – SAP HANA Studio



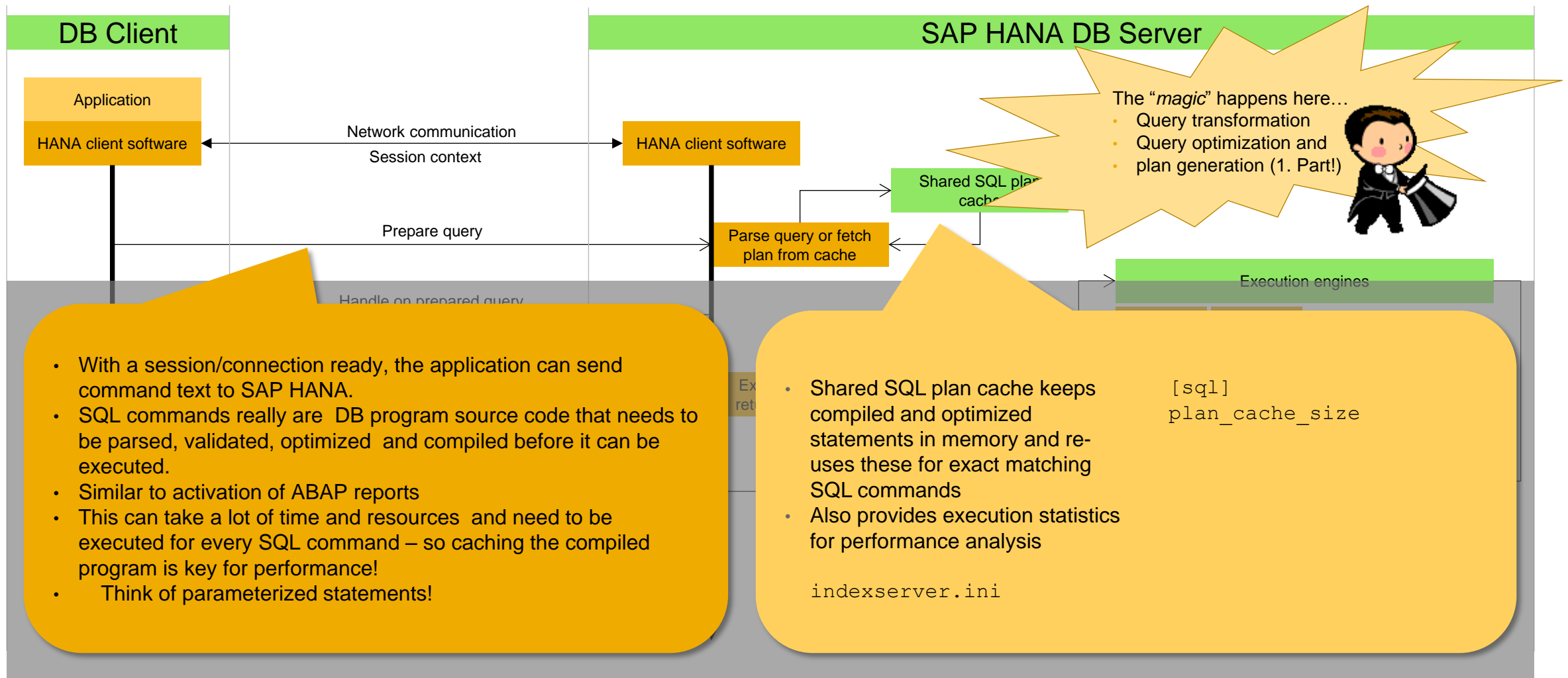
SQL *SQL Console 2 SQL *WR1 - 000002.sql WR1 SQL *WR1 - SQL Console 3 WR1 - Shows a list of connections

Raw Data Distinct values Show Log Max rows: 5000

Filter pattern 128 rows retrieved - 339 ms Add filter

12	IDLE_TIME	CONNECTION_STATUS	CLIENT_HOST	CLIENT_IP	12	CLIENT_PID	USER_NAME	CONNECTION_TYPE	OWN	IS_HISTORY
	0	RUNNING	VIEN60239482A.sap....	147.204.206.133		3.328	SYSTEM	Remote	TRUE	FALS
	2.565.005	IDLE	VIEN60239482A.sap....	147.204.206.133		3.328	I028297	Remote	FALS	FALS
	2.548.088	IDLE	VIEN60239482A.sap....	147.204.206.133		3.328	I028297	Remote	FALS	FALS
	286.283	IDLE	VMW3217	10.66.146.84		5.720	SYSTEM	Remote	FALS	FALS
	0	IDLE				0	_SYS_AFL	Local	FALS	FALS
	12.625.053	IDLE	WDFN00287523A.sa...	10.19.27.176		16.376	SYSTEM	Remote	FALS	FALS
	0	IDLE				0	SYSTEM	Local	FALS	FALS
	0	IDLE				0	_SYS_AFL	Local	FALS	FALS
	0	IDLE				0	_SYS_AFL	Local	FALS	FALS
	8.523.268	IDLE	VIEN60239482A.sap....	147.204.206.133		3.328	SYSTEM	Remote	FALS	FALS
	13.594.780	IDLE	WDFN00287523A.sa...	10.19.27.176		16.376	SYSTEM	Remote	FALS	FALS
	0	IDLE				0	SYSTEM	Local	FALS	FALS
	4.888.375	IDLE	dewdfgwp00399	10.68.84.140		5.840	SAPWRN	Remote	FALS	FALS

Lifetime of a SAP HANA session



Shared SQL plan cache – SQL monitoring

SQL	Result																																																																																				
<pre> select plan_id, statement_string, execution_count, avg_execution_time, accessed_objects, parameter_count, reference_count, plan_memory_size, avg_preparation_time, total_execution_fetch_time, preparation_count from "M_SQL_PLAN_CACHE" pc join m_services s on s.host = pc.host and s.port = pc.port where s.service_name = 'indexserver' and pc.is_internal = 'FALSE' and pc.user_name = 'I028297' </pre>	<ul style="list-style-type: none"> • Most flexible analysis approach • System views M_SQL_PLAN_CACHE and M_SQL_PLAN_CACHE_RESET provide lots of runtime statistics on statement level 																																																																																				
	<table> <tr> <th></th><th>PLAN_ID</th><th>STATEMENT_STRING</th><th>EXECUTION_COUNT</th><th>AVG_EXECUTION_TIME</th><th>ACCESSED_OBJECTS</th><th>PARAMETER_COUNT</th></tr> <tr> <td>1</td><td>3.592</td><td>select connection_id, transaction_id , client_host, client_pid, connection_status, user_na...</td><td>1</td><td>19.297</td><td>131390(36)</td><td>0</td></tr> <tr> <td>2</td><td>373</td><td>SELECT 'PING' FROM SYS.DUMMY</td><td>37</td><td>88</td><td>131390(36)</td><td>0</td></tr> <tr> <td>3</td><td>6.524</td><td>select * from SYS.DUMMY</td><td>11</td><td>74</td><td>131390(36)</td><td>0</td></tr> <tr> <td>4</td><td>6.523</td><td>SELECT VERSION, CURRENT_USER FROM SYS.M_DATABASE</td><td>11</td><td>84</td><td></td><td>0</td></tr> <tr> <td>5</td><td>6.525</td><td>select * from "PUBLIC"."M_FEATURES" where COMPONENT_NAME='SMART DATA ACCESS'</td><td>1</td><td>136</td><td></td><td>0</td></tr> <tr> <td>6</td><td>6.528</td><td>SELECT "HOST", "KEY", "VALUE" FROM SYS.M_HOST_INFORMATION WHERE UPPER("KEY")...</td><td>3</td><td>343</td><td>131390(36)</td><td>0</td></tr> <tr> <td>7</td><td>6.522</td><td>select * from m_session_context where connection_id = current_connection</td><td>3</td><td>39.590</td><td>131390(36)</td><td>0</td></tr> <tr> <td>8</td><td>6.531</td><td>{ call SYS.REPOSITORY_REST (?,?) }</td><td>8</td><td>144.006</td><td></td><td>2</td></tr> <tr> <td>9</td><td>6.530</td><td>SELECT * FROM M_CLIENT_VERSIONS WHERE CLIENT_TYPE='InformationModeler' AND C...</td><td>1</td><td>55</td><td></td><td>0</td></tr> <tr> <td>10</td><td>6.529</td><td>SELECT "HOST", "PORT", "SERVICE_NAME", "ACTIVE_STATUS", "PROCESS_ID", "COORDINAT...</td><td>3</td><td>409</td><td>131390(36)</td><td>0</td></tr> <tr> <td>11</td><td>6.527</td><td>SELECT MASSYSTEMDBPRIVILEGE(CURRENT_USER, 'BACKUP ADMIN') FROM SYS.DUMMY</td><td>7</td><td>62</td><td>131390(36)</td><td>0</td></tr> </table>		PLAN_ID	STATEMENT_STRING	EXECUTION_COUNT	AVG_EXECUTION_TIME	ACCESSED_OBJECTS	PARAMETER_COUNT	1	3.592	select connection_id, transaction_id , client_host, client_pid, connection_status, user_na...	1	19.297	131390(36)	0	2	373	SELECT 'PING' FROM SYS.DUMMY	37	88	131390(36)	0	3	6.524	select * from SYS.DUMMY	11	74	131390(36)	0	4	6.523	SELECT VERSION, CURRENT_USER FROM SYS.M_DATABASE	11	84		0	5	6.525	select * from "PUBLIC"."M_FEATURES" where COMPONENT_NAME='SMART DATA ACCESS'	1	136		0	6	6.528	SELECT "HOST", "KEY", "VALUE" FROM SYS.M_HOST_INFORMATION WHERE UPPER("KEY")...	3	343	131390(36)	0	7	6.522	select * from m_session_context where connection_id = current_connection	3	39.590	131390(36)	0	8	6.531	{ call SYS.REPOSITORY_REST (?,?) }	8	144.006		2	9	6.530	SELECT * FROM M_CLIENT_VERSIONS WHERE CLIENT_TYPE='InformationModeler' AND C...	1	55		0	10	6.529	SELECT "HOST", "PORT", "SERVICE_NAME", "ACTIVE_STATUS", "PROCESS_ID", "COORDINAT...	3	409	131390(36)	0	11	6.527	SELECT MASSYSTEMDBPRIVILEGE(CURRENT_USER, 'BACKUP ADMIN') FROM SYS.DUMMY	7	62	131390(36)	0
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Shared SQL plan cache – DBACockpit monitoring

SQL Plan Cache

Refresh

System WRN

SAP HANA database: Database Admin...

- Current Status
- Performance
 - Statistics Server
 - Threads
 - Expensive Statements
 - SQL Plan Cache
 - OMS Versions
 - Procedure Statistics
- Performance Warehouse
- Configuration
- Jobs
- Diagnostics
- System Information
- Documentation
- System Landscape

Host:

Port Number:

Statement String:

User Name:

Schema Name:

Sort by: Total Execution Time

Max. No. of Hits: 100

Statement String | EXPLAIN | EXPLAIN (graphically) | Execution Trace | Navigation to Editor

Host	Port Number	Plan ID	Statement String
ld9506	30.003	232	select t.schema_name, t.table_name from sys.tables as t where t.table_name like '/BIC/A%AO'
ld9506	30.003	248	select SCHEMA_NAME '.' TABLE_NAME '.' CLIENT SCHEMA_TABLE_CLIENT, SCHEMA_NAME, TABLE_NAME, CLIENT, STATUS, REQUEST_ID, ERR
ld9506	30.003	231	select count (*) NOT_OK_COUNT from PUBLIC.M_EXTRACTORS where status != 'OK'
ld9506	30.003	223	SELECT b.host, b.port, b.blocked_transaction_id AS blocked_transaction_id, b.blocked_update_transaction_id AS blocked_update_tra
ld9506	30.003	269	select "SCHEMA_NAME" '.' "TABLE_NAME" '.' "PART_ID" "SCHEMA_TABLE_PART", "HOST", "PORT", "SCHEMA_NAME", "TABLE_NAME"
ld9506	30.003	224	select HOST PORT SERVICE_NAME INDEX, HOST, PORT, SERVICE_NAME, PROCESS_ID, LOGICAL_MEMORY_SIZE, PHYSICAL_MEMORY_SIZE, CODE
ld9506	30.003	222	select ((select count(*) from sys.m_blocked_transactions) / (select map(count(*), 0, 1, count(*)) from sys.m_transactions)) * 10
ld9506	30.003	218	select HOST, ROUND(sum(USED_SIZE)/sum(ALLOCATED_SIZE)*100) VALUE from SYS.M_SHARED_MEMORY where CATEGORY = 'TOPOLOGY' group by H
ld9506	30.003	262	select HOST '.' PORT '.' COMPONENT INDEX_COL, HOST, PORT, COMPONENT, USED_MEMORY_SIZE FROM SYS.M_SERVICE_COMPONENT_M
ld9506	30.003	352	select "SCHEMA_NAME" '.' "TABLE_NAME" "SCHEMA_TABLE_NAME", "SCHEMA_NAME", "TABLE_NAME", "RECORD_COUNT", "ALLOCATED_FIXED_
ld9506	30.003	219	SELECT TB.STATE_NAME, TF.SOURCE_ID, TF.HOST, TV.PORT, TF.SERVICE_TYPE_NAME FROM "PUBLIC"."M_BACKUP_CATALOG" TB, "PUBLIC"."M_BACK
ld9506	30.003	247	select "SCHEMA_NAME" '.' "TABLE_NAME" "SCHEMA_TABLE_NAME", "SCHEMA_NAME", "TABLE_NAME", "TMB_SUM_MEMORY_SIZE_IN_TOTAL" "CU

- Easy filtering and sorting of the data
- Straight forward workflow to find e.g. the long runner SQL statements
- Build-in navigation to **EXPLAIN PLAN**, **SQL Editor** and **PlanViz-File** creation

Shared SQL plan cache – SAP HANA Studio monitoring

WR1 (SYSTEM) WR1 - Warroom Testsystem Id9506.wdf.sap.corp 00 Last Update: 09.09.2013 17:40:01 Interval: 60 Seconds

Overview Landscape Alerts Performance Volumes Configuration System Information Diagnosis Files Trace Configuration Console

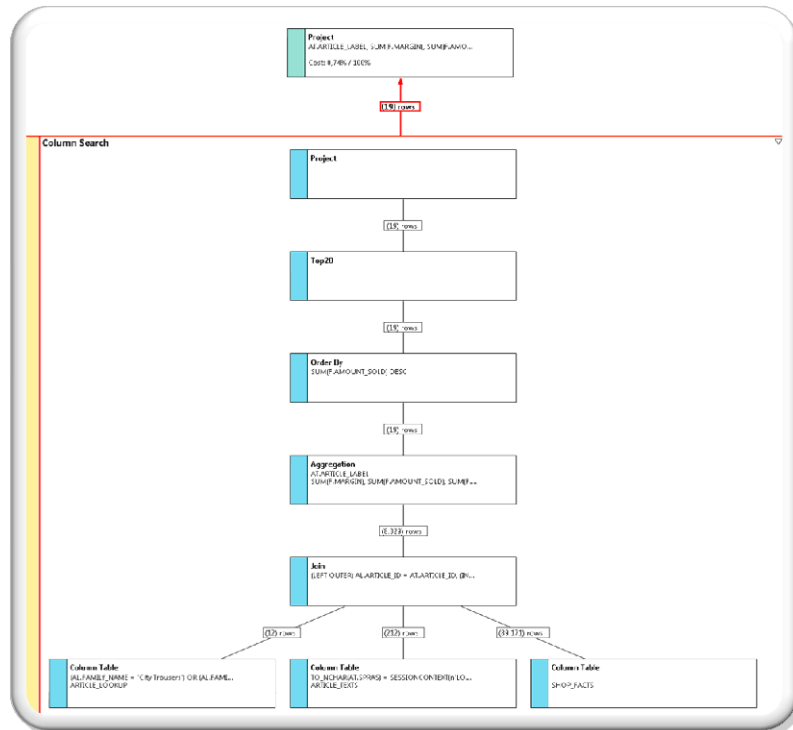
Threads Sessions Blocked Transactions SQL Plan Cache Expensive Statements Trace Job Progress Load

Enter your filter Visible rows: 4376/4376

AVG_EXECUTION_TIME	EXECUTION_COUNT	STATEMENT_STRING	STATEMENT_HASH	USER_NAME	SCHEMA_NAME	IS_VALID
14.911.094	23	select "SCHEMA_NAME" '.' "TABLE_NAME"...	fc2c80017e051f94638a8f382bd6323	_SYS_STATISTICS	_SYS_STATISTICS	TRUE
7.809.447	88	select SCHEMA_NAME '.' TABLE_NAME ...	67300b9fa874852406025d12121e8ed	_SYS_STATISTICS	_SYS_STATISTICS	TRUE
7.698.302	176	select t.schema_name, t.table_name from s...	905dbaa938			TRUE
7.608.654	88	select count (*) NOT_OK_COUNT from PUB...	73fd22e11d			TRUE
7.117.476	1	select "SCHEMA_NAME" '.' "TABLE_NAME"...	c3ce484e14			TRUE
5.064.733	23	select HOST '.' PORT '.' COMPONEN...	71991dbf589bc4bccc342e43e084314	_SYS_STATISTICS	_SYS_STATISTICS	TRUE
4.550.187	23	select "SCHEMA_NAME" '.' "TABLE_NAME"...	f6d34a3b24			TRUE
3.076.183	23	select "SCHEMA_NAME" '.' "TABLE_NAME"...				TRUE
1.747.951	1	CALL "_SYS_AFL"."PALFORECASTWITHLOGI...	bfe2d0271c			TRUE
1.530.095	1	SELECT TOP 5001 "Server Host", "Server Por...	f900490ccc			TRUE
1.453.926	1	SELECT TOP 5001 "Server Host", "Server Por...	30d1e254b6b8438f21aa925eeeb0bc8	SYSTEM	SYSTEM	TRUE
1.034.786	88	SELECT TB.STATE_NAME, TF.SOURCE_ID, T...	062a118a73583797125c01e2871f7d4	_SYS_STATISTICS	_SYS_STATISTICS	TRUE
876.821	1	SELECT "NAME" FROM "TRDIR" WHERE "N...	bbc2ff8720f950ed797c6ce6b4622f6	SAPWRN	SAPWRN	TRUE

- Easy filtering and sorting of the data
- Straight forward workflow to find e.g. the long runner SQL statements
- Build-in navigation to **Plan Visualization**

Query plan information available after preparation



=

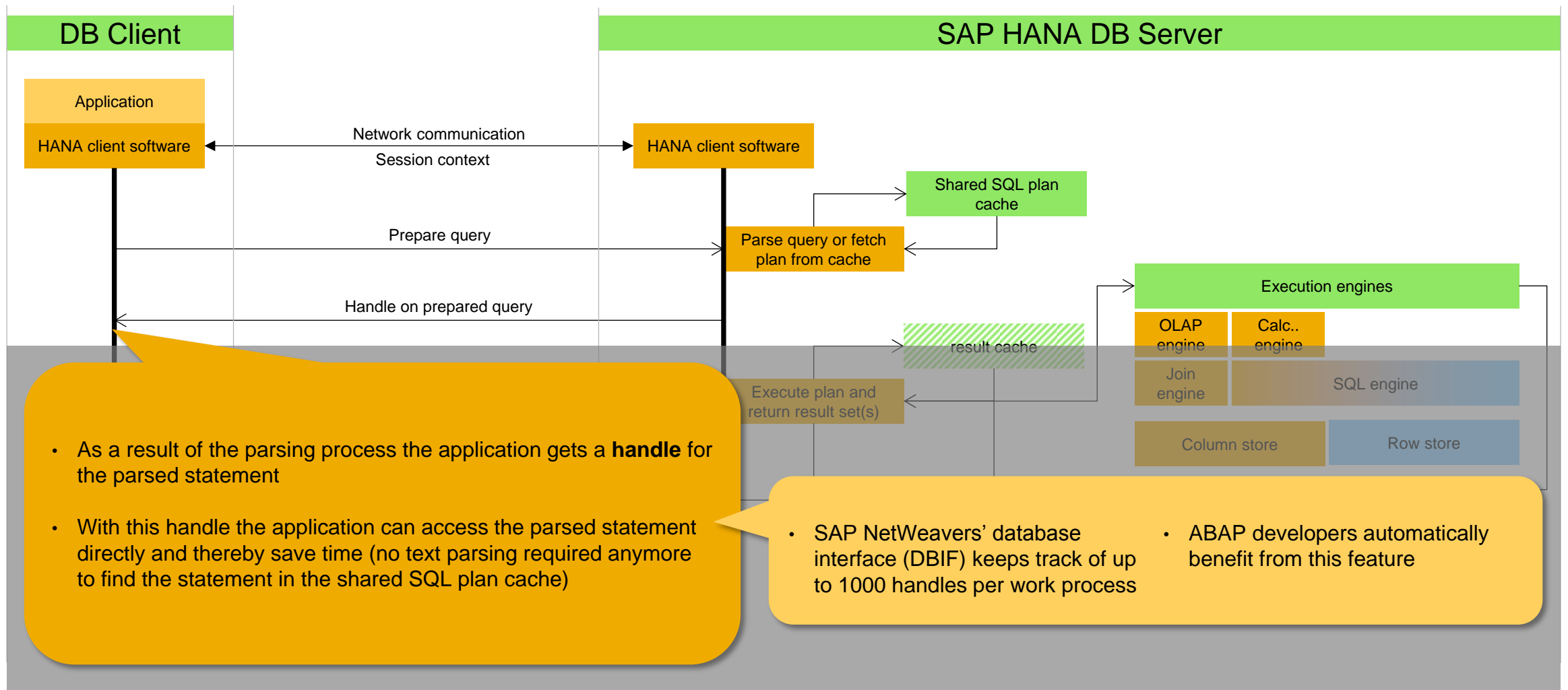
SQL | Result

EXPLAIN PLAN FOR
SELECT TOP 20
at.article_label as "ARTICLE_LABEL_LOCALE",
sum("MARGIN") AS "MARGIN",
sum("AMOUNT_SOLD") AS "AMOUNT_SOLD",
sum("QUANTITY_SOLD") AS "QUANTITY_SOLD"
FROM efashion.shop_facts f
left outer join efashion.article_lookup al
on f.article_id = al.article_id
left outer join efashion.article_texts at
on al.article_id = at.article_id
and at.spras = session_context ('LOCALE_SAP')
left outer join efashion.outlet_lookup ol
on f.shop_id = ol.shop_id
WHERE "FAMILY_NAME" IN ('City Trousers', 'City Skirts')
GROUP BY
at.article_label
ORDER BY "AMOUNT_SOLD" desc

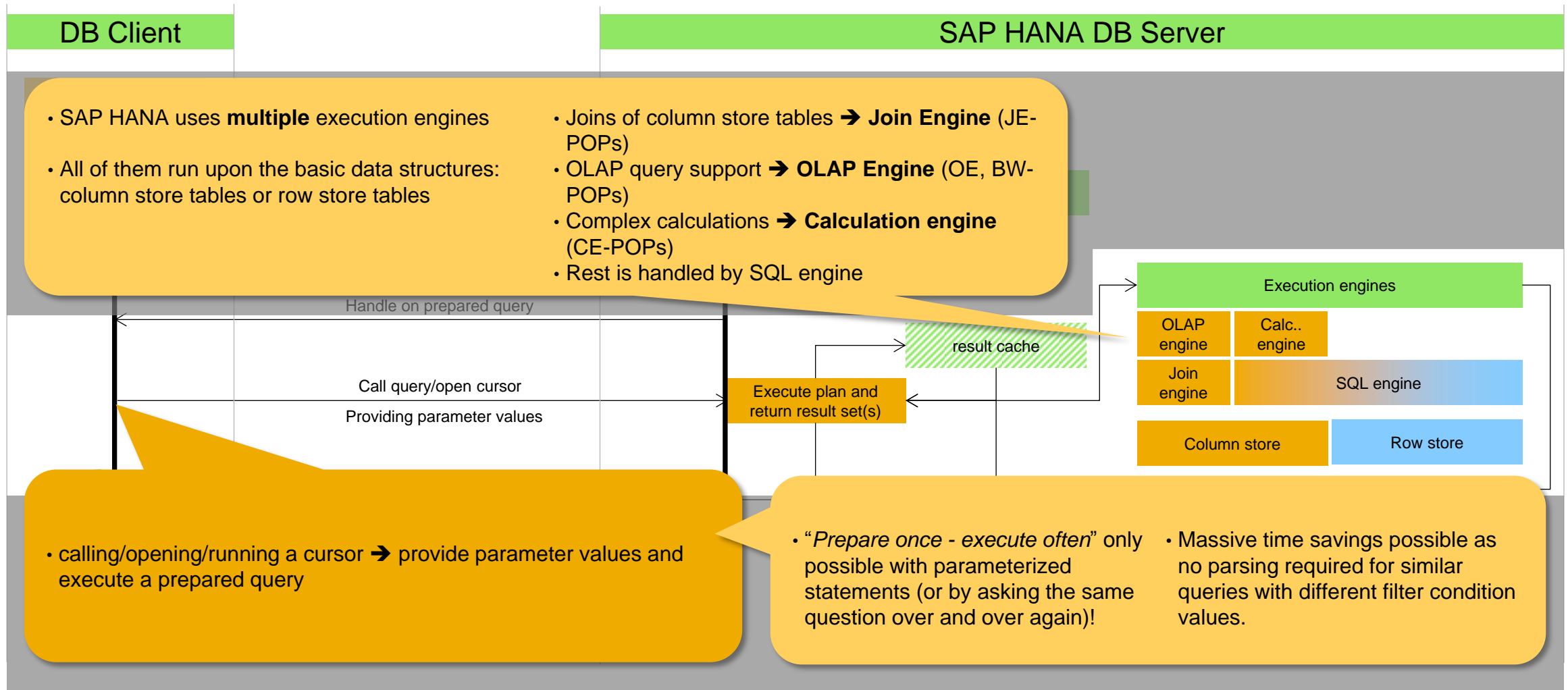
	OPERATOR_NAME	OPERATOR_DETAILS	EXECUTION_ENGINE	SCHEMA_NAME	TABLE_NAME	TABLI
1	COLUMN SEARCH	AT.ARTICLE_LABEL, SUM(F.MARGIN), SUM(F.AMOUNT_SOLD), SUM(F.QUANTITY_SOLD) (...	COLUMN	NULL	NULL	NULL
2	LIMIT	NUM RECORDS: 20	COLUMN	NULL	NULL	NULL
3	ORDER BY	SUM(F.AMOUNT_SOLD) DESC	COLUMN	NULL	NULL	NULL
4	AGGREGATION	GROUPING: AT.ARTICLE_LABEL, AGGREGATION: SUM(F.MARGIN), SUM(F.AMOUNT_SOLD...	COLUMN	NULL	NULL	NULL
5	JOIN	JOIN CONDITION: (LEFT OUTER) AL.ARTICLE_ID = AT.ARTICLE_ID, (INNER) AL.ARTICLE_ID...	COLUMN	NULL	NULL	NULL
6	COLUMN TABLE	FILTER CONDITION: (AL.FAMILY_NAME = 'City Trousers') OR (AL.FAMILY_NAME = 'City S...	COLUMN	EFASHION	ARTICLE_L...	COLU
7	COLUMN TABLE	FILTER CONDITION: TO_NCHAR(AT.SPRAS) = SESSIONCONTEXT(n'LOCALE_SAP')	COLUMN	EFASHION	ARTICLE_TE...	COLU
8	COLUMN TABLE		COLUMN	EFASHION	SHOP_FACTS	COLU'

- Explain plan and it's graphical representation represent the **plan** created and optimized by the SQL optimizer.
- It's based on runtime information about the data (e.g. number of records, data distribution etc.) as well as table statistics (if available).
- Upon actual execution, additional optimizations are applied by the execution engines (e.g. column pruning in the calculation engine, join ordering in the join engine, removal of superfluous joins, etc.)
- **That means, the explain plan can not tell us, where time is spent during execution!**

Lifetime of a SAP HANA session



Lifetime of a SAP HANA session



Parameterized Statements...?!

```
select id, name from employees  
where id = 1;
```

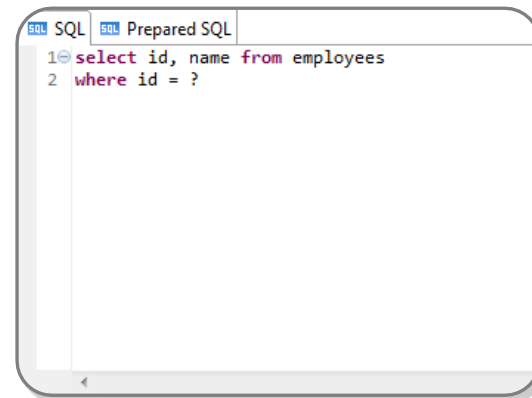
```
select id, name from employees  
where id = 2;
```

- 2 similar, but **different** statements
- 2 x parsing, optimizing
- 2 x storing and keeping the execution plan in memory
- Can be executed only for the hard coded ID number.

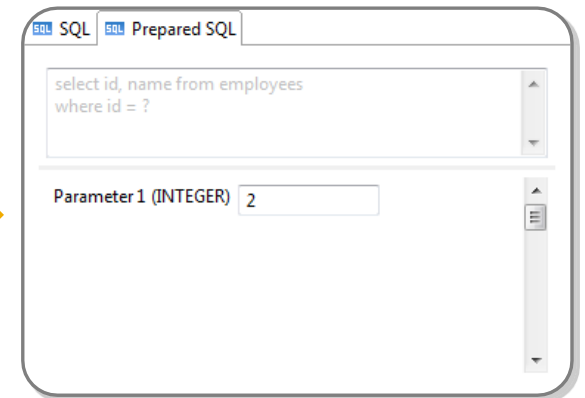


```
select id, name from employees  
where id = ?;
```

- Just 1 statement with a parameter
- 1 x parsing, optimizing
- 1 x storing and keeping the execution plan in memory
- Can be re-used indefinitely

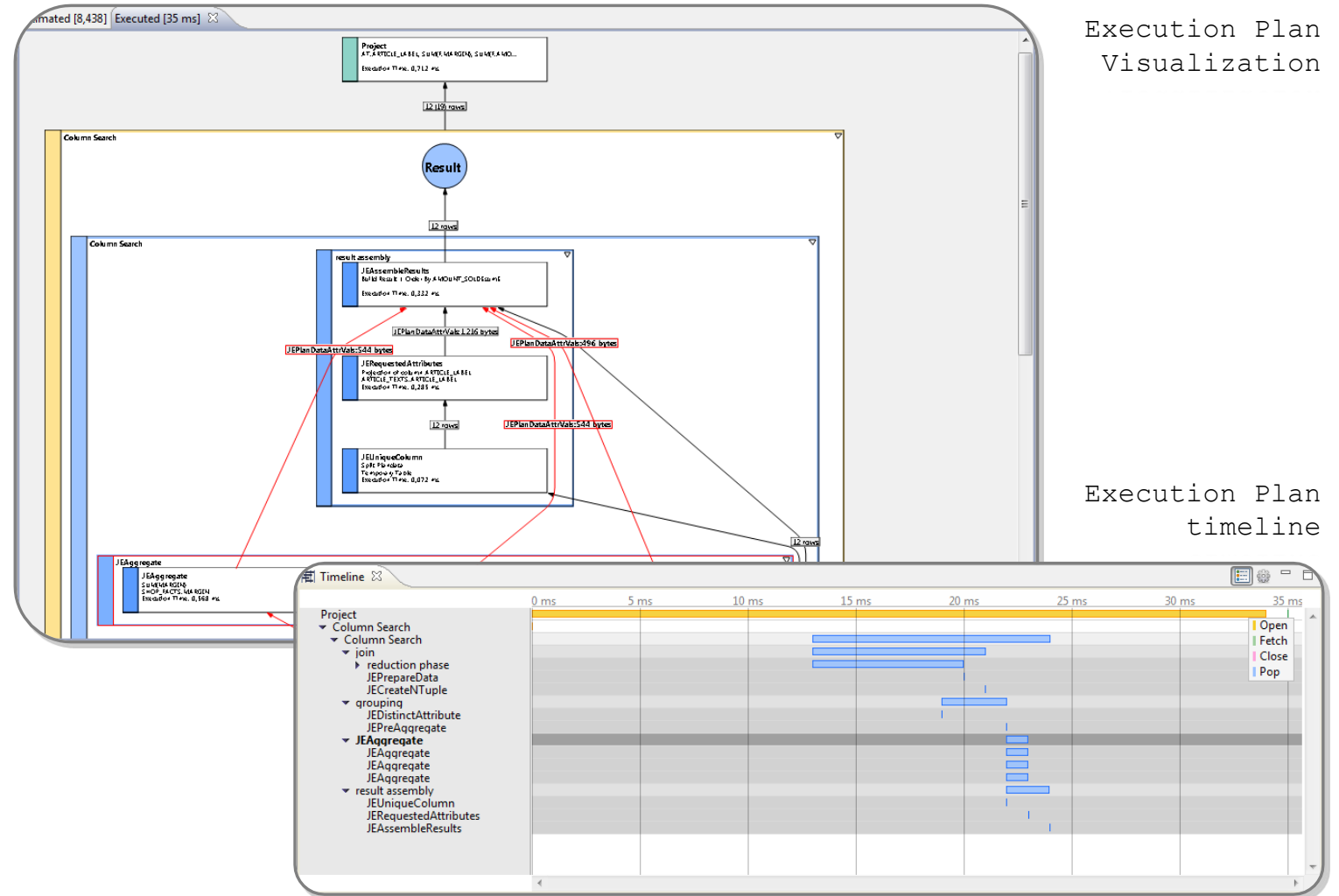


Execute [F8]

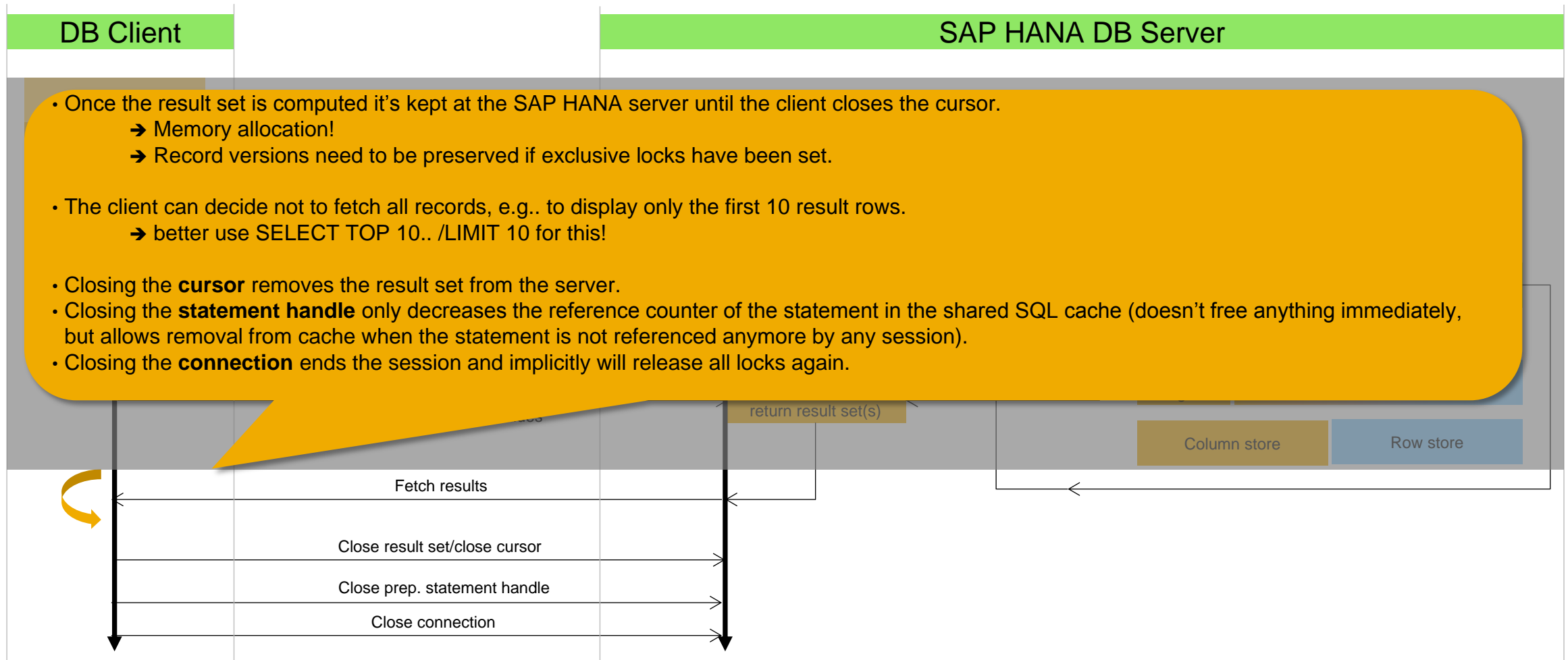


How to know what is really executed?

- The execution engines perform additional optimizations when the parameter values are known.
- This can change the actual execution tremendously.
- Plan Visualization → Execute shows actual operation order, intermediate result set size, parallelism, biggest runtime contributors, etc.



Lifetime of SAP HANA session



How does that look in the real world?

```
3 Connection connection = myHANAconnection.getConnection();
4 ClientInfo myClientInfos = new ClientInfo(connection);
5
6 PreparedStatement pstmt = connection.prepareStatement
7     ("select * from EFASHION.SHOP_FACTS where shop_facts_id= ?");
8
9 for (int i = 1; i <= LOOPCNT; i++) {
10     pstmt.setInt(1, i);
11
12     ResultSet resultSet = pstmt.executeQuery();
13
14     while (resultSet.isAfterLast() == false) {
15         resultSet.next();
16     }
17     resultSet.close();
18
19 }
20
21
22 pstmt.close();
23 connection.close();
24 System.exit(0);
```

vanilla JAVA code

Prepare

Open

Fetch

Close

Program Name	Object name	Operation	Curs	Array	Σ	Recs.	RC	Conn	Statement
SAPLPA_PACKAGE_SERVICES	TDEV	PREPARE	486	0	0	0	0	R/3	SELECT WHERE "DEVCLASS" = ?
SAPLPA_PACKAGE_SERVICES	TDEV	OPEN	486	0	0	0	0	R/3	SELECT WHERE "DEVCLASS" = 'SM&P'
SAPLPA_PACKAGE_SERVICES	TDEV	FETCH	486	1	1	0	0	R/3	

SAP NetWeaver SQL trace (ST05)



Performance Analysis Tools

What tools to you use when...

Trace options in SAP HANA Studio

Default settings for traces

Actual system wide trace settings

Actual user specific trace settings

Setup for NetWeaver E2E-traces via SAP PASSPORT

The screenshot shows the 'Trace Configuration' tab in SAP HANA Studio. It contains several sections for configuring different types of traces:

- Global Database Trace**: Configuration: **Default**. Description: The global database trace configuration overrides the default configuration for the database traces. Note: Only database traces with the default configuration are overridden. If a particular database trace is configured, this configuration will be used for that database trace.
- Database Trace**: Configuration: **Default**. Description: If the database trace is configured, the traces for the trace components (for example, INDEXSERVER and NAMESERVER) of the system are written to files named <servicename>.trc. Some of these traces are always activated by default.
- User-Specific Trace**: Configuration: **Not Specified**. Description: If the user trace is specified, the traces for the trace components (for example, INDEXSERVER and NAMESERVER) for a specific database or application user are written to files named <servicename>_<servername>_<contextname>.trc.
- End-to-End Traces**: Description: The predefined end-to-end traces are used by applications to record the steps through all the available trace components (for example, INDEXSERVER and NAMESERVER) in a configuration. When an end-to-end trace is used, the traces for the trace components are written to files named <servicename>_<servername>_<end-to-end_trace_name>.trc.
 - sap_passport_high**: Configuration: **Default**
 - sap_passport_medium**: Configuration: **Default**
- SQL Trace**: Status: **Inactive**. Description: If the SQL trace is active, the database calls for the specified database or application users are traced. The trace data is stored in files starting with sqltrace_<servername>.
- Performance Trace**: Status: **Inactive**. Description: If the performance trace is running, the system performance is traced. The trace data is saved to the file specified.
- Expensive Statements Trace**: Status: **Active** (with a warning icon). Description: If the expensive statements trace is active, all statements that last longer than the specified threshold are traced. You can analyze the results on the Performance tab under Expensive Statements Trace.
- Kernel Profiler**: Status: **Inactive**. Description: The kernel profiler helps you to analyze performance issues with systems on which third-party software cannot be installed. It is also a useful tool for investigating issues with customer systems, as it allows you to analyze issues in parts of the SAP HANA database where performance trace and function profiler tools are not available.

system wide or user specific SQL trace

SAP internal performance trace & profiler

Expensive statement trace

SAP internal sampling profiler

Trace options in SAP HANA Studio

- **SQLTRACE (PYTHON TRACE)**
- **PERFORMANCE TRACE + FUNCTION PROFILER**
- **KERNEL PROFILER**
- **OPTIMIZER TRACES**
- **LOAD GRAPH**
- **STATISTICS SERVER**
- **EXPENSIVE STATEMENTS TRACE**
- **SQL PLAN CACHE**
- **EXPLAIN PLAN**
- **PLAN VISUALIZATION**

SQLTRACE (PYTHON TRACE)

- Incomprehensible w/o SAP HANA development knowledge
- Is like “*taking a sledgehammer to crack a nut*”
- Doesn't provide what *happens* during the execution (rather input → output trace)

PERFORMANCE TRACE + FUNCTION PROFILER

- TREX heritage
- unsupported for non-SAP-Development usage
- requires HANA server access + X11-Window client
- requires special privileges
- doesn't cover row store activity
- tool is barely documented and complex
- function profiler is useless w/o source code

KERNEL PROFILER

- stack code sampling
- profiler tells you how often a specific part of the SAP HANA code was executed and how long that took (approx.)
- again, useless w/o source code

OPTIMIZER TRACES

- `sqlopttime` (runtime information for the query optimization phase)
- `sqloptStep` (single query optimization/transformation steps)
- `trex_qo` (TREX query optimizer → column store plans)

Trace options in SAP HANA Studio

- SQLTRACE (PYTHON TRACE)
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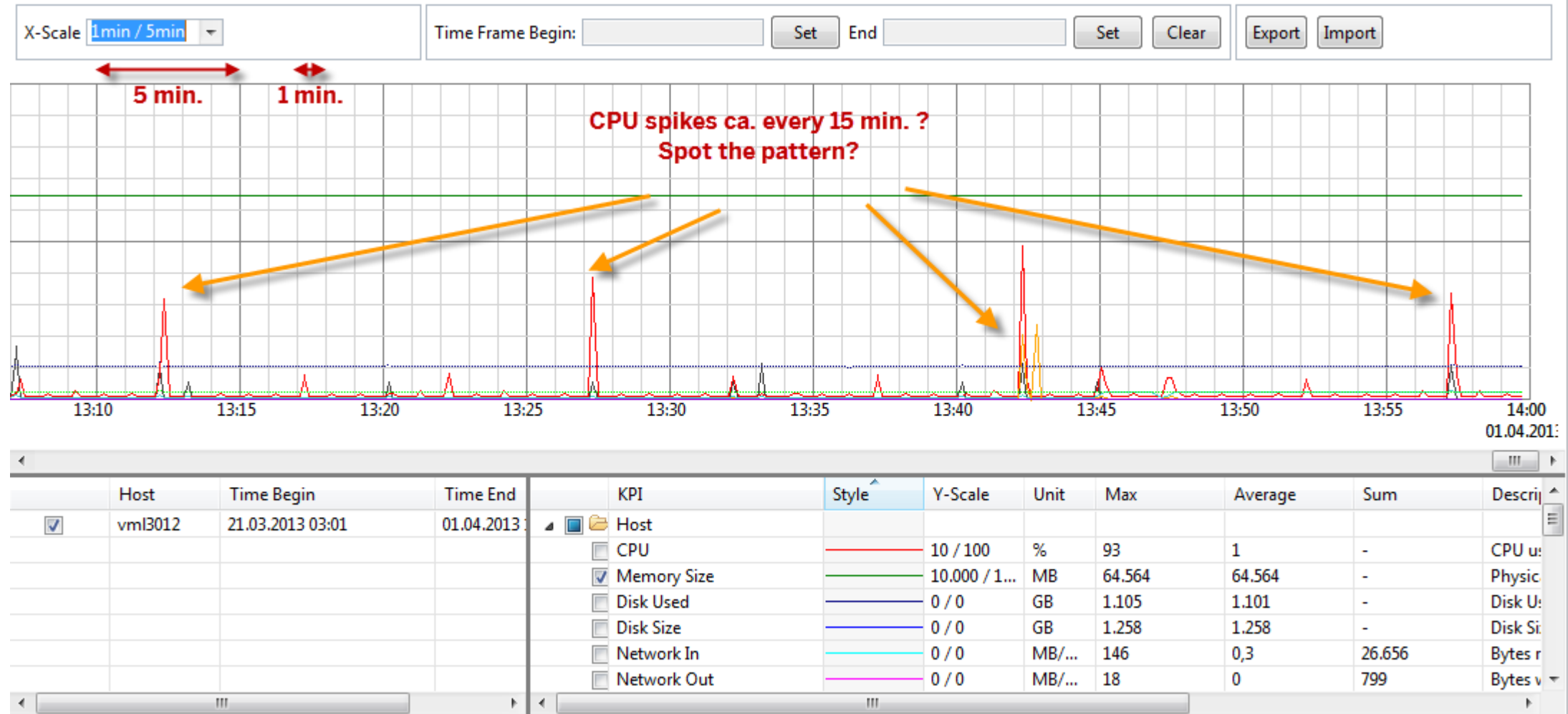


pretty useless for mere mortals like us...

LOAD GRAPH

- Nameserver data (nameserver_history.trc)
- TREX heritage
- Highly aggregated data - cannot (easily) be mapped to a specific user action
- Yet, give a "feeling" of how workload "looks like"
- Could be used to give a rough baseline
- No function to compare to time frames side-by-side or by overlay
- MIN/MAX/AVG numbers are highly volatile and fully depend on the chosen time frame

LOAD GRAPH – Screenshot



STATISTICS SERVER

- `_SYS_STATISTICS` schema
- Lots of data, gathered by automatic snapshots
- Are purged automatically
- Is used as the data source for solution manager (performance warehouse)
- Provide alerts for SAP HANA

STATISTICS SERVER

The screenshot displays the SAP Statistics Server interface for the system 'WR1 (SYSTEM) WR1 - Warroom Testsystem'. The interface includes a navigation bar with tabs for Overview, Landscape, Alerts, Performance, Volumes, Configuration, System Information, Diagnosis Files, and Trace Configuration. The 'Alerts' tab is active, showing a list of alerts with columns for Time and Description. Below the alerts, there is a 'Check Information' section with a table of checks.

Alerts:

Time	Description
Last 15 min (0/1/0)	
Last 30 min (0/1/0)	
Last hour (1/1/2)	
06.06.13 01:06	BIG_DATA.Z_FACTS contains 1770337637 records.
06.06.13 01:06	BIG_DATA.Z_FACTS partition 0 contains 1770337637 records. A table partition cannot contain more than 2,000,000,000 (2
06.06.13 01:06	There are currently 152 diagnosis files. This might indicate a problem with trace file rotation, a high number of crashes, c
06.06.13 02:00	The last data backup is 9 days old. This will increase downtime in a recovery situation.
Last 2 hours (2/1/4)	
06.06.13 00:06	BIG_DATA.Z_FACTS contains 1770337637 records.
06.06.13 00:06	BIG_DATA.Z_FACTS partition 0 contains 1770337637 records. A table partition cannot contain more than 2,000,000,000 (2

Check Information:

ID	Check	Max Priority	Last Run	On Sche...	Next Run
0	Internal statistics server problem		<not available>		<not avail
1	Host physical memory usage		06.06.2013 02:04:35	Yes	06.06.2013
2	Disk usage		06.06.2013 02:01:34	Yes	06.06.2013
3	Inactive services		06.06.2013 02:04:35	Yes	06.06.2013
4	Restarted services		06.06.2013 02:04:35	Yes	06.06.2013
5	Host CPU Usage		06.06.2013 02:04:35	Yes	06.06.2013
10	Delta merge (mergedog) configuration		06.06.2013 01:06:54	Yes	06.06.2013
12	Memory usage of name server		06.06.2013 02:04:35	Yes	06.06.2013
16	Lock wait timeout configuration		06.06.2013 01:06:54	Yes	06.06.2013

_SYS_STATISTICS:

- Column Views
- Functions
- Indexes
- Procedures
- Sequences
- Synonyms
- Tables
 - GLOBAL_COLUMN_TABLES_SIZE
 - GLOBAL_CPU_STATISTICS
 - GLOBAL_DEC_EXTRACTOR_STATUS
 - GLOBAL_DISKS
 - GLOBAL_INTERNAL_DISKFULL_EVENTS
 - GLOBAL_INTERNAL_EVENTS
 - GLOBAL_MEMORY_STATISTICS
 - GLOBAL_PERSISTENCE_STATISTICS
 - GLOBAL_ROWSTORE_TABLES_SIZE
 - GLOBAL_TABLES_SIZE
 - GLOBAL_TABLE_PERSISTENCE_STATISTICS
 - HOST_BLOCKED_TRANSACTIONS
 - HOST_COLUMN_TABLES_PART_SIZE
 - HOST_CONNECTIONS
 - HOST_CONNECTION_STATISTICS
 - HOST_CS_UNLOADS
 - HOST_DATA_VOLUME_PAGE_STATISTICS
 - HOST_DATA_VOLUME_SUPERBLOCK_STATISTICS
 - HOST_DELTA_MERGE_STATISTICS
 - HOST_HEAP_ALLOCATORS
 - HOST_LONG_IDLE_CURSOR
 - HOST_LONG_RUNNING_STATEMENTS

EXPENSIVE STATEMENTS TRACE

- Provides information about runtimes of single statement executions
- Captures the parameter values for parameterized statements
- Can be easily configured to focus on the real long running statements
- What long running statements are, clearly depends on your use case.
- Sometimes this means milliseconds, sometimes it's minutes

EXPENSIVE STATEMENTS TRACE – Setup Screen

The screenshot displays the 'Expensive Statements Trace' setup screen in the SAP Warroom Testsystem. The main window shows a table of database statements with columns: CONNECTION_ID, STATEMENT_ID, DB_USER, APP_USER, STATEMENT_STRING, and DURATION_MICROSECONDS. A configuration dialog box is open, titled 'Expensive Statements Trace', with the following content:

Expensive Statements Trace

You can configure an Expensive Statements Trace by specifying threshold duration for SQL statements execution

Trace Status: ☐ Inactive ☒ Active

Threshold Duration (µs):

12	CONNECTION_ID	STATEMENT_ID	DB_USER	APP_USER	STATEMENT_STRING	12	DURATION_MICROSECONDS
232.183	997218825607679	SYSTEM	1028297	SELECT "THREADS"."HOST", "TH...		609	
232.915	1000362368870435	_SYS_STATISTI...		select HOST PORT SERVICE...		840	
232.915	1000362321656404	_SYS_STATISTI...		select HOST, ROUND(sum(USED...		811	
232.914	1000359220064382	SYS_STATISTI...		select HOST PORT SERVICE...		840	
232.914	1000359359955960					774	
232.912	1000350855578915					800	
232.912	1000349977262957					730	
232.911	1000346372483504					840	
232.911	1000346029942957					730	
232.909	1000337129935564					878	
232.909	1000336744086561					800	
232.908	1000333938465779					830	
232.908	1000332261656446					740	
232.906	1000324602749189					9.650	
232.904	1000316445543360					500	
232.906	1000325234641888					9.940	
232.904	1000315995220495					4.430	
232.904	1000315995220495					4.430	
232.904	1000316262756914					1.120	
232.904	1000316527966304	_SYS_STATISTI...		select reason, count(*) as numb...		1.210	
232.904	1000315538118792	_SYS_STATISTI...		select "SCHEMA_NAME" '.' "		3.240	
232.904	1000315538118792	SYS_STATISTI...		select "SCHEMA NAME" '.' "		3.230	

EXPENSIVE STATEMENTS TRACE – Navigation

Overview Landscape Alerts Performance Volumes Configuration System Information Diagnosis Files Trace Configuration

Threads Sessions Blocked Transactions SQL Plan Cache Expensive Statements Trace Job Progress Load

Enter your filter Visible rows: 1800/1800 Configure Add filter Save as file

NT_ID	DB_USER	APP_USER	START_TIME	DURATION...	RECORDS	STATEMENT_STRING
62	BACKUP_AD...		20.06.2013 22:15:02	1.487.749.527	0	BACKUP DATA ALL USING FILE ('/usr/sap/
13	BACKUP_AD...		22.06.2013 22:15:01	1.487.749.527	0	BACKUP DATA ALL USING FILE ('/usr/sap/
50	BACKUP_AD...				0	BACKUP DATA ALL USING FILE ('/usr/sap/
32	BACKUP_AD...				0	BACKUP DATA ALL USING FILE ('/usr/sap/
70	I815462	I815462			365	SELECT "FIELDA", "FIELDDB", "KEYDATE", SU
70	I815462	I815462			32	SELECT "FIELDA", "FIELDDB", "KEYDATE", SU
77	SYSTEM	d03163			0	{ call SYS.REPOSITORY_REST (?,?) }
70	SAPWRN	DDIC			1	SELECT * FROM "TSP0
34	SYSTEM	d03163			0	{ call SYS.REPOSITORY
05	I815462	I815462			0	{ call SYS.REPOSITORY
70	SYSTEM	d031643	20.06.2013 17:04:22	45.489.971	0	{ call SYS.REPOSITORY
46	SYSTEM	d020788	21.06.2013 14:00:18	42.109.527	0	grant "DATA_ADMIN,
18	SYSTEM	d020788	21.06.2013 13:59:28	41.329.651	0	grant "CONTENT_ADMIN" to "D020788"
45	SYSTEM	d031643	20.06.2013 17:03:39	40.374.016	0	{ call SYS.REPOSITORY_REST (?,?) }
54	I833916		20.06.2013 15:51:02	37.069.820	0	{ call SYS.REPOSITORY_REST (?,?) }
95	SYSTEM	d031643	20.06.2013 17:08:37	36.684.323	0	{ call SYS.REPOSITORY_REST (?,?) }
3	SYSTEM	I028297	24.06.2013 15:35:49	34.747.379	-1	alter system reclaim log
79	I815462	I815462	20.06.2013 17:41:36	33.624.550	0	{ call SYS.REPOSITORY_REST (?,?) }

double click

right click

STATEMENT_STRING

SELECT "FIELDA", "FIELDDB", "KEYDATE", SUM("COUNT") FROM BIG_DATA.Z_FACTSGROUP BY "FIELDA", "FIELDDB", "KEYDATE"

Copy Save As... Close

Column filters

DB_USER (17/18) - Not Equal

_SYS_STATISTICS

Quick filter on [SELECT "FIELDA", "FIELDDB" ...]

Distinct values for [STATEMENT_STRING]

Copy row

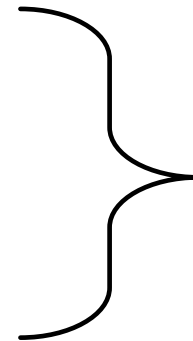
Visualize Plan

SQL PLAN CACHE

- Contains two kind of information:
 1. parsed statements
 2. call and runtime statistics for these statements
- Can answer questions like:
 - "How much time was spent on actually executing the statement?"
 - "Can my statement be reused or does it need to be optimized over and over again?"
- Depending on the use case, the default cache size can be much to small
 - We're gaining experience with that right now

Trace options in SAP HANA Studio

- SQLTRACE (PYTHON TRACE)
- PERFORMANCE TRACE + FUNCTION PROFILER
- KERNEL PROFILER
- OPTIMIZER TRACES
- **LOAD GRAPH**
- **STATISTICS SERVER**
- **EXPENSIVE STATEMENTS TRACE**
- **SQL PLAN CACHE**
- **EXPLAIN PLAN**
- **PLAN VISUALIZATION**



**System wide monitoring – the
BIG picture**

EXPLAIN PLAN

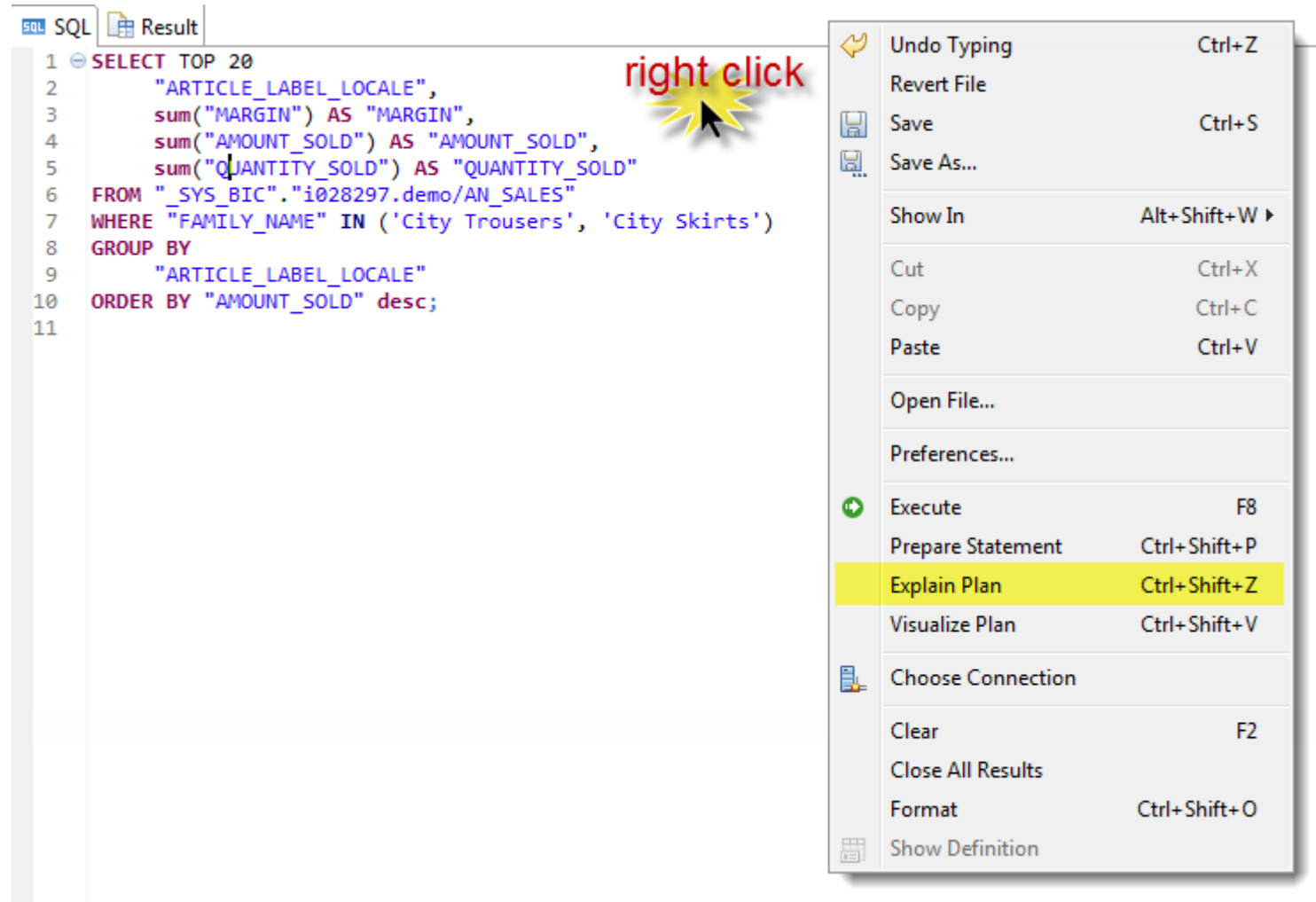
- Can't look "into" modeled views!
- Raw formatting
- Focusses on "costs" and estimated cardinalities (no. of rows)
- First information on which **engine** is used

EXPLAIN PLAN – Demo 1

```
SELECT TOP 20
    "ARTICLE_LABEL_LOCALE",
    sum("MARGIN") AS "MARGIN",
    sum("AMOUNT_SOLD") AS "AMOUNT_SOLD",
    sum("QUANTITY_SOLD") AS "QUANTITY_SOLD"
FROM "_SYS_BIC"."i028297.demo/AN_SALES"
WHERE "FAMILY_NAME" IN ('City Trousers', 'City Skirts')
GROUP BY
    "ARTICLE_LABEL_LOCALE"
ORDER BY "AMOUNT_SOLD" desc;
```

ARTICLE_LABEL_LOCALE	MARGIN	AMOUNT_SOLD	QTY_SOLD
Side Slit Long Skirt	64.437,7000000000004	130.569,09999999992	598
Lycra Trousers	45.848,6000000000006	105.164,09999999992	600
Corduroy Shorts	26.852,0000000000015	76.395,49999999994	429
...			

EXPLAIN PLAN – Demo 2



The screenshot shows the SAP SQL Editor interface. The left pane displays a SQL query, and the right pane shows a context menu after a right-click. A red text label 'right click' with a yellow starburst icon points to the right-click action.

SQL Query:

```
1 SELECT TOP 20
2     "ARTICLE_LABEL_LOCALE",
3     sum("MARGIN") AS "MARGIN",
4     sum("AMOUNT_SOLD") AS "AMOUNT_SOLD",
5     sum("QUANTITY_SOLD") AS "QUANTITY_SOLD"
6 FROM "_SYS_BIC"."i028297.demo/AN_SALES"
7 WHERE "FAMILY_NAME" IN ('City Trousers', 'City Skirts')
8 GROUP BY
9     "ARTICLE_LABEL_LOCALE"
10 ORDER BY "AMOUNT_SOLD" desc;
11
```

Context Menu Options:

Action	Shortcut
Undo Typing	Ctrl+Z
Revert File	
Save	Ctrl+S
Save As...	
Show In	Alt+Shift+W ▶
Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Open File...	
Preferences...	
Execute	F8
Prepare Statement	Ctrl+Shift+P
Explain Plan	Ctrl+Shift+Z
Visualize Plan	Ctrl+Shift+V
Choose Connection	
Clear	F2
Close All Results	
Format	Ctrl+Shift+O
Show Definition	

EXPLAIN PLAN – Demo 3

SQL Result

EXPLAIN PLAN FOR
SELECT TOP 20
"ARTICLE_LABEL_LOCALE",
sum("MARGIN") AS "MARGIN",

	OPERATOR_NAME	OPERATOR_DETAILS	EXECUTION_ENGINE	SCHEMA_NAME	TABLE_NAME	TABLE_TYPE	TABLE_SIZE
1	COLUMN SEARCH	i028297.demo/AN_SALES.ARTICLE_LABEL_LOCALE, SUM(i028297.d...	COLUMN	NULL	NULL	NULL	NULL
2	LIMIT	NUM RECORDS: 20	COLUMN	NULL	NULL	NULL	NULL
3	ORDER BY	SUM(i028297.demo/AN_SALES.AMOUNT_SOLD) DESC	COLUMN	NULL	NULL	NULL	NULL
4	AGGR...	GROUPING: i028297.demo/AN_SALES.ARTICLE_LABEL_LOCALE, AGG...	COLUMN	NULL	NULL	NULL	NULL
5	CO...	FILTER CONDITION: i028297.demo/AN_SALES.FAMILY_NAME = 'ci...	COLUMN	_SYS_BIC	i028297...	OLAP VIEW	89.17



Which Engines are used to process the query?

EXPLAIN PLAN – Demo 4

OPERATOR_NAME	OPERATOR_DETAILS
COLUMN SEARCH	i028297.demo/AN_SALES.ARTICLE_LABEL_LOCALE, SUM(i028297.demo/AN_SALES.MARGIN) , SUM(i028297.demo/AN_SALES.AMOUNT_SOLD) , SUM(i028297.demo/AN_SALES.QUANTITY_SOLD) (LATE MATERIALIZATION)
LIMIT	NUM RECORDS: 20
ORDER BY	SUM(i028297.demo/AN_SALES.AMOUNT_SOLD) DESC
AGGREGATION	GROUPING: i028297.demo/AN_SALES.ARTICLE_LABEL_LOCALE, AGGREGATION: SUM(i028297.demo/AN_SALES.MARGIN) , SUM(i028297.demo/AN_SALES.AMOUNT_SOLD) , SUM(i028297.demo/AN_SALES.QUANTITY_SOLD)
COLUMN VIEW	FILTER CONDITION: i028297.demo/AN_SALES.FAMILY_NAME = 'City Trousers' OR i028297.demo/AN_SALES.FAMILY_NAME = 'City Skirts'

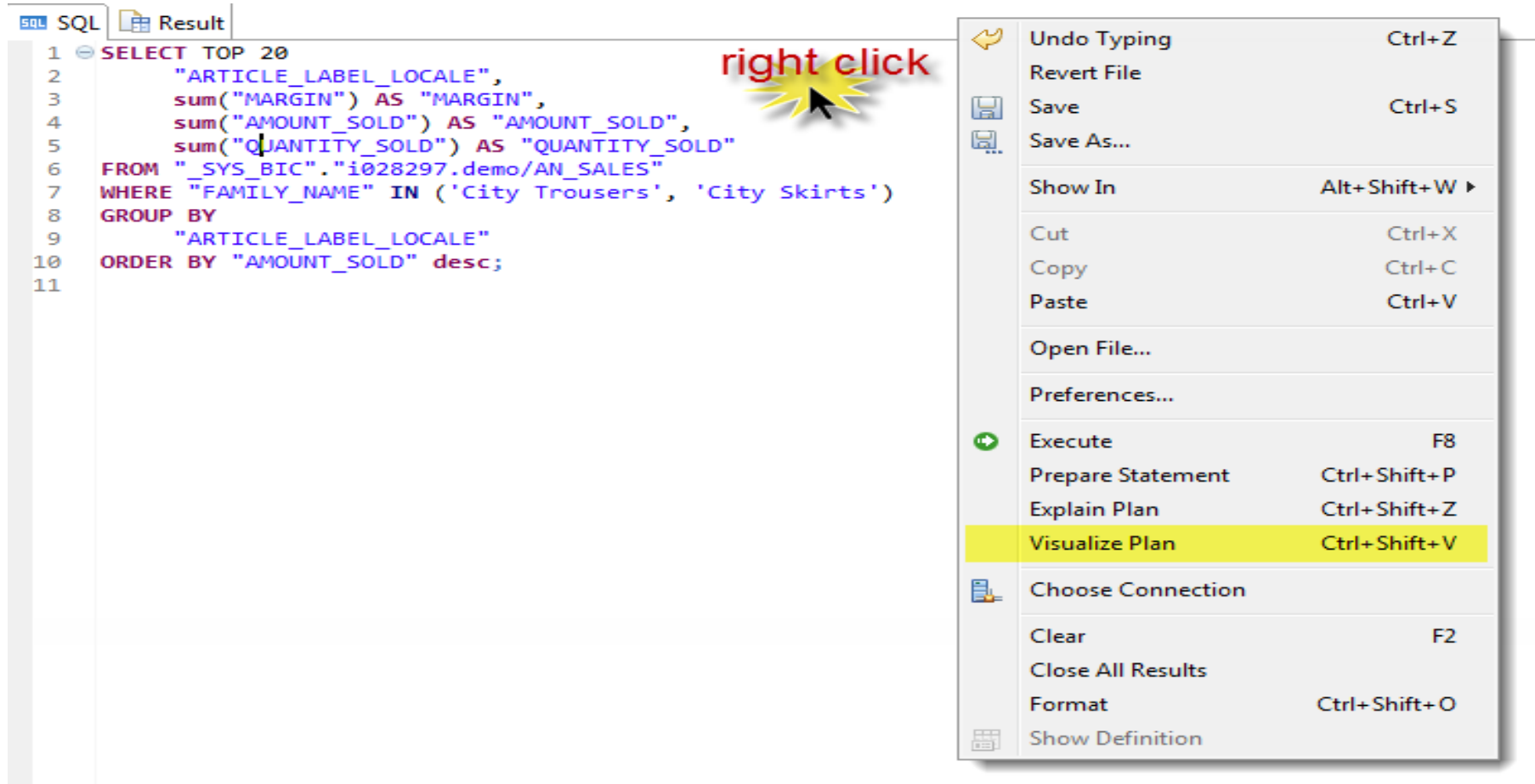
EXPLAIN PLAN – Demo 5

OPERATOR_NAME	EXEC_ENGINE	SCHEMA_NAME	TABLE_NAME	TABLE_TYPE
COLUMN SEARCH				
LIMIT	COLUMN	NULL	NULL	NULL
ORDER BY	COLUMN	NULL	NULL	NULL
AGGREGATION	COLUMN	NULL	NULL	NULL
COLUMN VIEW	COLUMN	NULL	NULL	NULL
	COLUMN	_SYS_BIC	i028297.demo/AN_SALES	OLAP VIEW

PLAN VISUALIZATION

- Relatively easy to use
- Graphical tool, build into SAP HANA studio
- Provides estimation and actual runtime statistics for memory, CPU time, parallelism and total runtime.
- Can be access via SQL Editor, SQL statement cache view, Expensive statement view
- Can be saved (XML file) and reviewed later on
- THE TOOL OF CHOICE!

Plan Visualization (PlanViz)



The screenshot shows the SAP SQL Editor interface. The left pane displays an SQL query, and the right pane shows a context menu after a right-click. A red arrow points to the right-click action.

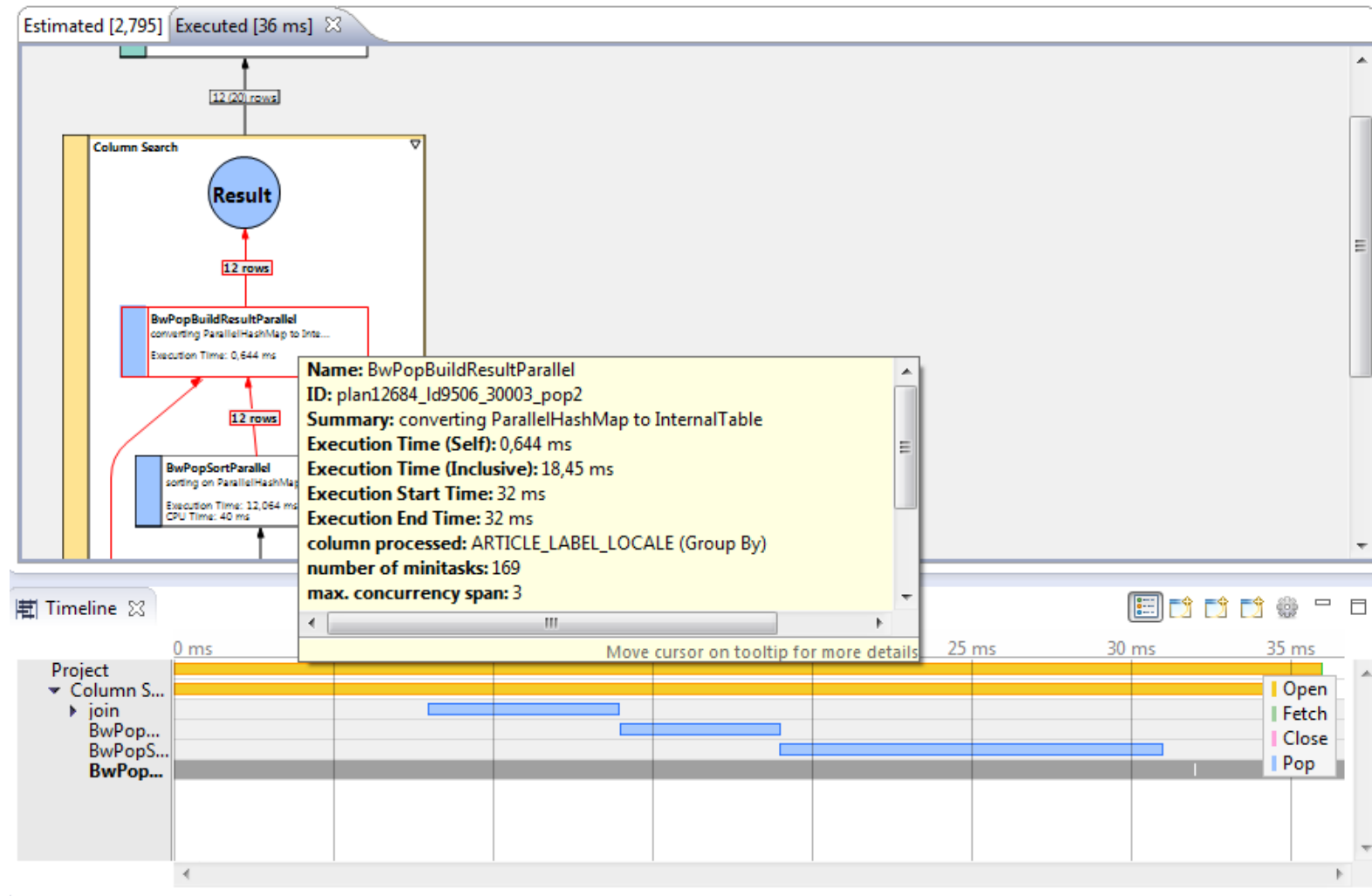
SQL Query:

```
1 SELECT TOP 20
2     "ARTICLE_LABEL_LOCALE",
3     sum("MARGIN") AS "MARGIN",
4     sum("AMOUNT_SOLD") AS "AMOUNT_SOLD",
5     sum("QUANTITY_SOLD") AS "QUANTITY_SOLD"
6 FROM "SYS_BIC"."i028297.demo/AN_SALES"
7 WHERE "FAMILY_NAME" IN ('City Trousers', 'City Skirts')
8 GROUP BY
9     "ARTICLE_LABEL_LOCALE"
10 ORDER BY "AMOUNT_SOLD" desc;
11
```

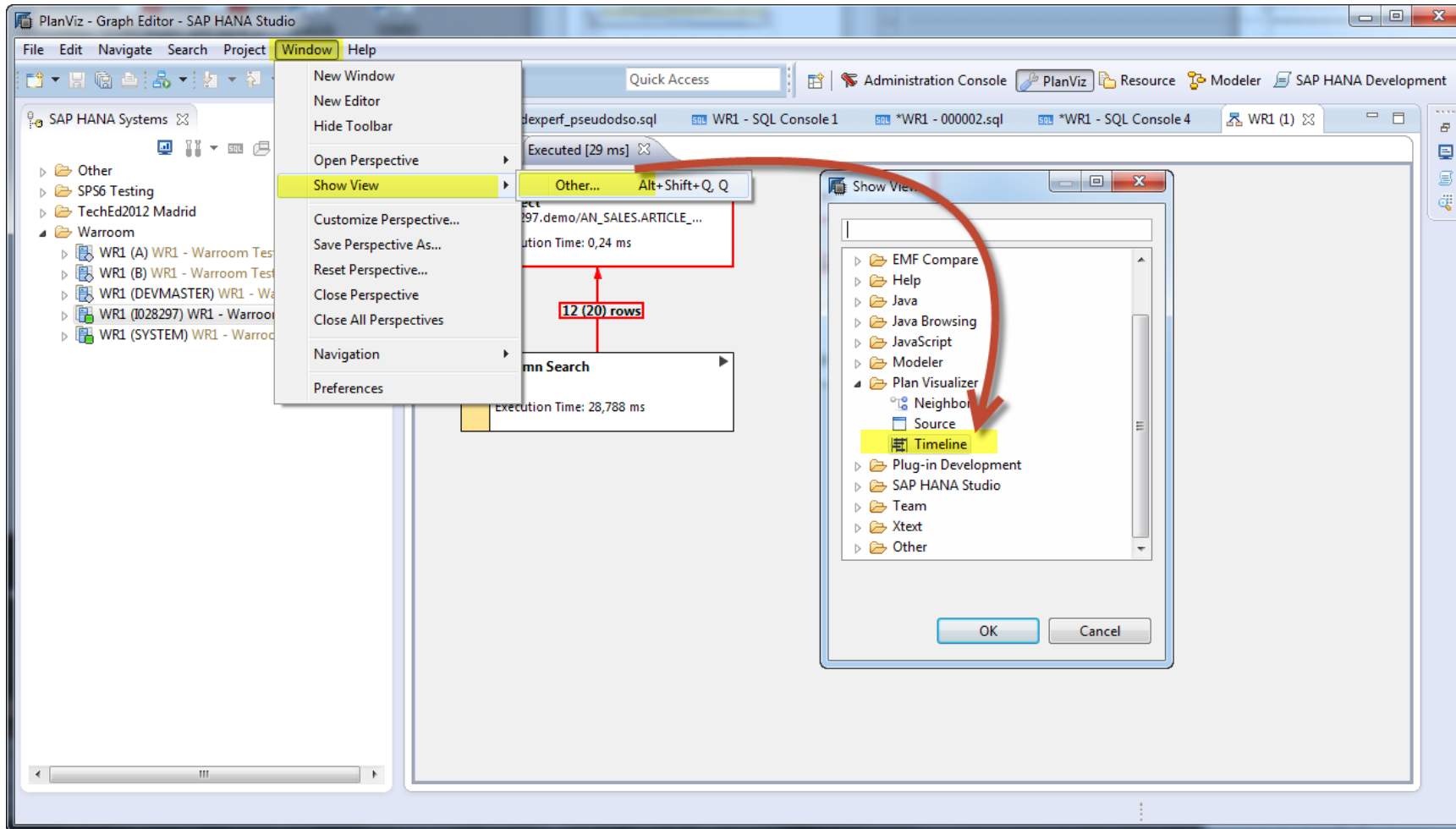
Context Menu Options:

Icon	Action	Shortcut
Undo	Undo Typing	Ctrl+Z
	Revert File	
Save	Save	Ctrl+S
Save As...	Save As...	
	Show In	Alt+Shift+W ▶
	Cut	Ctrl+X
	Copy	Ctrl+C
	Paste	Ctrl+V
	Open File...	
	Preferences...	
Execute	Execute	F8
	Prepare Statement	Ctrl+Shift+P
	Explain Plan	Ctrl+Shift+Z
	Visualize Plan	Ctrl+Shift+V
Choose Connection	Choose Connection	
	Clear	F2
	Close All Results	
	Format	Ctrl+Shift+O
Show Definition	Show Definition	

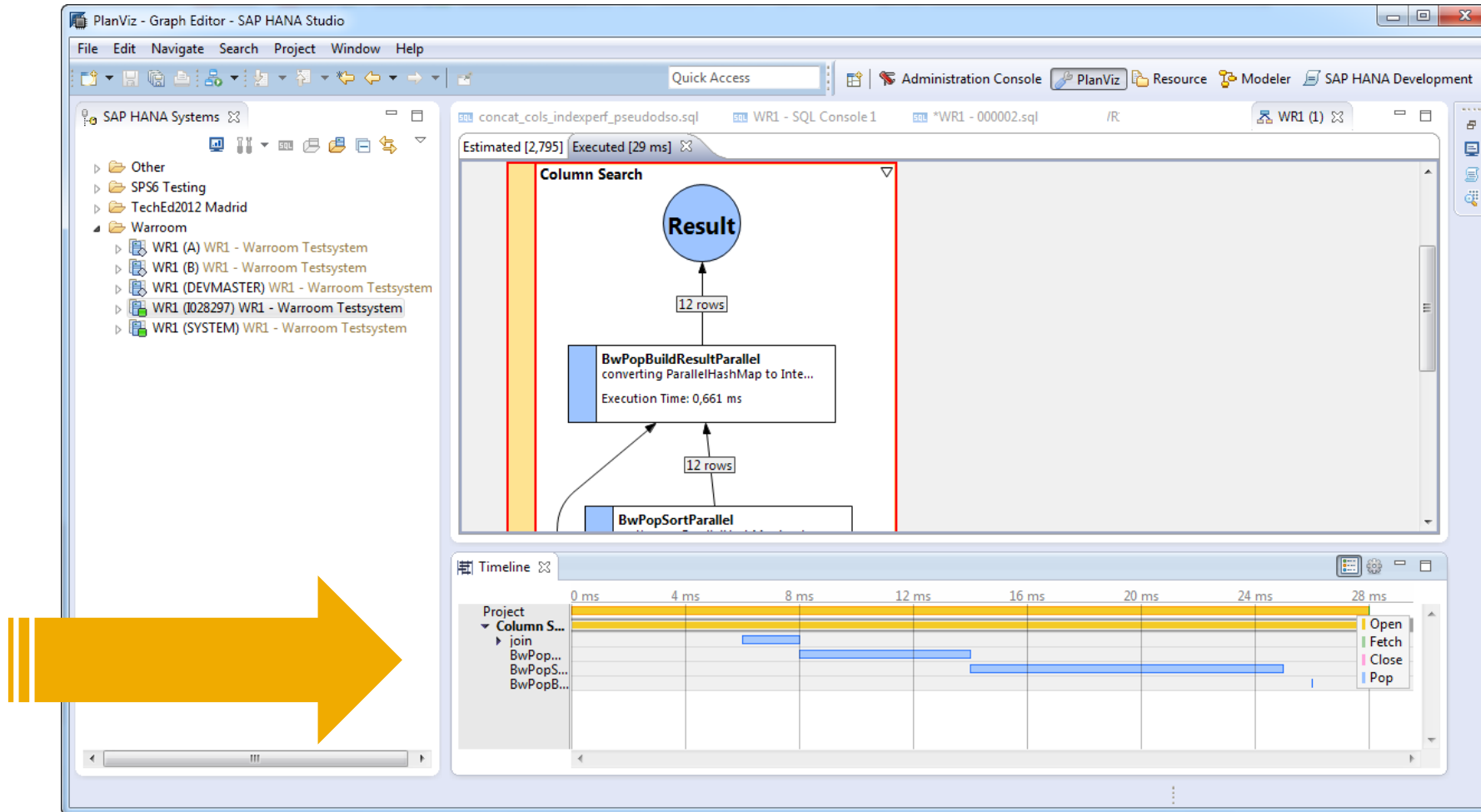
PlanViz



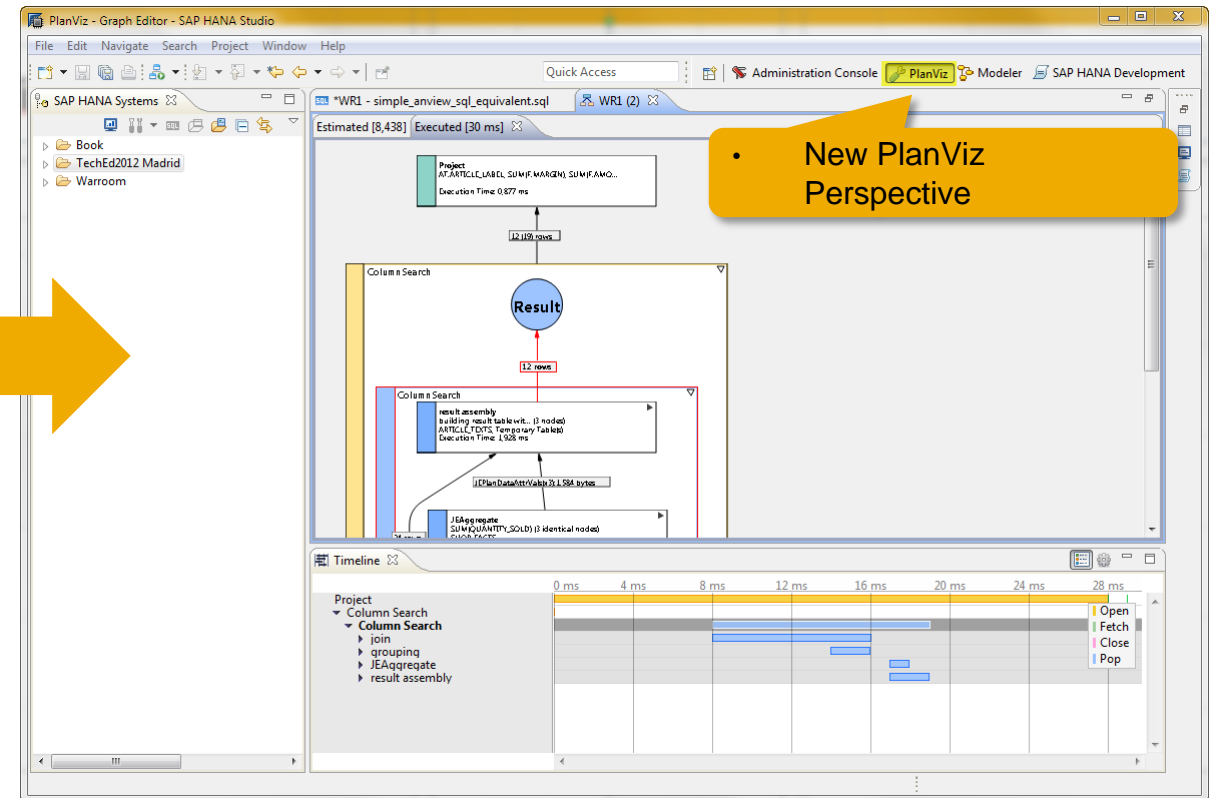
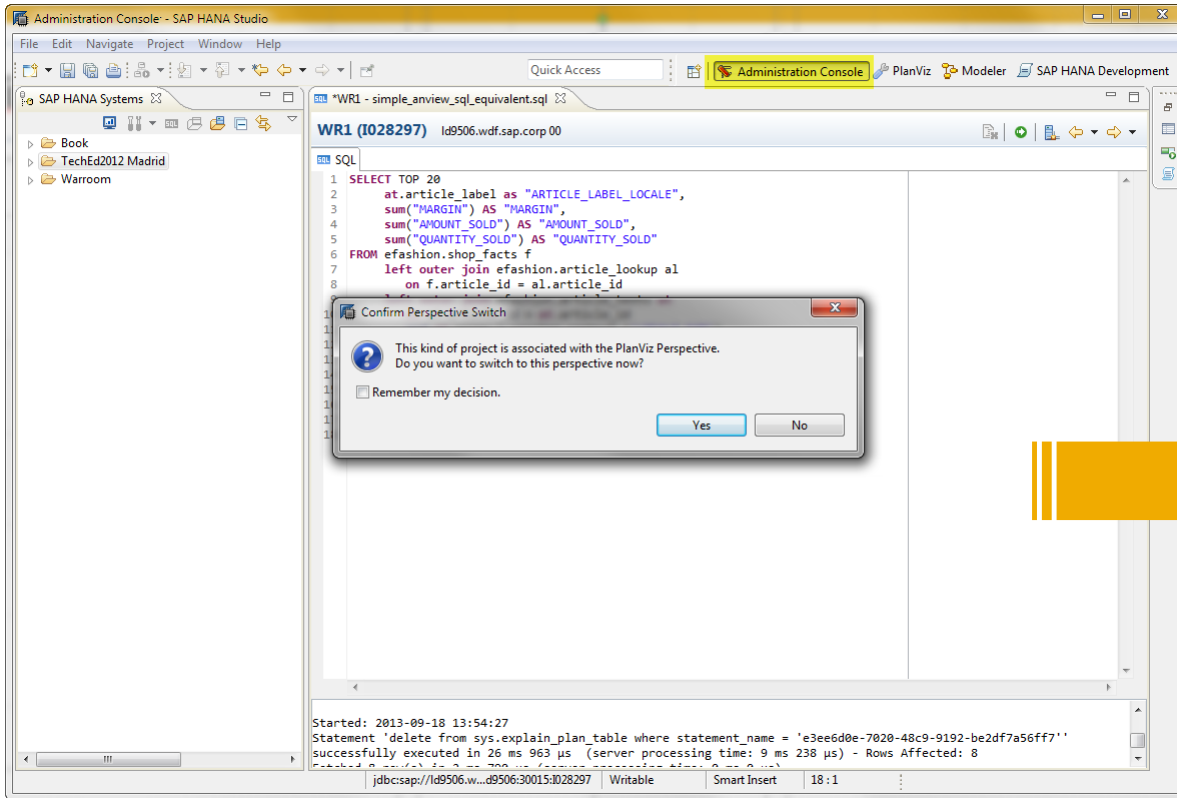
PlanViz – display timelines (pre-SPS 06)



PlanViz – display timelines

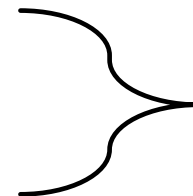


PlanViz – display timelines (SPS 06)



Trace options in SAP HANA Studio

- SQLTRACE (PYTHON TRACE)
- PERFORMANCE TRACE + FUNCTION PROFILER
- KERNEL PROFILER
- OPTIMIZER TRACES
- **LOAD GRAPH**
- **STATISTICS SERVER**
- **EXPENSIVE STATEMENTS TRACE**
- **SQL PLAN CACHE**
- **EXPLAIN PLAN**
- **PLAN VISUALIZATION**



Single statement analysis

Summary

- Use SAP HANA database as a service, but not as a black box!
- In case of performance problems, think about where the problem could occur.
- Use the proper tools to measure if the problem really is where you think it is.

Further Information

SAP Public Web

SCN:

SAP In-Memory computing: <http://scn.sap.com/community/hana-in-memory>

SAP HANA Developer center: <http://scn.sap.com/community/developer-center/hana>

Further important information sources:

Public HANA community: <http://www.saphana.com/>

Public documentation: http://help.sap.com/hana_platform

SAP Education and Certification Opportunities

SAP HANA Training Curriculum

<https://training.sap.com/us/en/curriculum/hana-g-en>

Watch SAP TechEd Online

www.sapteched.com/online

SAP TechEd Virtual Hands-on Workshops and SAP TechEd Online

Continue your SAP TechEd education after the event!

SAP TechEd Virtual Hands-on Workshops

- Access hands-on workshops post-event
- Available January – March 2014
- Complementary with your SAP TechEd registration

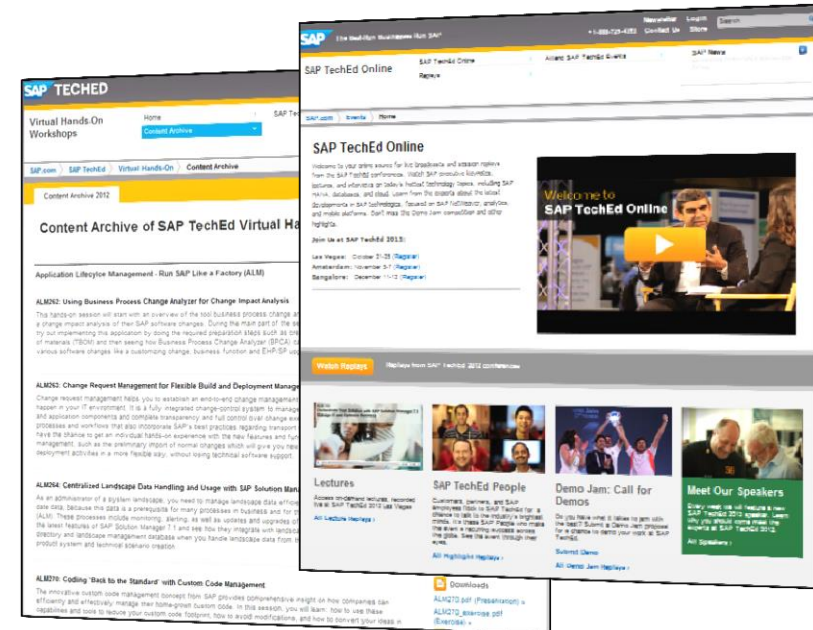
<http://saptechedhandson.sap.com/>



SAP TechEd Online

- Access replays of keynotes, Demo Jam, SAP TechEd LIVE interviews, select lecture sessions, and more!
- View content only available online

<http://sapteched.com/online>





Feedback

Please complete your session evaluation for [RDP302](#).

Thanks for attending this SAP TechEd session.



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