

ABAP CDS Views

- Code Pushdown
- Joins and Associations
- Building and consuming CDS views

A typical requirement

- 'give me details of the employees who have taken leave within 14 days of finishing their higher duties'
- Typical approach
 - Use logical database PNP/PNPCE
 - Get data into application server
 - Apply date calculations
 - Get additional details of the employees who meet the criteria
 - Display output in ALV

Classic ABAP Programming

- The basic approach to classic ABAP programming
 - Keep load from the database
 - Get all the data you need to the application server
 - Do your processing in ABAP
- Reduce amount of data transferred between the database and application server

SQL Functions available in ABAP 7.50

SQL Function	ABAP CDS	Open SQL
CONCAT(arg1, arg2)	X	X
CONCAT_WITH_SPACE(arg1, arg2, spaces)	X	-
INSTR(arg, sub)	X	-
LEFT(arg, len)	X	-
LENGTH(arg)	X	X
LPAD(arg, len, src)	X	X
LTRIM(arg, char)	X	X
REPLACE(arg1, arg2, arg3)	X	X
RIGHT(arg, len)	X	X
RPAD(arg, len, src)	X	-
RTRIM(arg, char)	X	X
SUBSTRING(arg, pos, len)	X	X

SQL Function	ABAP CDS	Open SQL
ABS (arg)	X	X
CEIL (arg)	X	X
DIV(arg1, arg2)	X	X
DIVISION(arg1, arg2, dec)	X	-
FLOOR (arg)	X	X
MOD(arg1, arg2)	X	X
ROUND (arg, pos)	X	X

ABAP CDS - Date Functions

Syntax

```
... DATS_IS_VALID(date)
| DATS_DAYS_BETWEEN(date1,date2)
| DATS_ADD_DAYS(date,days,on_error)
| DATS_ADD_MONTHS(date,months,on_error) ...
```

SQL CASE expression

Without CASE expression

```
UPDATE SC246300.TBEMPLOYEE
SET SALARY = SALARY * 1.10
WHERE JOB IN ('MANAGER' , 'SUPRVSR') ;

UPDATE SC246300.TBEMPLOYEE
SET SALARY = SALARY * 1.08
WHERE JOB IN ('DBA' , 'SYS PROG') ;

UPDATE SC246300.TBEMPLOYEE
SET SALARY = SALARY * 1.05
WHERE JOB = 'PRGRMR' ;

UPDATE SC246300.TBEMPLOYEE
SET SALARY = SALARY * 1.035
WHERE JOB NOT IN ('MANAGER' , 'SUPRVSR', 'DBA' , 'SYS PROG', 'PRGRMR') ;
```

With CASE expression

```
UPDATE SC246300.TBEMPLOYEE
SET SALARY = CASE
    WHEN JOB IN ('MANAGER' , 'SUPRVSR') THEN SALARY * 1.10
    WHEN JOB IN ('DBA' , 'SYS PROG') THEN SALARY * 1.08
    WHEN JOB = 'PRGRMR' THEN SALARY * 1.05
    ELSE SALARY * 1.035
END ;
```

How to 'Code Pushdown'

- Three different ways of Code Pushdown
 1. Open SQL (database independent)
 2. CDS Views (database independent)
 3. Stored Procedures (AMDP – HANA specific)

```

9
10 SELECT b~pernr, b~plans, b~persg, b~orgeh, a~vorna, a~nachn, a~rufnm,
11        c~personid_ext, d~stext, e~orgtx, f~wostd,
12  * If employee has a nick name, use format FirstName(NickName)Lastname
13  * else use format Firstname Lastname to show employee full name
14  CASE length( a~rufnm )
15    WHEN 0 THEN
16      concat( a~vorna, concat( '&', a~nachn ) )
17    ELSE
18      concat( a~vorna, concat( ' (', concat( a~rufnm, concat( ')&' , a~nachn ) ) ) )
19  END AS personfullname
20  FROM pa0002 AS a
21  INNER JOIN pa0001 AS b
22    ON b~pernr = a~pernr
23    AND b~begda LE @im_start_date
24    AND b~endda GE @im_start_date
25  INNER JOIN pa0709 AS c
26    ON c~pernr = a~pernr
27    AND c~begda LE @im_start_date
28    AND c~endda GE @im_start_date
29  INNER JOIN hrpl000 AS d
30    ON d~objid = b~plans
31    AND d~plvar = '01'
32    AND d~otype = 'S'
33    AND d~begda LE @im_start_date
34    AND d~endda GE @im_start_date
35  INNER JOIN t527x AS e
36    ON e~orgeh = b~orgeh
37    AND e~sprsl = 'E'
38    AND e~begda LE @im_start_date
39    AND e~endda GE @im_start_date
40  INNER JOIN pa0007 AS f
41    ON f~pernr = a~pernr
42    AND f~begda LE @im_start_date
43    AND f~endda GE @im_start_date
44  WHERE a~pernr IN @l_it_pernr_list
45    AND a~begda LE @im_start_date
46    AND a~endda GE @im_start_date
47    AND b~plans IN @l_it_pos_list
48  INTO TABLE @DATA(l_it_person_list).
49
50  LOOP AT l_it_person_list ASSIGNING FIELD-SYMBOL(<fs_person>).
51    REPLACE '&' WITH space INTO <fs_person>-personfullname.
52  ENDLOOP.

```

Example of Code Pushdown using Open SQL

SQL Function	ABAP CDS	Open SQL
CONCAT(arg1, arg2)	X	X
CONCAT_WITH_SPACE(arg1, arg2, spaces)	X	-
INSTR(arg, sub)	X	-
LEFT(arg, len)	X	-
LENGTH(arg)	X	X
LPAD(arg, len, src)	X	X
LTRIM(arg, char)	X	X
REPLACE(arg1, arg2, arg3)	X	X
RIGHT(arg, len)	X	X
RPAD(arg, len, src)	X	-
RTRIM(arg, char)	X	X
SUBSTRING(arg, pos, len)	X	X

```

1 @AbapCatalog.sqlViewName: 'ZEMPDETAILS'
2 define view ZEMP_DETAILS
3 with parameters p_datum : syst_datum @<Environment.systemField: #SYSTEM_DATE
4 as select from pa0002 as a
5 inner join pa0001 as b
6   on a.pernr = b.pernr
7   and b.begda <= $parameters.p_datum
8   and b.endda >= $parameters.p_datum
9 inner join pa0709 as c
10  on a.pernr = c.pernr
11  and c.begda <= $parameters.p_datum
12  and c.endda >= $parameters.p_datum
13 inner join pa0007 as g
14  on a.pernr = g.pernr
15  and g.begda <= $parameters.p_datum
16  and g.endda >= $parameters.p_datum
17 inner join hrp1000 as d
18  on b.plans = d.objid
19  and d.plvar = '01'
20  and d.otype = 'S'
21  and d.istat = '1'
22  and d.langu = 'E'
23  and d.begda <= $parameters.p_datum
24  and d.endda >= $parameters.p_datum
25 inner join t527x as e
26  on b.orgeh = e.orgeh
27  and e.sprsl = 'E'
28  and e.begda <= $parameters.p_datum
29  and e.endda >= $parameters.p_datum
30 inner join hrp1011 as f
31  on b.plans = f.objid
32  and f.plvar = '01'
33  and f.otype = 'S'
34  and f.istat = '1'
35  and f.begda <= $parameters.p_datum
36  and f.endda >= $parameters.p_datum
37 {
38   b.pernr as EmpID, b.plans as PositionId, b.orgeh as OrgUnitId, c.personid_ext as PersonId,
39   // d.stext //Sensitive
40   f.wkavg * 2 as FortNightlyAvg,
41   g.wostd * 2 as FortNightlyHrs,
42   division((g.wostd * 2), (f.wkavg * 2), 2) as FTE,
43   // If employee has a nick name, show employee full name as 'FirstName(NickName)Lastname' else use format 'Firstname Lastname'
44   case length( a.rufnm )
45     when 0 then
46       concat_with_space( a.vorna, a.nachn, 1 )
47     else
48       concat_with_space( a.vorna, concat( '(', concat( a.rufnm, concat_with_space( ' ', a.nachn, 1 ) ) ), 1 )
49     end as PersonFullName
50 }
51 where a.begda <= $parameters.p_datum
52 and a.endda >= $parameters.p_datum

```

Example of Code Pushdown using CDS View

Associations

Adhoc Associations

```
D [HEI] ZCDS_ADHOC_ASN ⓘ
1 @AbapCatalog.sqlViewName: 'zcdsadhoc'
2 @AbapCatalog.compiler.compareFilter: true
3 @AccessControl.authorizationCheck: #CHECK
4 @EndUserText.label: 'Adhoc Association'
5 define view ZCDS_ADHOC_ASN
6   as select from spfli as c
7     association [1] to scarr as _carrier
8       on c.carrid = _carrier.carrid
9
10    association [*] to sflight as _flights
11      on c.carrid = _flights.carrid
12      and c.connid = _flights.connid
13 {
14   key c.carrid,
15   key c.connid,
16   c.cityfrom,
17   c.cityto,
18   _carrier.carrname,
19   _flights.fldate
20 }
```

```
CREATE VIEW "ZCDSADHOC" AS SELECT
  "C"."MANDT" AS "MANDT",
  "C"."CARRID",
  "C"."CONNID",
  "C"."CITYFROM",
  "C"."CITYTO",
  "=A0"."CARRNAME",
  "=A1"."FLDATE"
FROM (
  "SPFLI" "C" LEFT OUTER JOIN "SCARR" "=A0" ON (
    "C"."MANDT" = "=A0"."MANDT" AND
    "C"."CARRID" = "=A0"."CARRID"
  )
) LEFT OUTER JOIN "SFLIGHT" "=A1" ON (
  "C"."CARRID" = "=A1"."CARRID" AND
  "C"."CONNID" = "=A1"."CONNID" AND
  "C"."MANDT" = "=A1"."MANDT"
)
```

Exposed Associations

```
D [HEI] ZCDS_EXPOSED_ASN ⓘ
1 @AbapCatalog.sqlViewName: 'zcdsexposed'
2 @AbapCatalog.compiler.compareFilter: true
3 @AccessControl.authorizationCheck: #CHECK
4 @EndUserText.label: 'Exposed Association'
5 define view ZCDS_EXPOSED_ASN
6   as select from spfli as c
7     association [1] to scarr as _carrier
8       on c.carrid = _carrier.carrid
9
10    association [*] to sflight as _flights
11      on c.carrid = _flights.carrid
12      and c.connid = _flights.connid
13 {
14   key c.carrid,
15   key c.connid,
16   c.cityfrom,
17   c.cityto,
18   _carrier,
19   _flights
20 }
```

```
CREATE VIEW "ZCDSEXPOSED" AS SELECT
  "C"."MANDT" AS "MANDT",
  "C"."CARRID",
  "C"."CONNID",
  "C"."CITYFROM",
  "C"."CITYTO"
FROM "SPFLI" "C"
```

Original requirement

- Position ID
- Position Title
- Org Unit ID
- Org Unit Name
- Position Start Date
- Position End Date
- Position Employee Group
- Position Employee Subgroup
- Work Centre
- Cost Centre
- Internal Order
- Costing Percentage
- Job Code
- Job Name
- Wage Rate
- Chief Position ID
- Chief Position Title
- Established Hours
- Established Full Time Equivalent
- Appointed Hours
- Appointed Full Time Equivalent
- Occupied Hours
- Occupied Full Time Equivalent
- Payroll Tax Exempt
- Fringe Benefits Tax Exempt
- Direct Service Delivery
- Identified Position
- Personal Assignment Number
- Employee Full name
- Contracted Hours
- Contracted Full Time Equivalent
- Wage Rate
- Occupant Status
- Assignment End Date
- Employee Group
- Employee Subgroup
- Work Contract
- Work Contract Description

Initial Groupings

- **Position ID**
- Position Title
- Position Start Date
- Position End Date
- Position Employee Group
- Position Employee Subgroup
- Work Centre
- Cost Centre
- Internal Order
- Costing Percentage
- Job Code
- Job Name
- Wage Rate
- Chief Position ID
- Chief Position Title
- Established Hours
- Established Full Time Equivalent
- Appointed Hours
- Appointed Full Time Equivalent
- Occupied Hours
- Occupied Full Time Equivalent
- Payroll Tax Exempt
- Fringe Benefits Tax Exempt
- Direct Service Delivery
- Identified Position

- **Org Unit ID**
- **Org Unit Name**

- **Personal Assignment Number**
- Employee Full name
- Contracted Hours
- Contracted Full Time Equivalent
- Wage Rate
- Occupant Status
- Assignment End Date
- Employee Group
- Employee Subgroup
- Work Contract
- Work Contract Description

Initial Groupings

- **Position ID**

- Position Title
- Position Start Date
- Position End Date
- Position Employee Group
- Position Employee Subgroup
- Work Centre
- Cost Centre
- Internal Order
- Costing Percentage
- Job Code
- Job Name
- Wage Rate
- Chief Position ID
- Chief Position Title
- Established Hours
- Established Full Time Equivalent
- Appointed Hours
- Appointed Full Time Equivalent
- Occupied Hours
- Occupied Full Time Equivalent
- Payroll Tax Exempt
- Fringe Benefits Tax Exempt
- Direct Service Delivery
- Identified Position

- **Org Unit ID**

- Org Unit Name

- **Personal Assignment Number**

- Employee Full name
- Contracted Hours
- Contracted Full Time Equivalent
- Wage Rate
- Occupant Status
- Assignment End Date
- Employee Group
- Employee Subgroup
- Work Contract
- Work Contract Description

Position Details (Main View)

- **Position ID**

- Position Title
- Position Start Date
- Position End Date

EmpGrp/SubGrp

- Position Employee Group
- Position Employee Subgroup

Cost Centre

- Cost Centre
- Internal Order
- Costing Percentage

Org Unit Details

- **Org Unit ID**
- Org Unit Name

Employee Details

- **Personal Assignment Number**

- Employee Full name
- Contracted Hours
- Contracted Full Time Equivalent
- Wage Rate
- Occupant Status
- Assignment End Date
- Employee Group
- Employee Subgroup
- Work Contract
- Work Contract Description

FTE

- Established Hours
- Established Full Time Equivalent
- Appointed Hours
- Appointed Full Time Equivalent
- Occupied Hours
- Occupied Full Time Equivalent

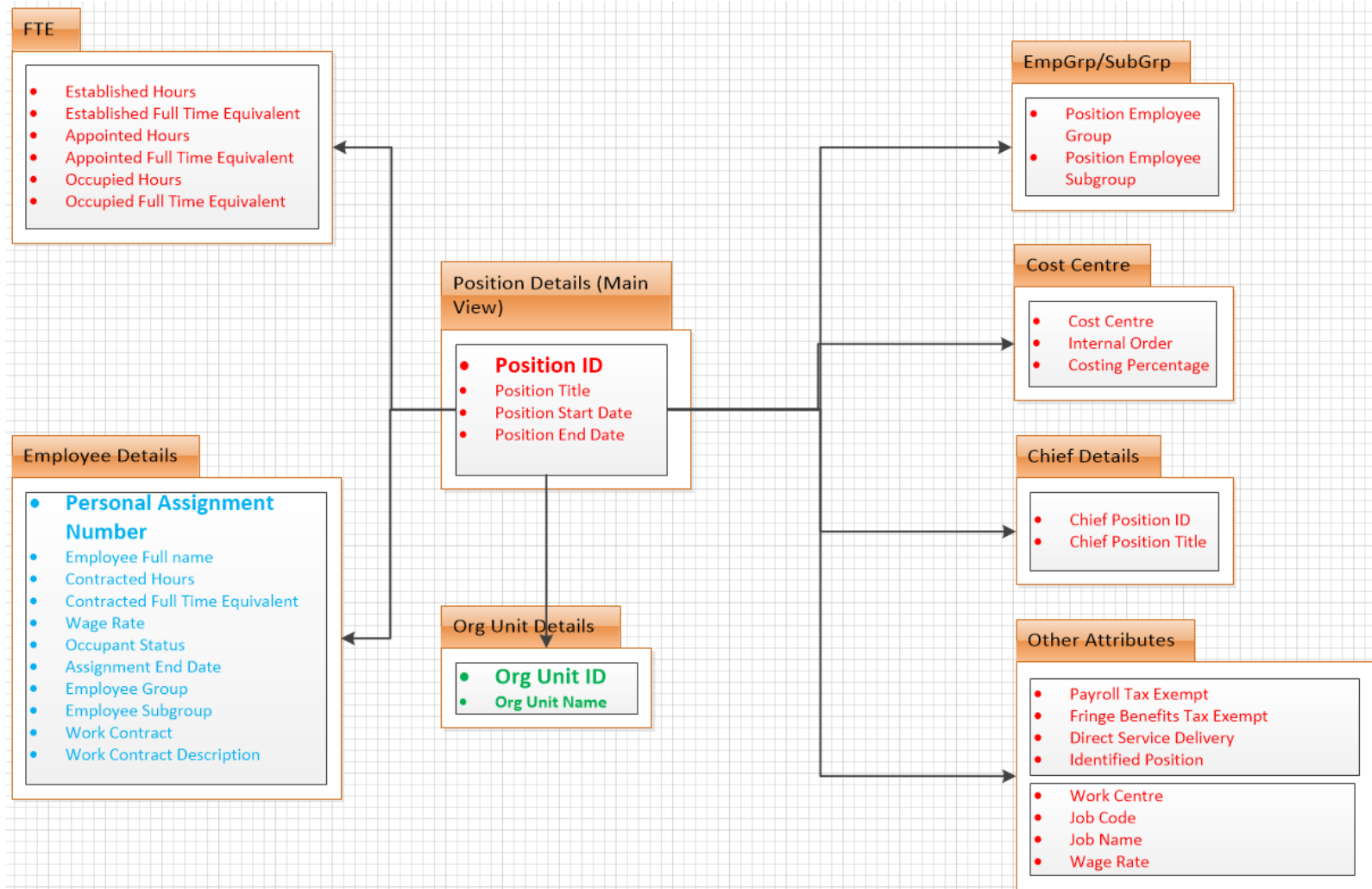
Other Attributes

- Payroll Tax Exempt
- Fringe Benefits Tax Exempt
- Direct Service Delivery
- Identified Position

- Work Centre
- Job Code
- Job Name
- Wage Rate

Chief Details

- Chief Position ID
- Chief Position Title



SQL Trace Record

Without Authorization check

Details for Selected SQL Trace Record	
<pre>SELECT /*+ FIRST_ROWS(101) */ "POSITIONID","POSITIONSTARTDATE","POSITIONENDDATE","POSITIONTITLE","POSEEGRP", "POSEESUBGRP","ORGUNITID","PDE","FBTEXEMPT","PERSONALASSIGNMENTNUMBER", "EMPFULLNAME","EMPGROUP","EMPSUBGROUP","ASSIGNMENTENDDATE","CONTRACTEDHOURS" FROM /* Entity name: ZPOS_EE_RPT */ "ZPOSEERPT" WHERE "MANDT"=:A0 FETCH FIRST 101 ROWS ONLY</pre>	
Variables	
A0(CH,3)	= '550'

With Authorization check

Details for Selected SQL Trace Record	
<pre>SELECT /*+ FIRST_ROWS(101) */ "POSITIONID","POSITIONSTARTDATE","POSITIONENDDATE","POSITIONTITLE","POSEEGRP", "POSEESUBGRP","ORGUNITID","PDE","FBTEXEMPT","PERSONALASSIGNMENTNUMBER", "EMPFULLNAME","EMPGROUP","EMPSUBGROUP","ASSIGNMENTENDDATE","CONTRACTEDHOURS" FROM /* Entity name: ZPOS_EE_RPT_AUTH */ "ZPOSEERPTAUTH" WHERE "MANDT"=:A0 AND "EMPGROUP"=:A1 FETCH FIRST 101 ROWS ONLY</pre>	
Variables	
A0(CH,3)	= '550'
A1(CH,1)	= 'K'

Buffering

```
D [HEU] ZBUFF X
1 @AbapCatalog.sqlViewName: 'zbuff_test'
2 @AbapCatalog.compiler.compareFilter: true
3 @AccessControl.authorizationCheck: #CHECK
4 @AbapCatalog.buffering.status: #ACTIVE
5 @AbapCatalog.buffering.type: #FULL
6 @EndUserText.label: 'Test - Buffering'
7 define view zbuff
8   as select from scarr as s
9   left outer join spfli as p
10    on s.carrid = p.carrid
11 {
12   s.carrid,
13   s.carrname,
14   p.connid
15 }
```

Name	SCARR	<input type="checkbox"/> transparent Table
Short Descript.	Airline	
Last Changed	80000317	02.11.2018
Status	Actv.	Saved

General Properties

DB-Specific Properties

Logical Storage Parameters

Data Class	APPL0	Master Data, Transparent Tables
Size Category	0	Expected Data Records 0 to 1,000

Buffering

☐ Buffering Not Allowed
☐ Buffering allowed but switched off
☒ Buffering Activated

Buffering Type

<input type="checkbox"/> Single records buff.	Number of Key Fields	0
<input type="checkbox"/> Generic Area Buffered		
<input checked="" type="checkbox"/> Fully Buffered		

Name	SPFLI	<input type="checkbox"/> transparent Table
Short Descript.	Flight schedule	
Last Changed	SAP	31.05.2013
Status	Actv.	Saved

General Properties

DB-Specific Properties

Logical Storage Parameters

Data Class	APPL0	Master Data, Transparent Tables
Size Category	1	Expected Data Records 3,600 to 14,000

Buffering

☐ Buffering Not Allowed
☐ Buffering allowed but switched off
☒ Buffering Activated

Buffering Type

<input type="checkbox"/> Single records buff.	Number of Key Fields	0
<input type="checkbox"/> Generic Area Buffered		
<input checked="" type="checkbox"/> Fully Buffered		

Buffering continued

```
Report ZCDS_BUFFER_TEST Active
1  *-----*
2  * Report ZCDS_BUFFER_TEST
3  *-----*
4  *
5  *-----*
6  REPORT zcds_buffer_test.
7
8  DATA: BEGIN OF wa,
9          carrid TYPE scarr-carrid,
10         carrname TYPE scarr-carrname,
11         connid TYPE spfli-connid,
12     END OF wa,
13     itab LIKE TABLE OF wa.
14
15     * Selection using CDS view
16     SELECT * FROM zbuff_test INTO TABLE @DATA(itab3).
17
18     * Selection using database tables
19     SELECT s~carrid s~carrname p~connid
20         INTO CORRESPONDING FIELDS OF TABLE itab
21         FROM scarr AS s
22         LEFT OUTER JOIN spfli AS p ON s~carrid = p~carrid.
23
24     CHECK 1 = 2.
```

Performance Analysis: Trace Display (Main Records)

Start Time	Σ Duration	Σ Records	Program Name	Object Name	Statement
■ 18,810 ■ 216					
10:00:42.188	7	0	ZCDS_BUFFER_TEST	AAB_ID_ACT	I 6 200
10:00:42.194	41	36	ZCDS_BUFFER_TEST	ZBUFF_TEST	I 6 200
	6,241	36	ZCDS_BUFFER_TEST	SCARR, SPFLI	SELECT <JOIN> WHERE "S"."MANDT" = '200'
10:00:42.904	7	0	ZCDS_BUFFER_TEST	AAB_ID_ACT	I 6 200
10:00:42.909	43	36	ZCDS_BUFFER_TEST	ZBUFF_TEST	I 6 200
10:00:42.910	7,522	36	ZCDS_BUFFER_TEST	SCARR, SPFLI	SELECT <JOIN> WHERE "S"."MANDT" = '200'
10:00:43.647	8	0	ZCDS_BUFFER_TEST	AAB_ID_ACT	I 6 200
10:00:43.653	41	36	ZCDS_BUFFER_TEST	ZBUFF_TEST	I 6 200
10:00:43.654	4,900	36	ZCDS_BUFFER_TEST	SCARR, SPFLI	SELECT <JOIN> WHERE "S"."MANDT" = '200'



Thank you.