



SAP-HANA: quick wins with the RDS Finance for public sector (FI-FM)

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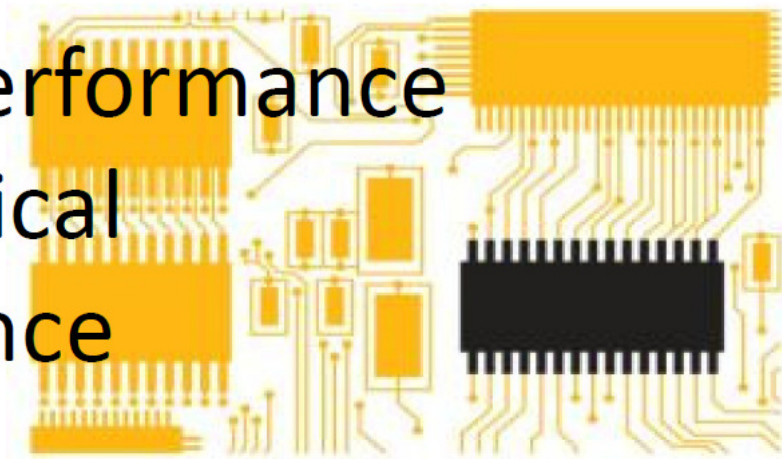


What is SAP HANA ?

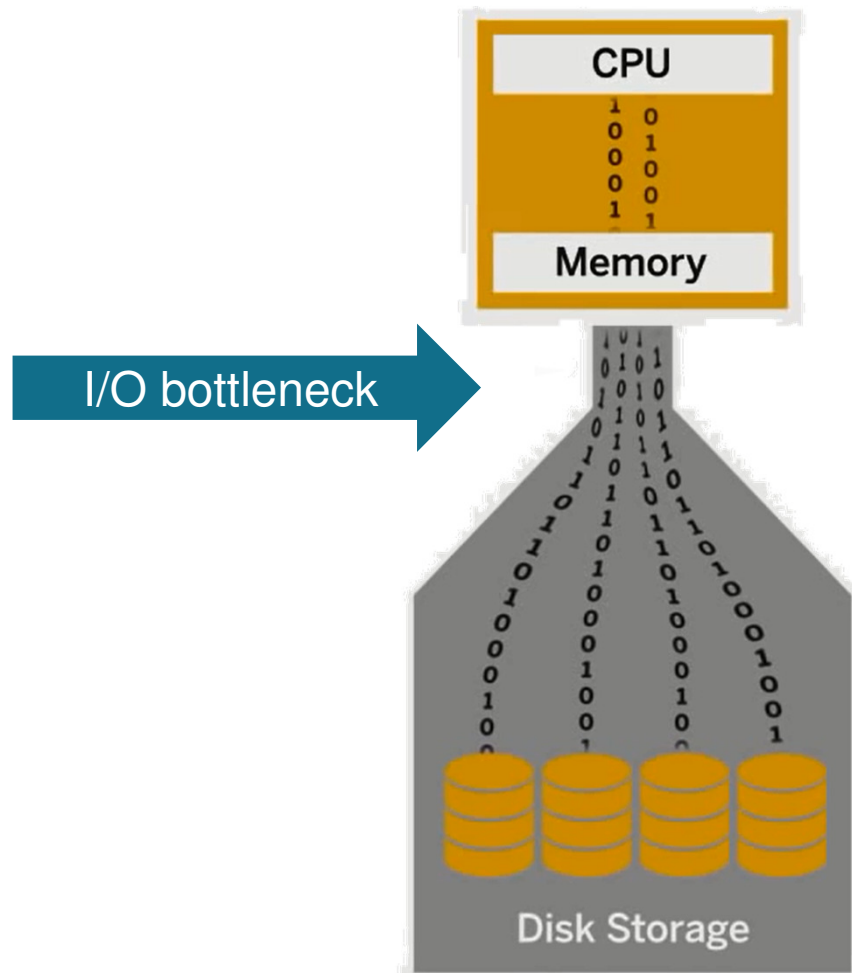
The theory...



High Performance
Analytical
Appliance



Classic DB-technology



Reports

get the data needed for calculations/reporting and store it temporary in work memory (RAM)

Data

is saved on disks

Issue 1 - OLTP vs. OLAP

OLTP	OLAP
OnLine Transaction Processing	OnLine Analytical Processing
e.g. Posting an invoice, register a student, display a customer, ...	e.g. BW-queries, "OLAP-reporting", operational reporting, dunning proces, MRP-run, ...
An ERP-system is optimized for efficient OLTP.	A BW-environment is optimized for OLAP

But: the ERP-system gets used more and more for OLAP-like queries.

Issue 2: ERP-data characteristics

- Lots of columns are NOT used
 - Lots of columns contain only few different values
 - NULL or default values are dominant
- ⇒ Sparse distribution, so high compression possible
(because of *Dictionary encoding a column*)
- ⇒ From a Row-store to a Column-store DB

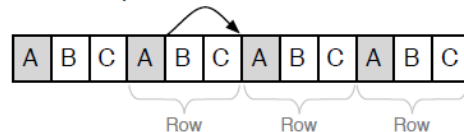
Row-store vs Column-store DB

Row Data Layout

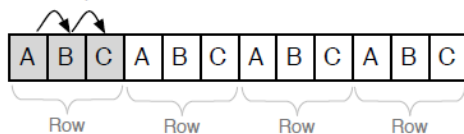
- Data is stored tuple-wise
- Leverage co-location of attributes for a single tuple
- Low cost for reconstruction, but higher cost for sequential scan of a single attribute

	Attributes		
Tuples / records	A	B	C
	A	B	C
	A	B	C

Column Operation



Row Operation

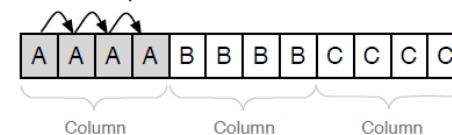


43

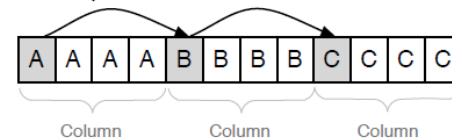
Columnar Data Layout

- Data is stored attribute-wise
- Leverage sequential scan-speed in main memory
- Tuple reconstruction is expensive

Column Operation



Row Operation



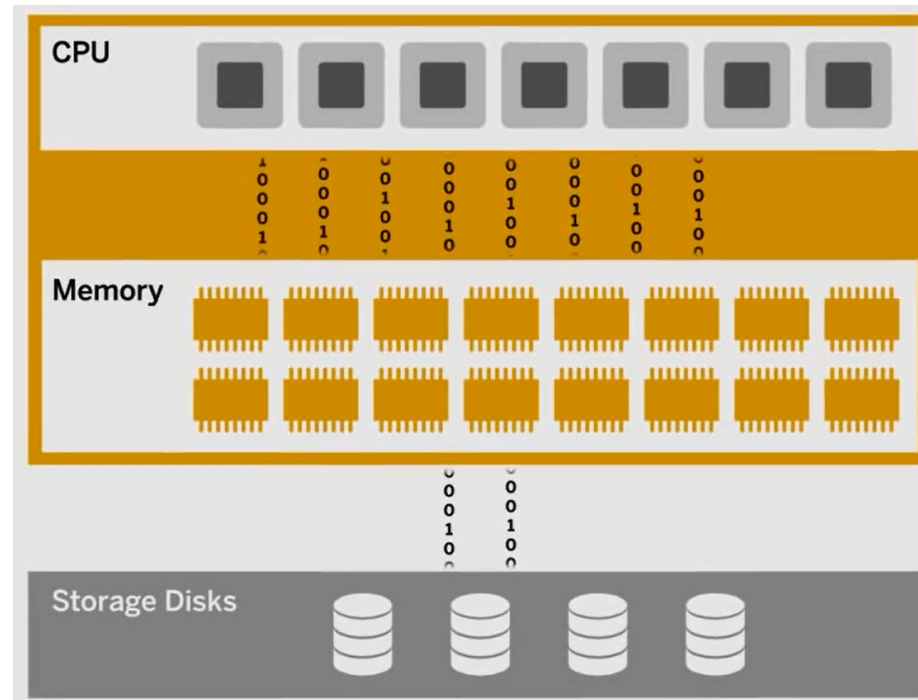
44

SAP HANA: in-memory technology

Multi-core
Massive parallel processing

Compression
Column-store DB

Logging & Backup
Persistence



A lot of
calculation
power to handle
data

All data is
constantly stored
in **RAM**



- _____

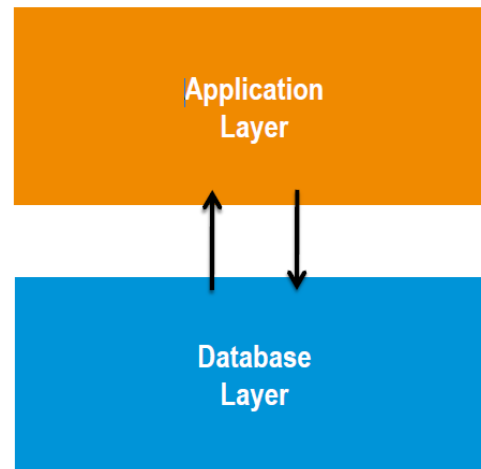


A new way of programming

“Push Code-to-Database”

- MOVE calculations into DB
- Only transfer RESULTS to application

Classical Approach

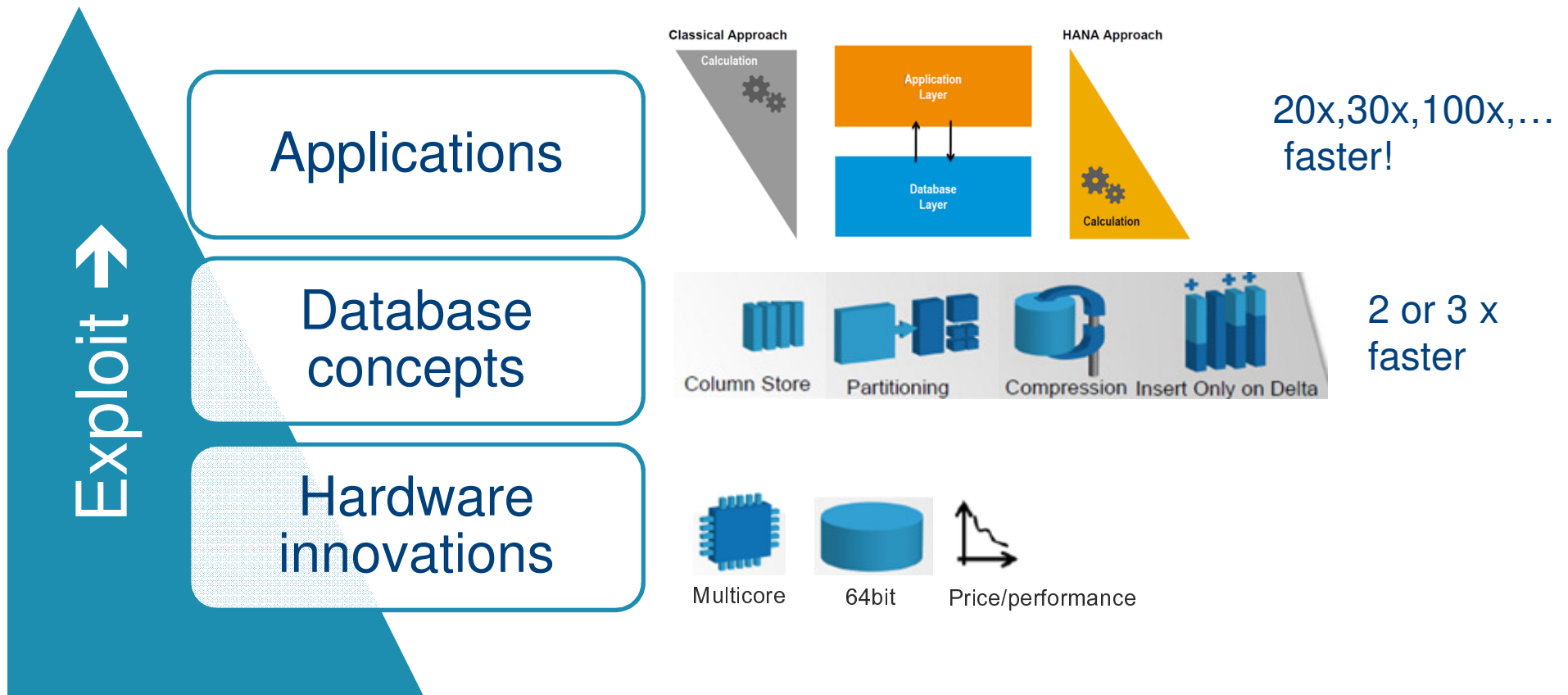


HANA Approach



- Standard SAP-programs → SAP adapts code or adds new reports, transactions
- Custom code → DIY

⇒ SAP HANA is a combination off...



Find the ROI / Value

End-user
experience

- Higher performance
- New applications

Application
Development

- Simplification of custom developments
- Archiving $\Rightarrow$ Aging

Database &
Hardware

- DB license (Oracle)
- Cheaper Hardware (storage, less application servers)



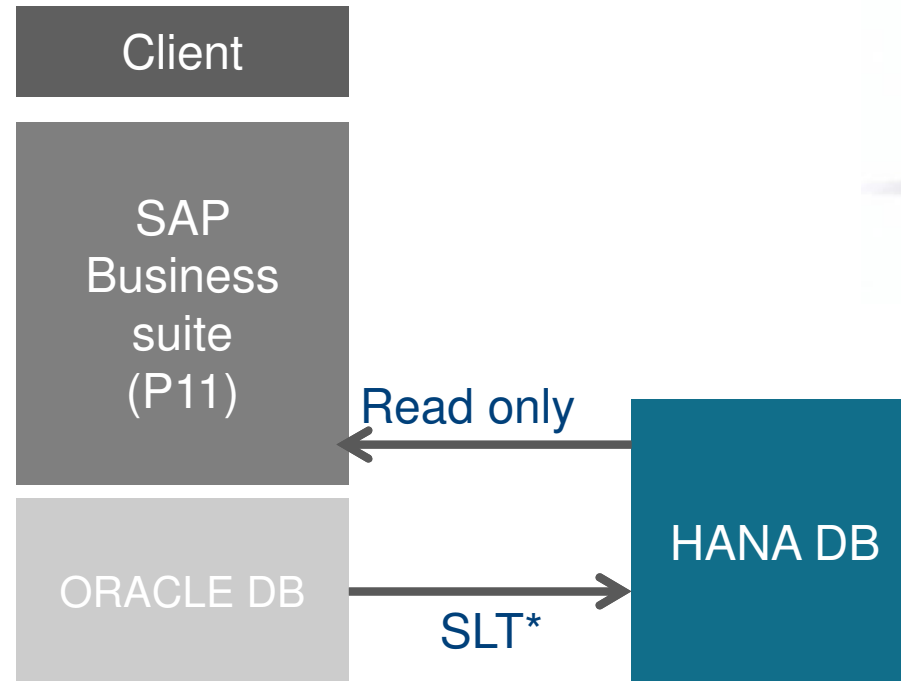
SAP HANA Implementation- scenarios

KU Leuven's choice...

Architecture illustrations & HANA offerings from SAP



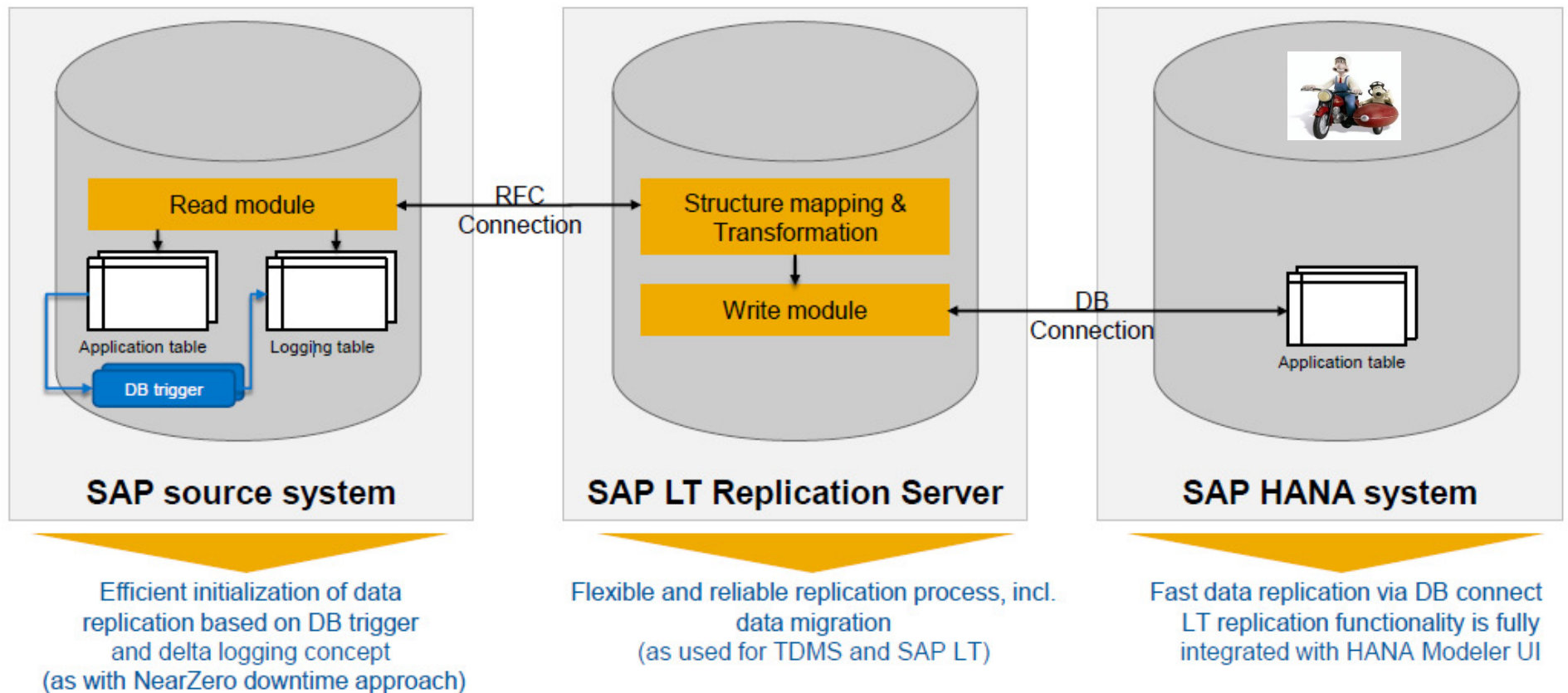
HANA-Accelerator = “Side-car”



HANA is Secondary database

* SLT = **SAP Landscape Transformation Replication Server** to provide the real-time copy (delta)

SLT – SAP Landscape Transformation



Approach via Proof-of-concept



First : Set-up HANA environment & some Show Cases

Then : Impress business



Business driven

- not only: what is too slow?
- also: what workarounds are used?
- new reports, processes?

IT-driven

- known performance issues (dialog)
- “no more batch?”
- simplification of custom developments !

First steps...

June -
July
2013

- Software licences
- Negotiation with hardware vendors

Aug.
2013

- Installation of first HANA-box

Sept -
Oct.
2013

- Set-up SLT

Nov.
2013

- First standard FI-report up and running

Nov. -
now

- System-setup, authorizations, transport



Standard SAP ↔ custom Code

First Steps...



STANDARD SAP
Accelerator
Finance for Public sector

e.g.

- FI: Line item browsers
(FBL3H, FBL1H, FBL5H,...)
- PS: Line item reports
(CJI3N, CJI4N)
- FM: Budget Control System
(reports, reconciliation tools & mass budget trx., closing operations)

ECC6 – EHP6 > NOTES!!

Netweaver 7.31 SP04
ECC 6.0 EHP6 SP04

Netweaver 7.40 SP04
ECC 6.0 EHP7 SP02

CUSTOM CODE
Experimenting
with “push code 2 DB”

- ABAP in Eclipse
- Open SQL vs. Native SQL vs. ADBC
- New trace tools
- HANA Views
- Authorizations
- HDBC – cockpit
(how should program react if HANA is down?)

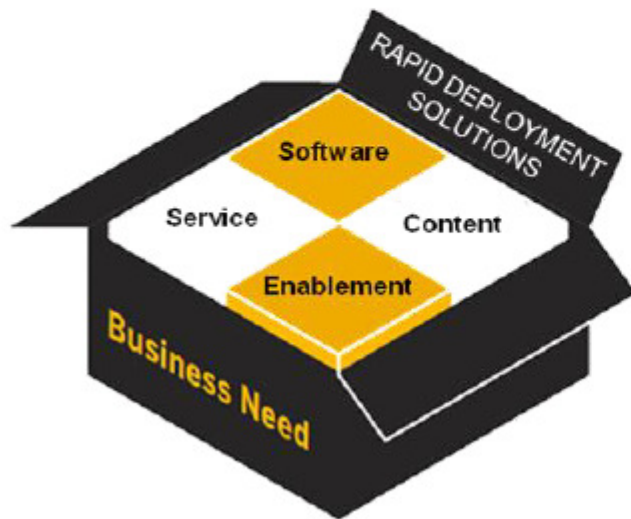
KU LEUVEN

RDS Finance for public sector (FI-FM)



RDS = Rapid Deployment Solution

SAP Rapid Deployment solutions



Software

Quickly address the most urgent business processes

Content

SAP-supported best practices, templates, and tools make solution adoption easier

Enablement

Guides and educational material speed end-user adoption

Service

Fixed scope and price provide maximum predictability and lower risk

/nHDBC - HANA DB Cockpit

ERP Accelerators: Display Application Settings

Selected Application: Public Sector Management - Budget Control System (BCS)

Application | **Note** | **Appl.** | **Sub-Appl.**

• ☒ Global Settings for All Applications		GC	
• ☐ Hierarchies		SETS	
▶ ☒ Financials		FI	
▶ ☒ Overhead Cost Controlling		COOM	
▶ ☐ Product Cost Controlling		COPC	
▶ ☒ Material Ledger		ML	
▶ ☐ Investment Management		IM	
▶ ☐ Materials Management		MM	
▼ ☒ Public Sector Management		PSM	
▼ ☒ Funds Management Government		PSM	FM_FM
• ☒ Reporting		PSM	FM_REPORTING
• ☒ Budget Control System (BCS)		PSM	FM_BCS
• ☒ Posting		PSM	FM_POSTING
• ☒ Closing Operations		PSM	FM_CLOSING
• ☒ Reassignment		PSM	FM_REASSIGNMENT
• ☒ Reconcil.		PSM	FM_RECON
▶ ☐ Grants Management		PSM	GM
▶ ☐ Functions for US Government		PSM	US
• ☒ Z_YFR012		PSM	Z_YFR012

General Application Settings | Replication Tables | ☒ Replication Options

Application Switch

☒ On
☐ Off

User Specific Activation

☒ All Users
☐ Or Users From to

Connection

Setting is maintained on a higher hierarchy level

Use Global Database Connection

Status ☒ Connection ok

Processing in Case Alternative DB Connection Cannot be Used

Setting cannot be changed for this application

Dialog Processing

Batch Processing

HDBC – per (sub-)application

- Transactions & reports
 - New
 - Existing, but adapted
 - More info on “which reports?” on OSS

ERP Accelerators: Display Application Settings

Selected Application: Public Sector Management

General Application Settings | Replication Tables | Replication Tables

Application	Note	Appl.	Sub-Appl.
Global Settings for All Applications	GC		
Hierarchies	SETS		
Financials	FI		
Overhead Cost Controlling	COOM		
Product Cost Controlling	COPC		
Material Ledger	ML		
Investment Management	IM		
Materials Management	MM		
Public Sector Management	PSM		
Funds Management Government	PSM		
Reporting	PSM		
Budget Control System (BCS)	PSM		
Posting	PSM		
Closing Operations	PSM		
Reassignment	PSM		
Reconcl.	PSM		
Grants Management	PSM		
Functions for US Government	PSM		
Z_YFR012	PSM		

SAP Note 1768201 - ERP Accelerators: Budget Control System

Version: 2 | Validity: 15.01.2013 - active | Language: English

Content: [Summary](#) | [Details](#)

Symptom

You want to use the accelerated data selection of a hybrid database (for

- Overview of AVC Data
 - Report RFFMAVC_HANA_VIEW
 - Transaction FMAVCH01
 - See SAP Note 1809058 and 1749359
- Overview of Budget Data
 - Report RFFMBUD_DOC_HANA

HDBC – per (sub-)application

- Tables involved
 - Tables that must be replicated on HANA (sidecar)

ERP Accelerators: Display Application Settings

Selected Application: Public Sector Management - Budget Control Sys

General Application Settings | Replication Tables | **Replication Options**

Replication Type: Use SLT Replication

Table Name	Explanatory short text	Action	Type	HDB Status
FMAVCT	AVC Summary Table (BCS)	None	Table	■
FMBASIDX	Index table for budget structure...	None	Table	■
FMBASOBJNR	Object numbers for FM addresses	None	Table	■
FMBDT	FM budget totals table	None	Table	■
FMBH	Funds management budget hea...	None	Table	■
FMBL	Funds management budget doc...	None	Table	■
FMIT	Totals Table for Funds Managem...	None	Table	■
V_FMBASIDX_R	Generierte Tabelle zu einem View	None	View	■

Application List:

- Global Settings for All Applications (GC)
- Hierarchies (SETS)
- Financials (FI)
- Overhead Cost Controlling (COOM)
- Product Cost Controlling (COPC)
- Material Ledger (ML)
- Investment Management (IM)
- Materials Management (MM)
- Public Sector Management (PSM)
 - Funds Management Government (PSM, FM_FM)
 - Reporting (PSM, FM_RE)
 - Budget Control System (BCS)** (PSM, FM_BC)
 - Posting (PSM, FM_PC)
 - Closing Operations (PSM, FM_CL)
 - Reassignment (PSM, FM_RE)
 - Reconcil. (PSM, FM_RE)
 - Grants Management (PSM, GM)
 - Functions for US Government (PSM, US)
 - Z_YFR012 (PSM, Z_YFR)

HDBC – per (sub-)application

- Settings
 - (de-)activate selection on HANA
 - Also possible per user

ERP Accelerators: Change Application Settings

Selected Application: Public Sector Management - Budget Control System (BCS)

General Application Settings | Replication Tables | Replication Options

Application Switch

☒ On
☐ Off

User Specific Activation

☒ All Users
☐ Or Users From to

Connection

Setting is maintained on a higher hierarchy level

Use Global Database Connection: 001:R:R

Status: ☒ Connection ok

Processing in Case Alternative DB Connection Cannot be Used

☒ Setting cannot be changed for this application

Dialog Processing:

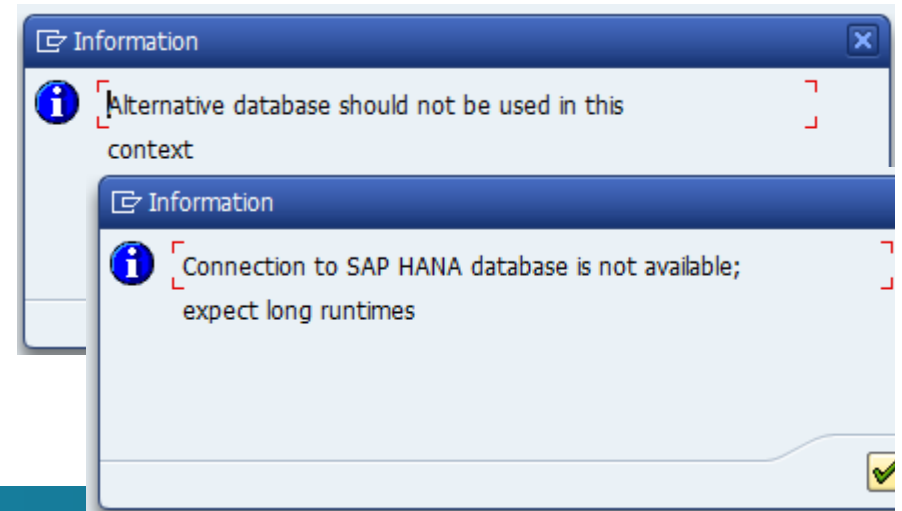
Batch Processing:

Application	Note	Appl.	S...
Global Settings for All Applications	f	GC	
Hierarchies	f	SETS	
Financials		FI	
Overhead Cost Controlling		COOM	
Product Cost Controlling	f	COPC	
Material Ledger		ML	
Investment Management		IM	
Materials Management	f	MM	
Public Sector Management		PSM	
Funds Management Government		PSM	FM_FM
Reporting	f	PSM	FM_RE
Budget Control System (BCS)	f	PSM	FM_BC
Posting	f	PSM	FM_PC
Closing Operations	f	PSM	FM_CL
Reassignment	f	PSM	FM_RE
Reconcil.	f	PSM	FM_RE
Grants Management		PSM	GM
Functions for US Government		PSM	US
Z_YFR012		PSM	Z_YFR

Example – BCS (Budget controlle system)

= Summary of available budget and consumption per fund

- AS IS: FMAVCR01
 - Very slow
 - 1 fund a time
- HANA: FMAVCH01
 - Very fast
 - For all funds off 1 year
- DEMO
 - Works also without HANA
 - But slower



Example - FBL3H

= G/L account line items

- AS IS: FBL3N
 - Get all details just to check totals
- HANA: FBL3H
 - Push code to DB
 - Default only totals
 - Details via variants
 - Does NOT run without HANA
- DEMO
 - HANA-ALV (scroll, varianten, ...)



Custom code



HDBC – Custom transactions

For

- A group of custom transactions/reports
- With similar *selects* on
- Your own combination of tables

ERP Accelerators: Display Application Settings

Selected Application: **Public Sector Management - KUL budget reports**

Application Settings: ☒ General Application Settings | Replication Tables | Replication Options

Replication Type: ☒ Use SLT Replication

Application List:

Application	Note	Appl.
Global Settings for All Applications	GC	
Hierarchies	SETS	
Financials	FI	
Overhead Cost Controlling	COOM	
Product Cost Controlling	COPC	
Material Ledger	ML	
Investment Management	IM	
Materials Management	MM	
Public Sector Management	PSM	
Funds Management Government	PSM	F
Grants Management	PSM	G
Functions for US Government	PSM	U
KUL budget reports	PSM	Z

Table List:

Table	Explanatory short text	Action	Type	HDB Status	ERP Status	DefSta...	Records
EKKN	Account Assignment in Purchasin...	None	Table	■	■	■	6.103.642
EKKO	Purchasing Document Header	None	Table	■	■	■	2.943.461
EKPO	Purchasing Document Item	None	Table	■	■	■	6.208.047
FMIFIHD	FI Header Table in Funds Manag...	None	Table	■	■	■	10.827.977
FMIFIIT	FI Line Item Table in Funds Mana...	None	Table	■	■	■	78.164.768
FMIOI	Commitment Documents Funds ...	None	Table	■	■	■	16.964.684
STXH	STXD SAPscript text file header	None	Table	■	■	■	23.992.878

HDBC – Custom transactions

With minimal effort

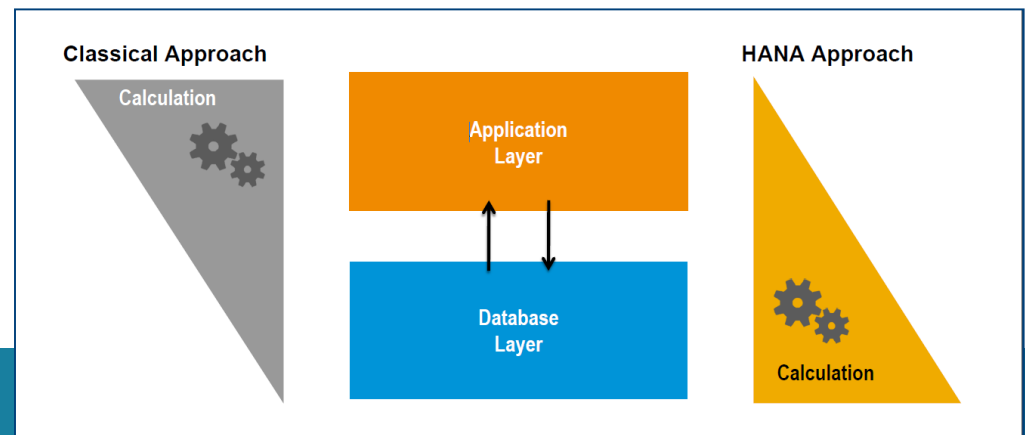
- Check HANA
 - is (sub)application activated in HDBC?
 - Check on status of tables
- *HANA-nise* select-statements
(namely dynamic select on R3 or Hana)

Gain: compare old-new, ready for suite-on-HANA

→ factor 2

But recommended :
new, optimized selects

→ Factor ???



Program YFFIR0035

Step 1:

```
SELECT bukr s belnr gjahr  
FROM bseg ...
```

Step 2:

```
LOOP AT lt_bseg.  
  SELECT * FROM bseg ...  
  SELECT SINGLE * FROM bkp f  
  ...  
  SELECT SINGLE ... FROM prps  
  ... SELECT SINGLE ...  
  FROM lfa1 ...  
ENDLOOP.
```



Step 1 : 19.348.208 tick's (BSEG-lines: 6.352)

Step 2 : 8.357.865 tick's

[OUD] Grootboekboekingen met tegenboekingen

Documentselectie	
Bedrijfsnummer	UNIV
Documentnr.	1000000
Boekjaar	
Positie	
Grootboekrekening	58030000
	tot
	tot 1120000
	tot
	tot
	tot

YFFIR0035 – minimal effort?

HANA-nise select-statement in step 1

```
SELECT bukrz belnr gjahr
FROM BSEG
CONNECTION (c_hana)
INTO (tab_bseg-bukrs, tab_bseg-belnr, tab_bseg-gjahr)
WHERE k
...
```

Syntaxerror		
Omschrijving	Regel	Soort
Programma YSKLHANA_0001_ZFT_BSEG	62	⊗
Bij gebruik van aanvulling "CONNECTION" the table "BSEG" must be transparent. moet tabel "BSEG" transparant zijn table "BSEG" must be transparent. the table "BSEG" must be transparent. the transparent.		

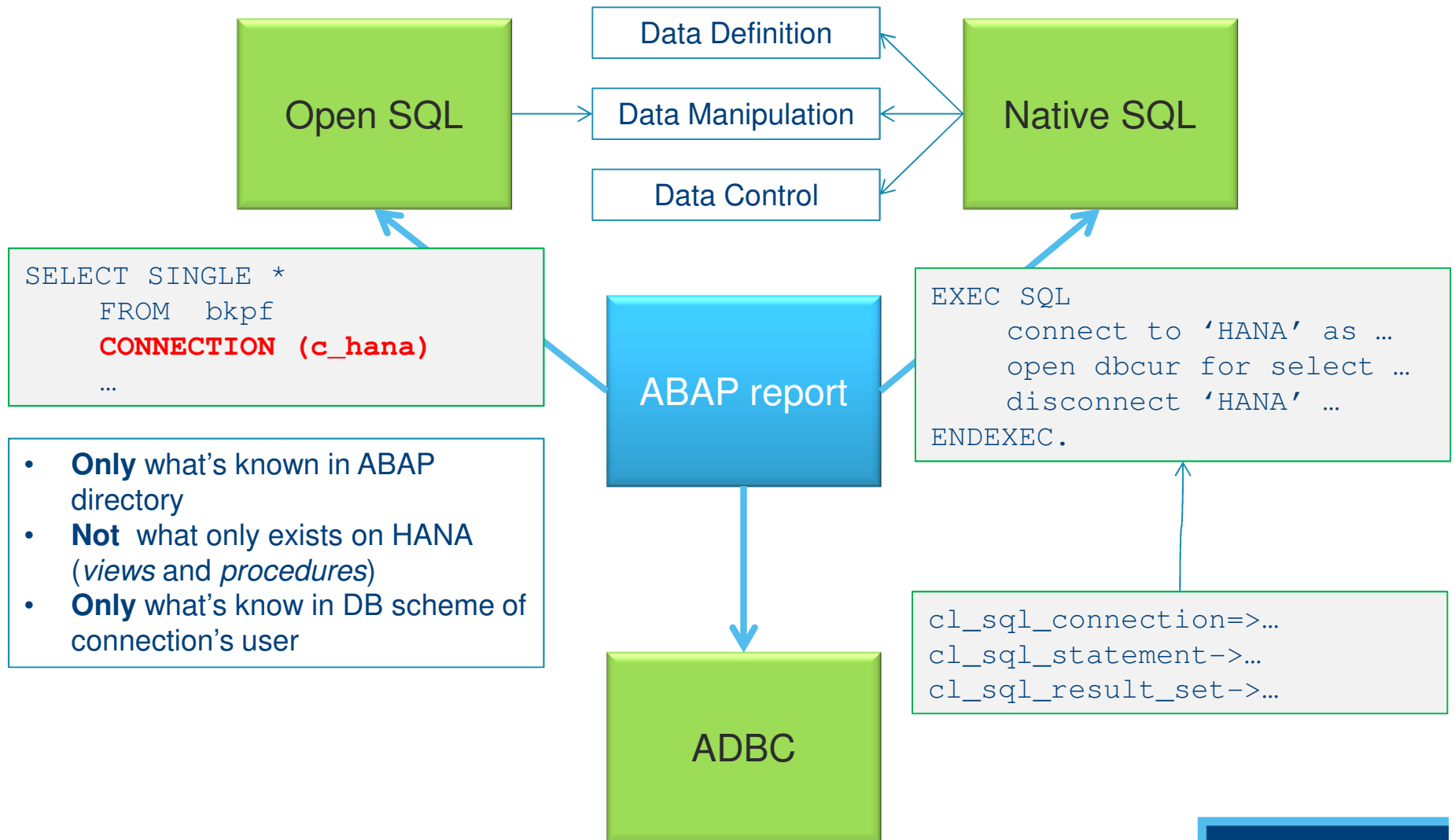
Problem

- BSEG = **clustered** table
- Using "CONNECTION" is only possible with **transparent** table

Solutions

- Native SQL
- ADBC
- New transparent ZFT_BSEG + view in HANA

ABAP



YFFIR0035 – first try

HANA-nise select-statements

```
SELECT buksr belnr gjahr
FROM ZFT_BSEG
CONNECTION (c_hana)
INTO (tab_bseg-buksr, tab_bseg-belnr, tab_bseg-gjahr)
WHERE buksr IN buksr
...
```

```
SELECT SINGLE *
FROM bkp
CONNECTION (c_hana)
WHERE buksr EQ ls_bseg2-buksr
AND belnr EQ ls_bseg2-belnr
AND gjahr EQ ls_bseg2-gjahr.
```

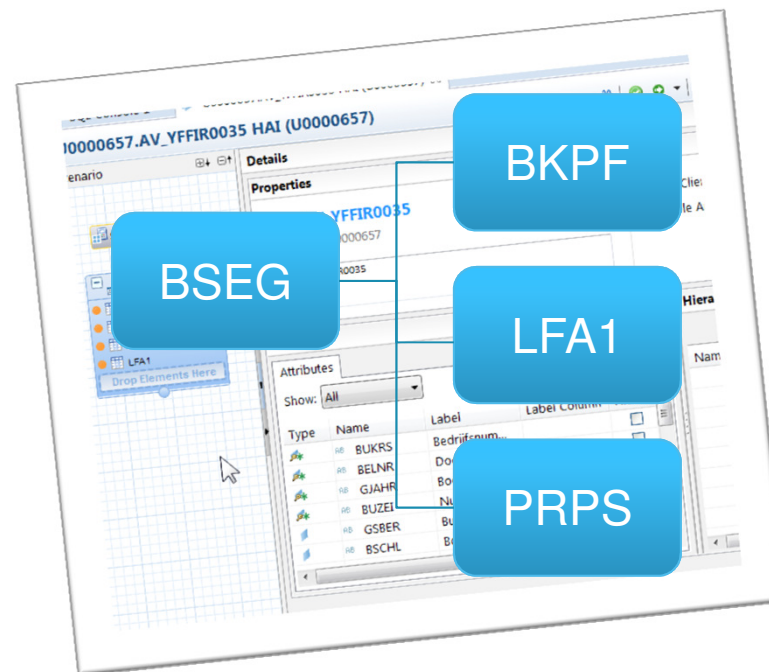
Step 1 : 19.348.208 --> 1.348.223 (factor 15)

Step 2 : 8.357.865 --> 144.271.653 (factor -17)

YFFIR0035 – if at first you don't succeed

Step 1 *HANA-nise* select-statement

Step 2 select through a VIEW on HANA



Step 1 : 19.348.208 --> 1.348.223

Step 2 : 8.357.865 --> 144.271.653 --> 152.739.868

YFFIR0035 – at last

Step 1 + Step 2 in one “full-HANA” select

- Create a view in HANA studio
- With extra fields
- SQL is generated

```
CREATE VIEW "kul.fi.r3"." AT_YFFIR0035" ( "START_BUKRS",  
    "START_BELNR", "START_GJAHR", "START_HKONT", "BUKRS",  
    "BELNR", "GJAHR", "BUZEI", "GSBER",  
    "BSCHL", "PSWSL", "HKONT", "KUNNR", "SGTXT", "GEBER",  
    "FISTL", "PROJK", "LIFNR",  
    "DMBTR", "WRBTR", "BLART", "BUDAT", "MONAT", "BKTXI",  
    "CPUDT", "XBLNR", "VERNR", "VERNA", "NAME1", "NAME2", "SHKZG",  
    "Z_WRBTR", "Z_DMBTR" )
```

The screenshot shows the SAP HANA Studio interface. On the left, the 'SAP HANA Systems' tree is visible. The main workspace shows a diagram with tables POC_I12_001.BSEG(BSEG_1), POC_I12_001.LFA1, and POC_I12_001. The 'Output' pane on the right shows the generated SQL, and the 'Properties' pane shows the details for the calculated column Z_WRBTR.

Output

```
NAME1: LFA1.NAME1  
NAME2: LFA1.NAME2  
SHKZG: BSEG.SHKZG  
Calculated Columns  
Z_WRBTR  
Z_DMBTR
```

Properties

Property	Value
Name	Z_WRBTR
Label	WRBTR met het juiste teken
Formula	if("SHKZG"='H', "WRBTR"*-1,"WRBTR")
Data Type	DECIMAL
Hidden	False

left join poc_i12_001.lfa1 as lfa1 on bseg.lifnr = lfa1.lifnr
order by bukrns,
gjahr,

YFFIR0035 – at last

Step 1 + Step 2 in one “full-HANA” select

- Create a structure in R3

Structuur

ZFS_BSEG_PLUS

Actief

Korte omschrijving

[HANA] gegevens BSEG plus dingen voor YFFIR0035

Eigenschappen

Componenten

Invoerhulp/-controle

Valuta-/hoeveelh.velden

Ingebouwd type

1 / 34

Component	Soort typering	Type component	Gegevens...	Lengte	Deci...	Korte omschr
<u>INCLUDE</u>	1 Type	<u>ZFS_BSEG_SELECT</u>		0	0	Basisselectie v
<u>START_BUKRS</u>	1 Type	<u>BUKRS</u>	CHAR	4	0	Bedrijfsnumme
<u>START_BELNR</u>	1 Type	<u>BELNR_D</u>	CHAR	10	0	Documentnun
<u>START_GJAHR</u>	1 Type	<u>GJAHR</u>	NUMC	4	0	Boekjaar
<u>START_HKONT</u>	1 Type	<u>HKONT</u>	CHAR	10	0	Rekening uit h
<u>BUKRS</u>	1 Type	<u>BUKRS</u>	CHAR	4	0	Bedrijfsnumme
<u>BELNR</u>	1 Type	<u>BELNR_D</u>	CHAR	10	0	Documentnun
<u>SHKZG</u>	1 Type	<u>SHKZG</u>	CHAR	1	0	Debet-/credit
<u>Z_WRBTR</u>	1 Type	<u>ZFWERT</u>	DEC	13	2	Getal 13.2
<u>Z_DMBTR</u>	1 Type	<u>ZFWERT</u>	DEC	13	2	Getal 13.2

YFFIR0035 – at last

Step 1 + Step 2 in one “full-HANA” select

- Replace the R3-selects

```
Step 1  lt_bseg = zf cl bseg=>lees via ranges(
SE      TRY.
        lr_connection->connect( ).
        * -----
        DATA(lv_stmt) = | select * from "_SYS_BIC"."kul.fi.r3/AT_YFFIR0035" where { lv_where } |.
        * create a statement object
        DATA(lr_stmt) = lr_connection->get_connection( )->create_statement( ).
        DATA(lr_result) = lr_stmt->execute_query( lv_stmt ).
        * set output table
        lr_result->set_param_table( REF #( lt_bseg ) ). " lr_dref ).
        * call to HANA
        * -----
        DATA(lv_row_cnt) = lr_result->next_package( ).
        * don't forget to close the result set object in order to free resources on the database
        lr_result->close( ).
        * -----
        lr_connection->disconnect( ).
        CATCH something
        CATCH something else.
        DATA(lv_stext) = lr_sql_exception->if_message~get_text( ).
        DATA(lv_ltext) = lr_sql_exception->if_message~get_longtext( ).
        ENDTRY.
        rt_bseg[] = lt_bseg[].
```

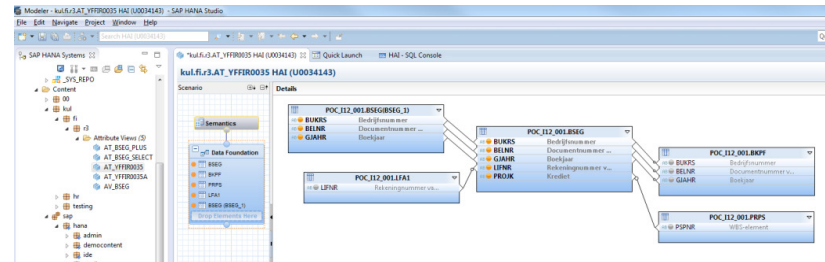
Step 2

```
LOOP AT lt_bseg.
  SELECT * FROM "..." WHERE ...
  SELECT * FROM "..." WHERE ...
  ...
  SELECT * FROM "..." WHERE ...
  ...
  SELECT * FROM "..." WHERE ...
  FROM "..."
ENDLOOP.
```

YFFIR0035 – at last

Step 1 + Step 2 in one “full-HANA” select

Structuur	ZFS_BSEG_PLUS	Actief				
Korte omschrijving	[HANA] gegevens BSEG plus dingen voor YFFIR0035					
Eigenschappen	Componenten	Invoerhulp/-controle Valuta-/hoeveelh.velden				
Ingebouwd type		1 / 34				
Component	Soort typing	Type component	Gegevens...	Lengte	Decl...	Korte omschr...
INCLUDE	1 Type	ZFS_BSEG_SELECT		0		0 Basselectie v...
START_BUKRS	1 Type	BUKRS	CHAR	4		0 Bedrijfsnumm...
START_BELNR	1 Type	BELNR_D	CHAR	10		0 Documentnum...
START_GJAHR	1 Type	GJAHR	NUMC	4		0 Boekjaar
START_HKONT	1 Type	HKONT	CHAR	10		0 Rekening uit h...
BUKRS	1 Type	BUKRS	CHAR	4		0 Bedrijfsnumm...
BELNR	1 Type	BELNR_D	CHAR	10		0 Documentnum...



```
lt_bseg = zf_cl_bseg=>lees_via_ranges(
  im_bukrs = so_bukrs[]
  im_belnr = so_belnr[]
  im_gjahr = so_gjahr[]
  im_buzei = so_buzei[]
  im_hkont = so_hkont[] ).
```

Factor depends on amount of data

Number	No HANA	Full HANA	Factor
13,689	42,084,558	465,061	90
219,871	880,741,896	6,180,751	142

Step 1 : 19.348.208

Step 2 : 8.357.865 --> **561.731** (factor 50)

HRP1000 / HRP1001

Other tables

```
SELECT COUNT( * )  
  FROM hrp1001  
  INTO lv_teller1  
  WHERE otype IN s_otype.
```

OTYPE	Number	No HANA	HANA	Factor
O	712,064	23,791,082	95,846	248
ST	11,607,592	256,718,183	66,174	3,879
9P	235,678	20,081,942	22,463	894

Still experimenting...

- Group by, (sub)totals, ...
- HANA-ALV
 - new select for every new layout
 - adding lines when scrolling

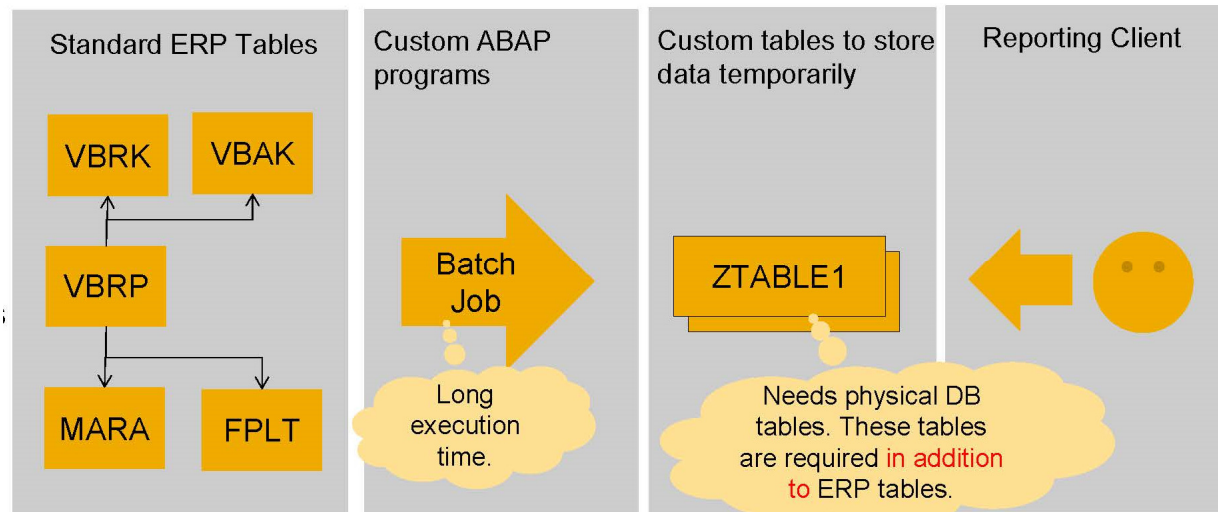


G/L Account Line Item Browser

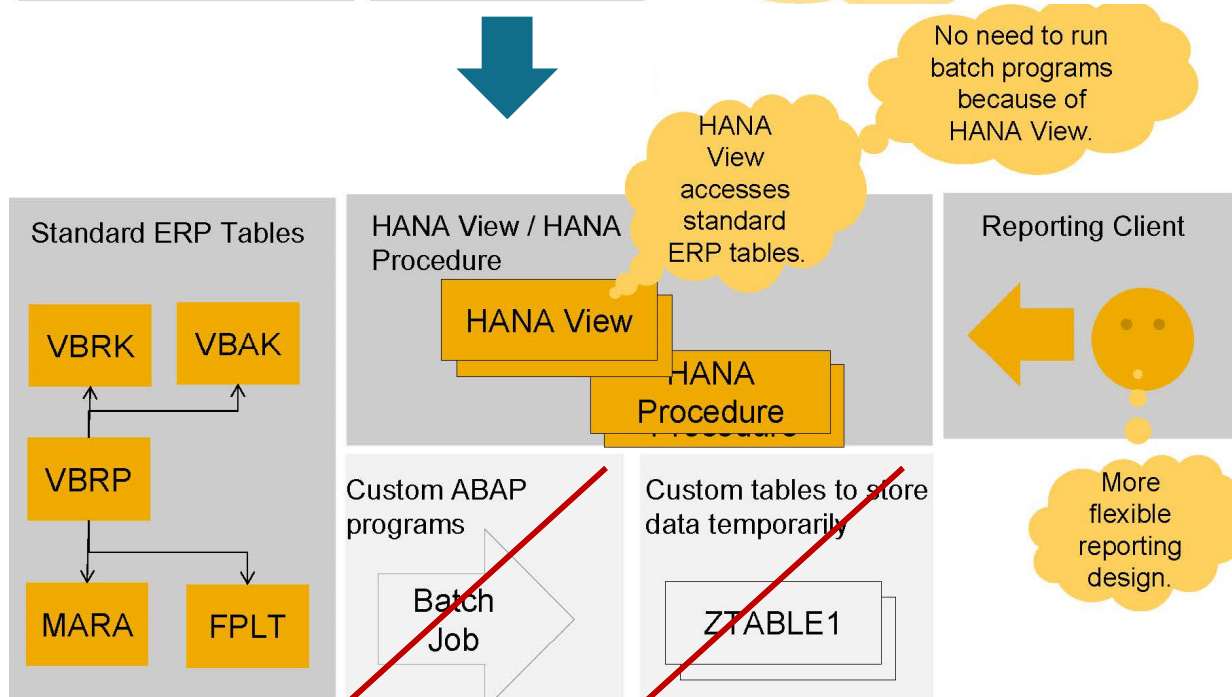
...	C...	G/L Acc	...	CC...	Σ	CCode	Curr	Value	Σ	DB	Rows
								EUR	398.714,56		3.748
20...	UNIV	60630000	1					454.505,97		262	
			2					48.591,00		252	
			3					113.909,19		357	
			4					35.273,85		204	
			5					147.463,90		214	
			6					62.865,19		184	
			7					8.385,70		207	
			8					47.676,17		165	
			9					94.702,18		271	
			1					148.856,58		492	
			1					304.683,78		526	
			1					305.038,58		543	
			1					1.373.237,53-		71	

Layout	Layout description
	Layout Changed Manual
/BTWAANGIFTE	
/RATEST	
/RA_DOCPOS	
/TESTH	
/ZIKH	
/ZIKH D/C	
/ZIKH DAT	
/ZIKH DOCNO	
/ZIKH F/KR	
/ZKVD1	
/ZKVD2	
RA SOM BA	
TESTJE	

Simplification of custom development



today:
Workaround for performance issues



SAP HANA:
every view or join can be
executed performant when
needed

Conclusion

Quick win:

- HANA-nise “big” selects

Gain more speed?

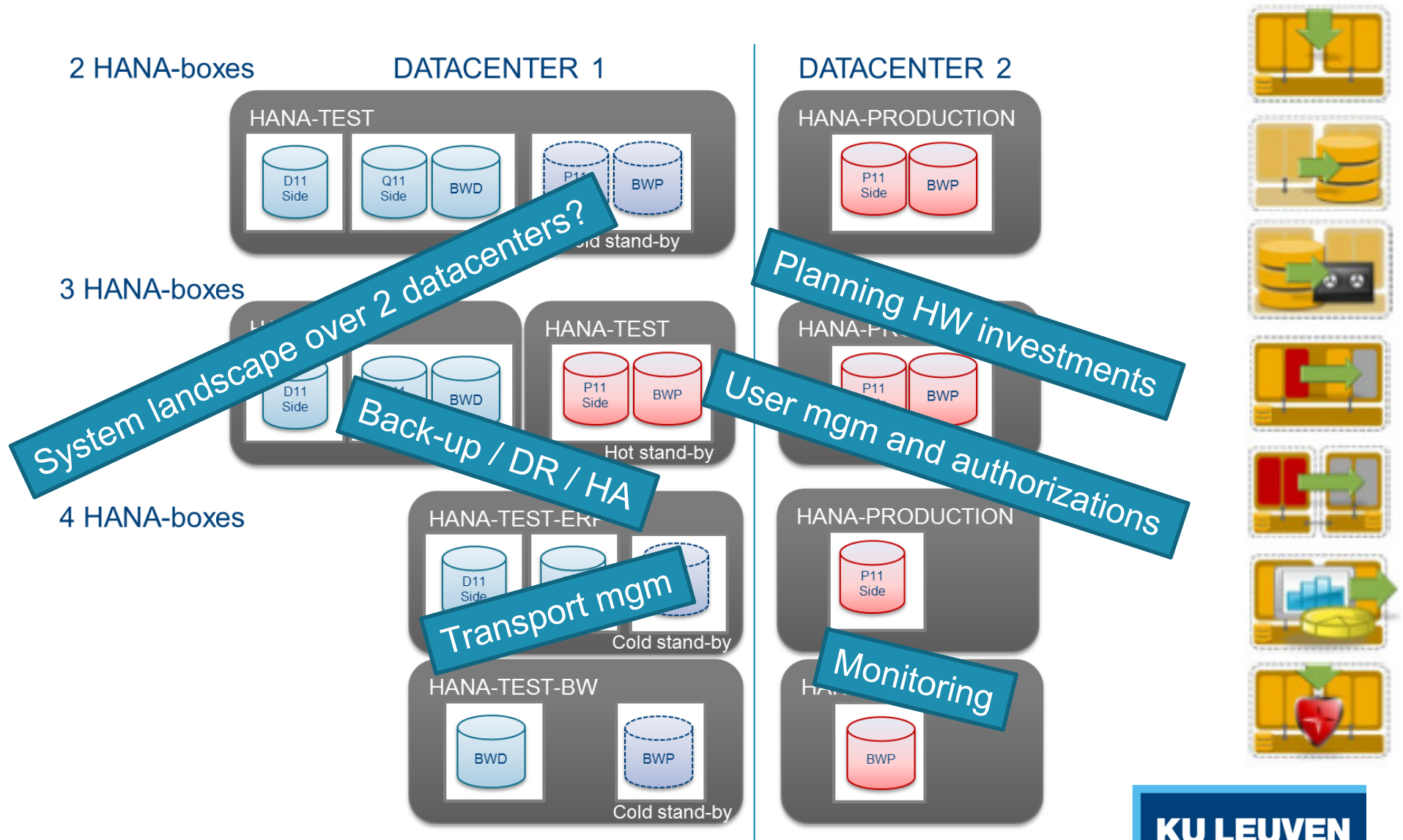
- Rewrite a group of selects into a full-HANA piece of code
- Redesign workarounds



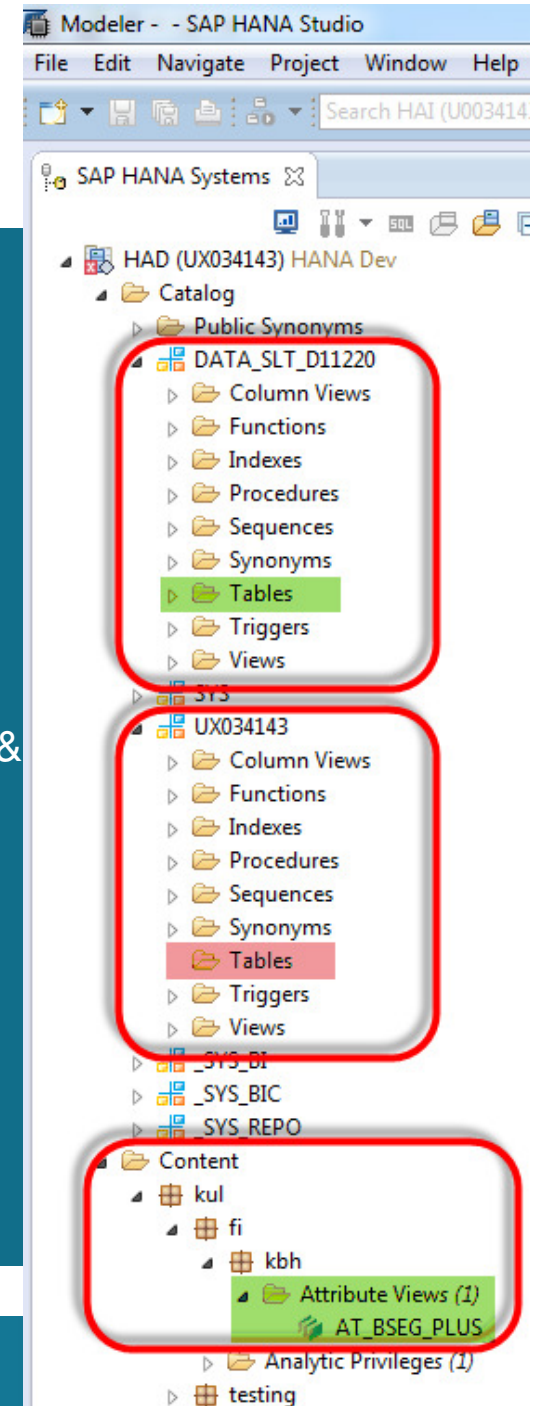
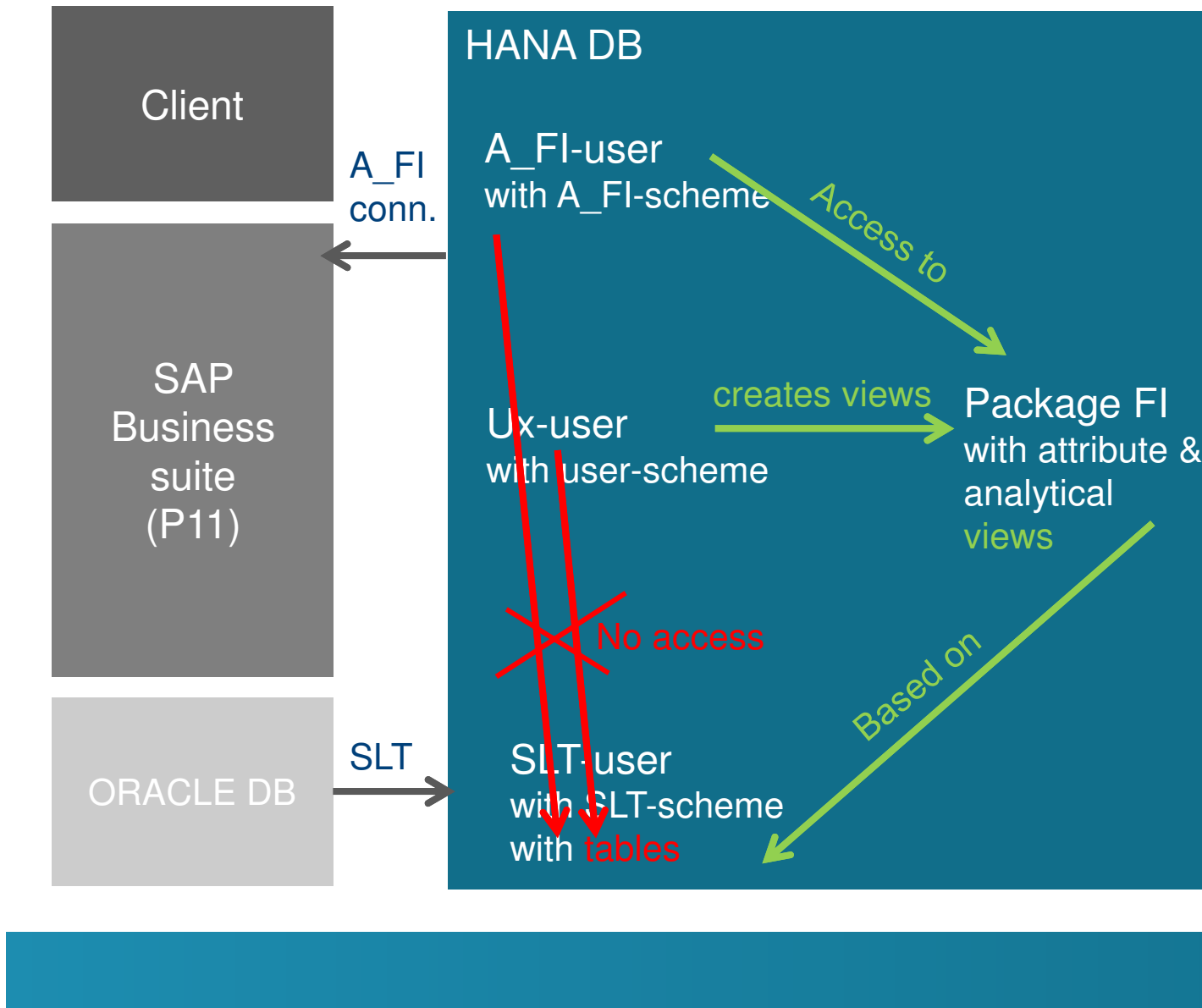
Next for KU Leuven



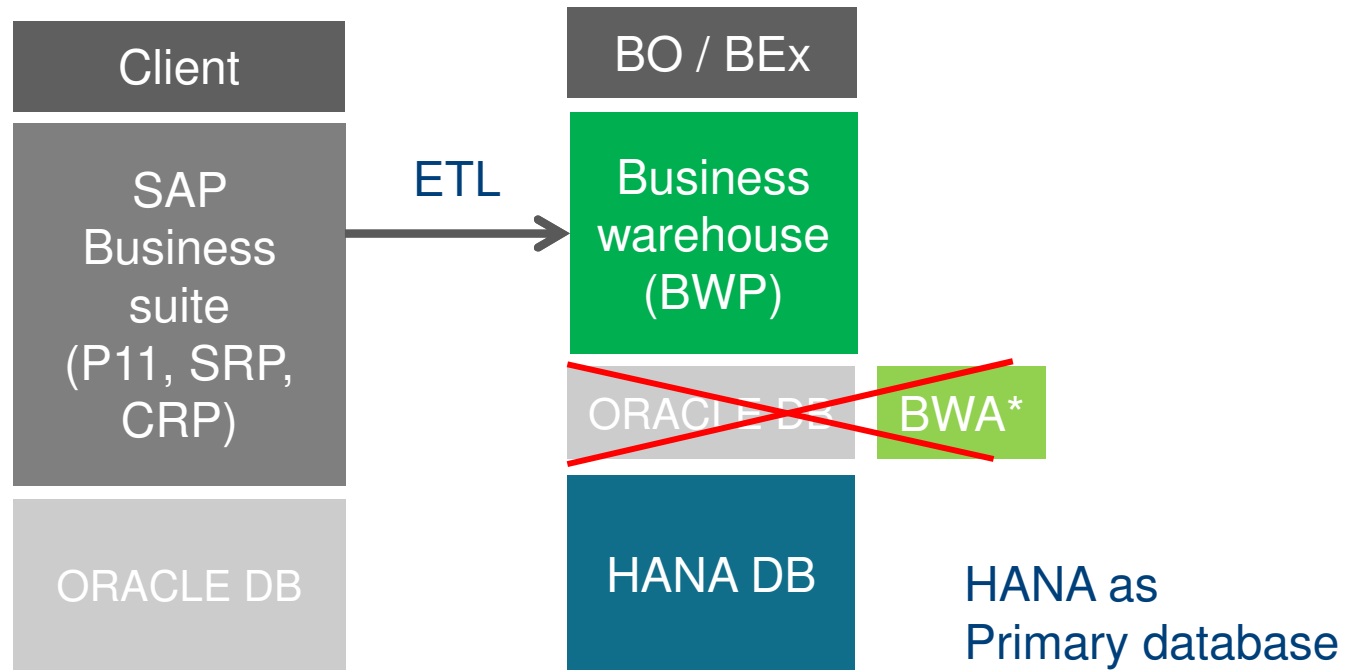
From Sandbox to a productive environment



Users & authorizations

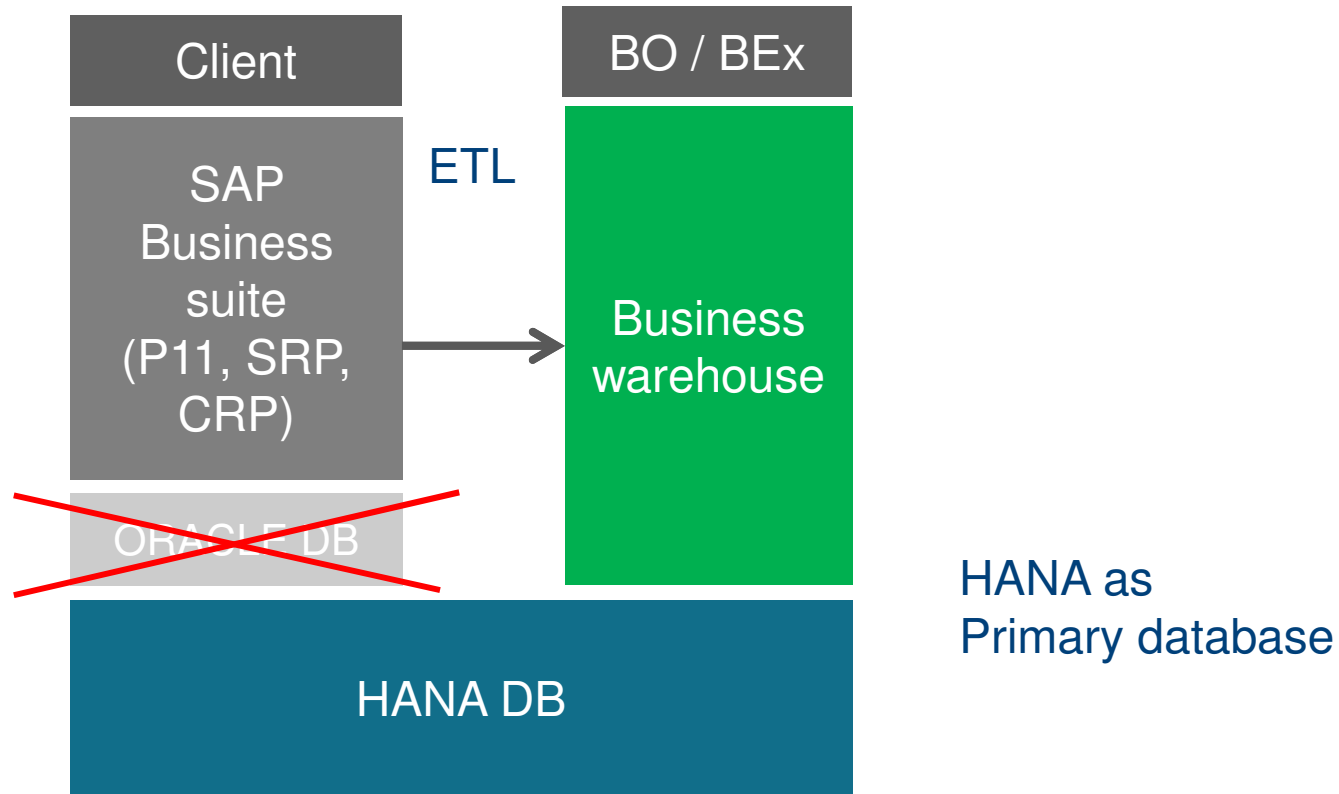


“BW-on-HANA”



* BWA = BW Accelerator (or BIA)

“Suite-on-HANA”

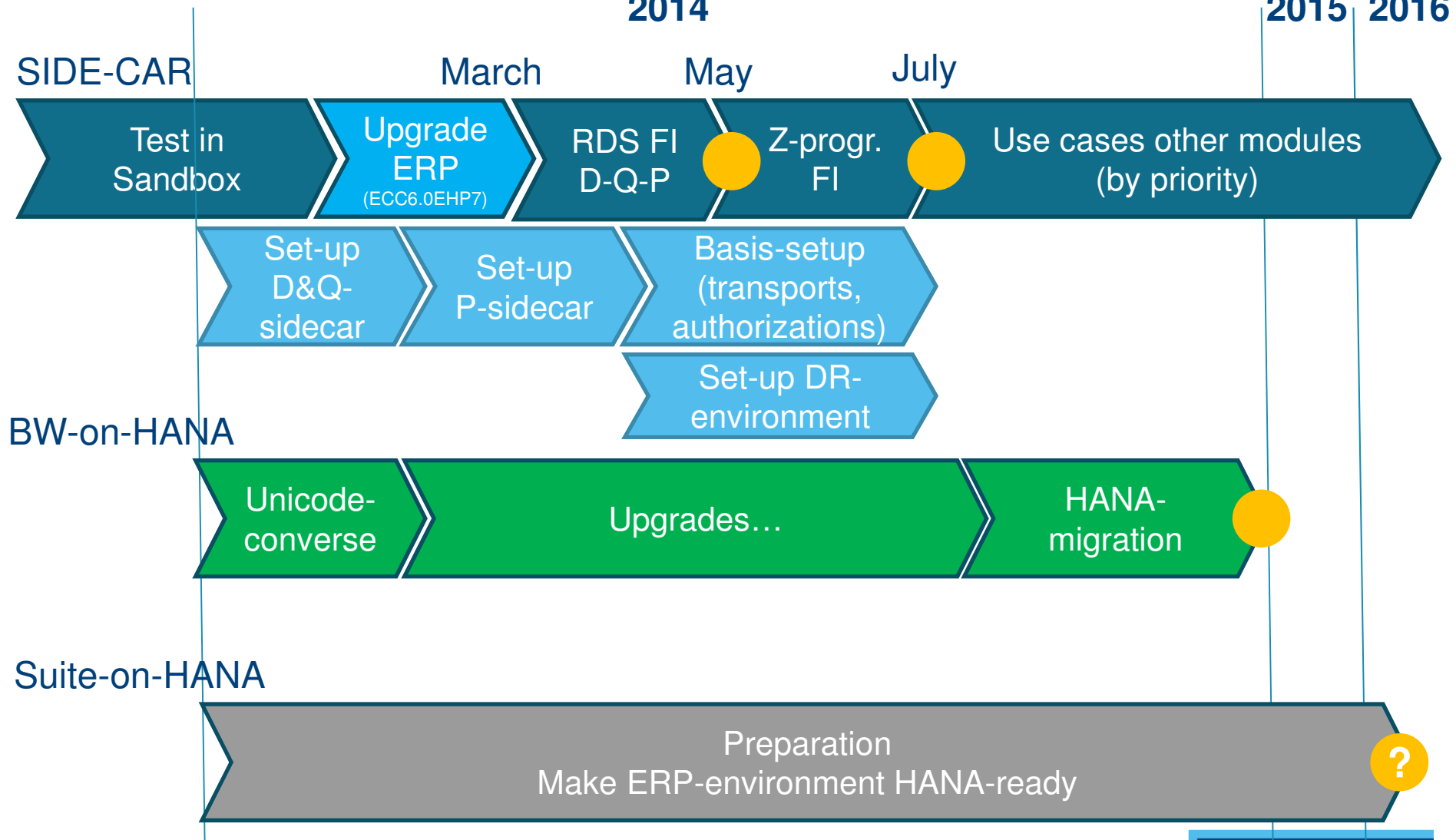


- SAP-system must FIRST be unicode-compliant!
- Making custom-code HANA-compliant (code-inspector)

An Optimistic Planning...

2014

2015 2016





Sources

- Website <http://www.saphana.com>
- Video “Heard about SAP HANA but not Clear what it can do for Your Business”
<http://www.youtube.com/watch?v=YVsJA1CaXqE>
- OpenSAP Mooc “In-memory DB management in a nutshell”
<https://open.sap.com/course/hana-warmup>
- My dear colleague Barbara De Bruyn for a part of the slides