Navigating the Clean Core Journey at SBB

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ABAPConf 2025, Mannheim, 04.06.2025

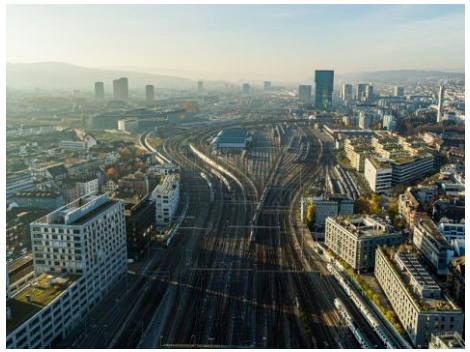
Agenda.

- About SBB and S/4 journey
- Looking Back and Planning Next Steps
- Fiori Low Code extension
- ABAP Cloud model and Three Tier extensibilty
- Released Objects Dilemma
- Wrapper – The chosen ones

About SBB

1.39 million passengers per day

93.2% punctuality for passenger trains



3,266 km of managed routes

11,569 trains on the network per day

801 station and stops for passenger transport

170,000 net tons of freight traffic per day

1,655 GWh traction power consumption

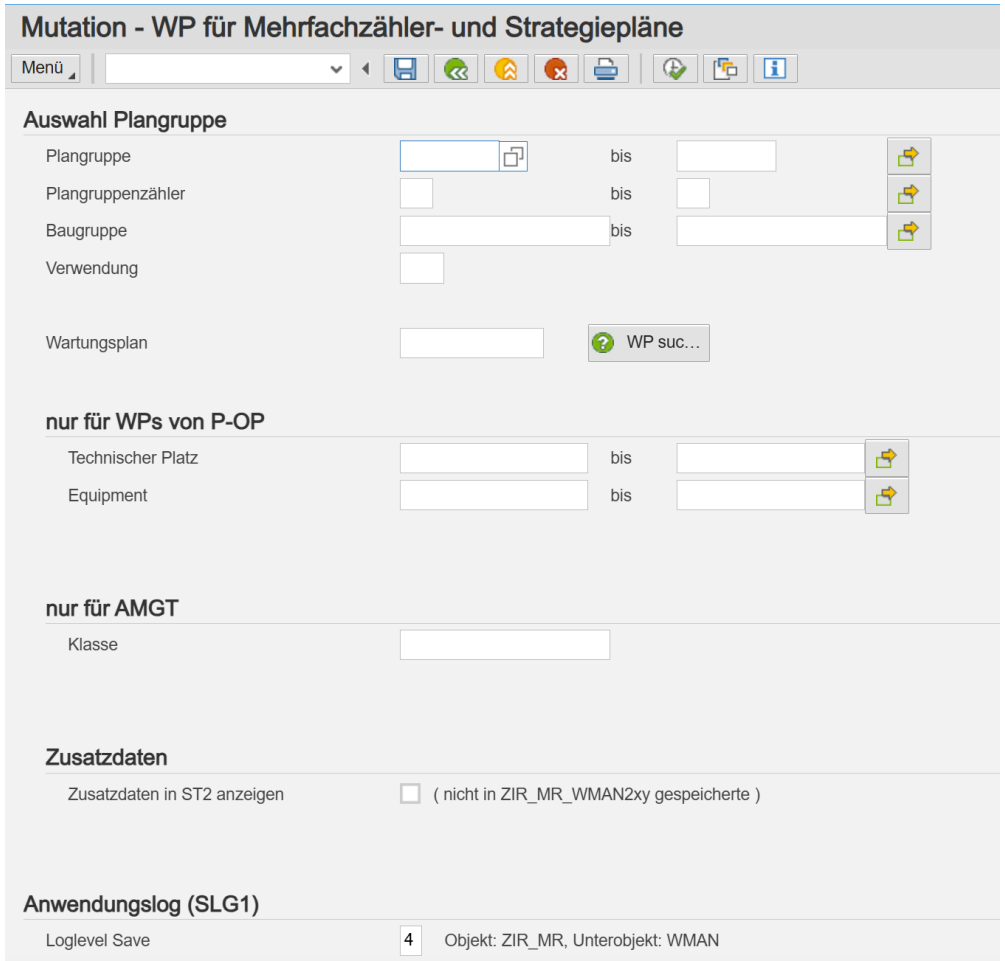
SBB S/4 HANA transformation journey

- Transitioning from SAP ECC to SAP S/4HANA
- Greenfield approach
- Prioritizing a Fiori first user experience and API first principle.

Looking Back and Planning Next Steps

Looking Back ‘Maintenance Plan manager’

- Core application, in use for more than 15 years.
- Classical GUI based application.



Looking Back ‘Maintenance Plan manager’

Mutation - Steuerungstabelle1 des MFZ-Wartungsplanmanagers

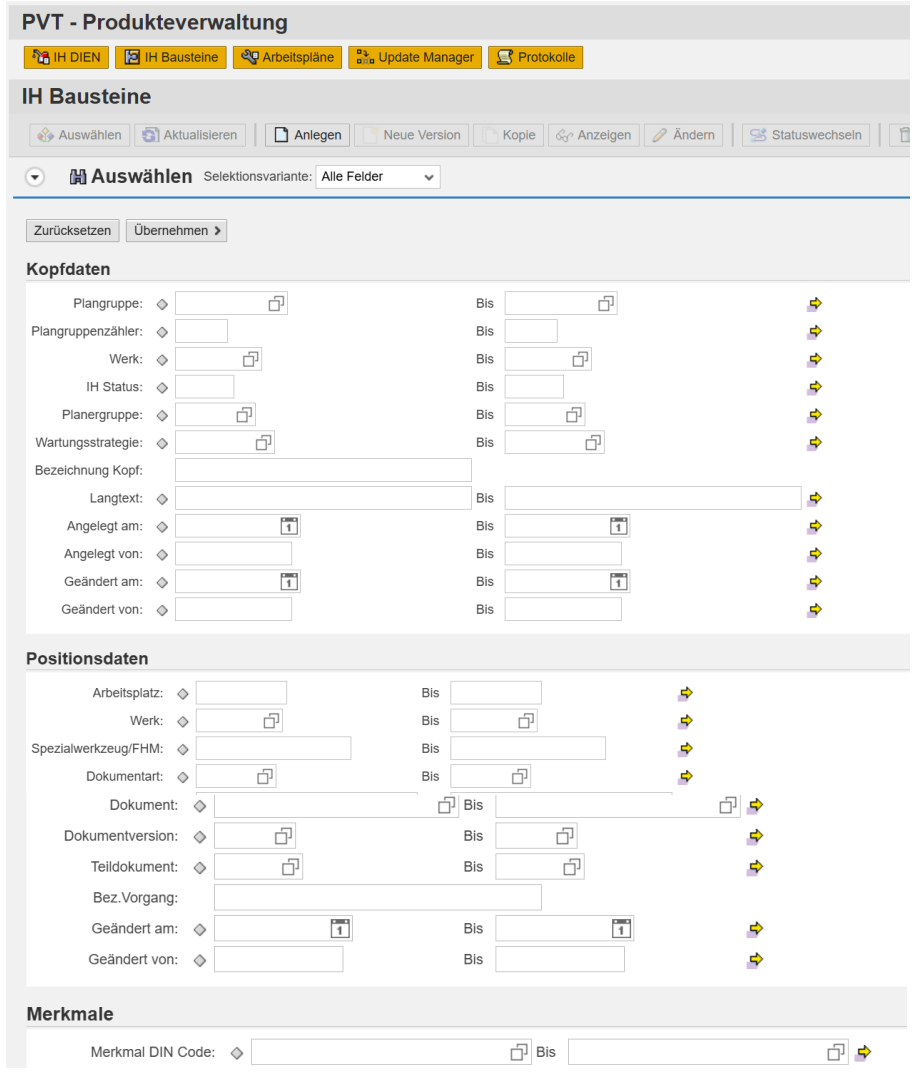
Menü | Anzeigen/Ändern | Objektliste | Steuertabelle2 (St2) | Datum setzen (St2) | WP's aktualisieren (St2)

Anzahl Zeilen: 1186

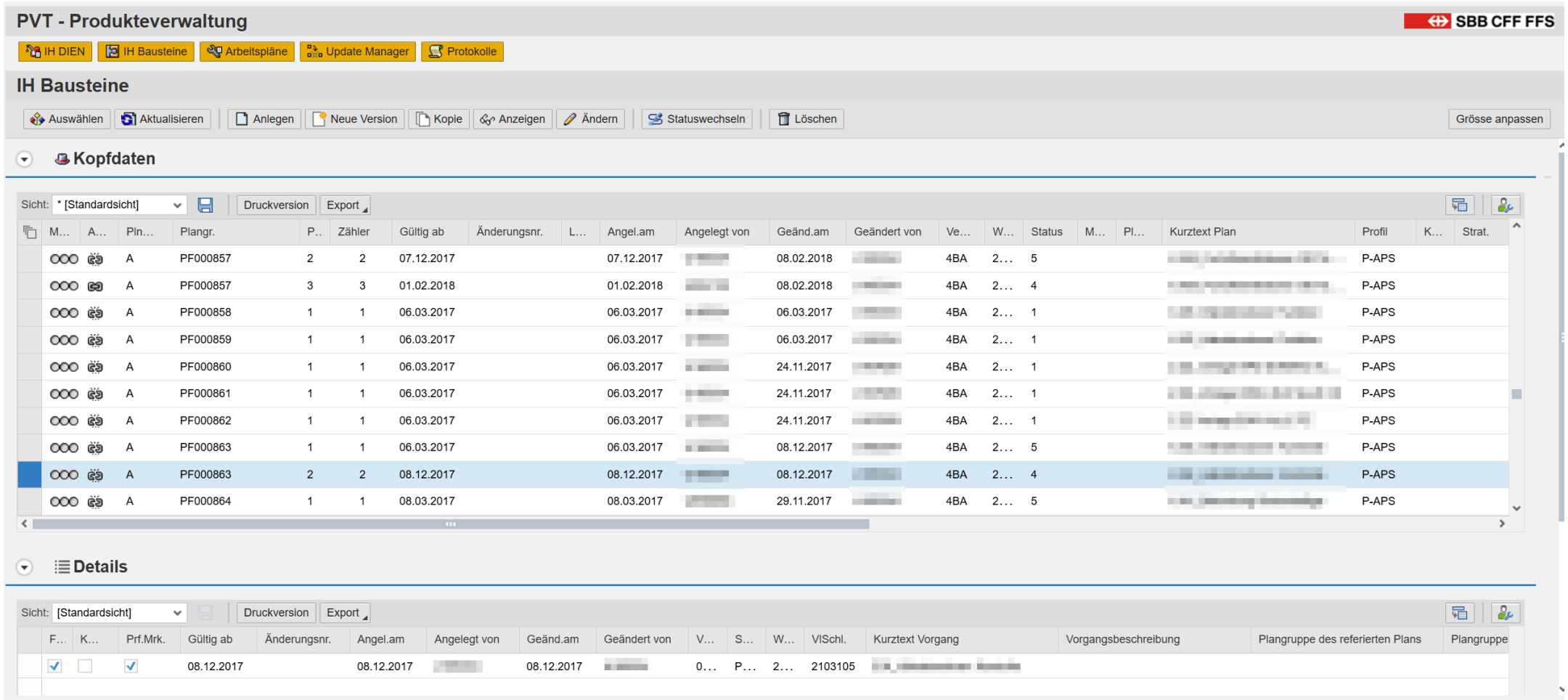
Plangruppe	PGZ	Verw.	Wartungstyp	WP Vorlage	WPlan-Beschreibung	NächstTerm	NächstTerm	Periode	EHTerm	IntAbr	ST2	Änderungsnr.	Angelegt von	Angelegt am
MR200	1	4MR	M-MR25	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	12.07.2014	12:19:33	7	TAG	70	X	20150401	[redacted]	20.06.2014
MR200	3	4MR	M-MR49	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	19.12.2015	12:20:13	7	TAG	70	X	20160101	[redacted]	15.12.2015
MR201	2	4MR	M-MR31	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	06.09.2014	16:07:19	7	TAG	70	X	20150202	[redacted]	05.09.2014
MR201	3	4MR	M-MR49	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	19.12.2015	12:20:53	7	TAG	70	X	20160101	[redacted]	15.12.2015
MR201	4	4MR	M-MR86	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	27.01.2018	15:10:44	7	TAG	70	X	20190201	[redacted]	23.01.2018
MR201	5	4MR	M-MR28	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	14.07.2018	10:44:43	7	TAG	70	X	20180701	[redacted]	09.07.2018
MR201	6	4MR	M-MR23	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	14.07.2018	11:17:50	7	TAG	70	X	20180701	[redacted]	09.07.2018
MR201	7	4MR	M-MR87	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	11.08.2018	08:09:31	7	TAG	70	X	20190201	[redacted]	06.08.2018
MR202	2	4MR	M-MR31	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	22.02.2014	15:10:20	7	TAG	70	X	20151001	[redacted]	18.02.2014
MR202	3	4MR	M-MR86	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	27.01.2018	15:12:47	7	TAG	70	X	20190201	[redacted]	23.01.2018
MR202	4	4MR	M-MR87	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	11.08.2018	08:10:24	7	TAG	70	X	20190201	[redacted]	06.08.2018
MR203	4	4MR	M-MR32	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	20.09.2014	17:05:28	7	TAG	70	X	20140901	[redacted]	16.09.2014
MR203	5	4MR	M-MR14	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	20.09.2014	17:05:45	7	TAG	70	X	20140901	[redacted]	16.09.2014
MR203	6	4MR	M-MR29	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	20.09.2014	17:06:02	7	TAG	70	X	20140901	[redacted]	16.09.2014
MR203	7	4MR	M-MR24	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	20.09.2014	17:06:18	7	TAG	70	X	20140901	[redacted]	16.09.2014
MR203	9	4MR	M-MR13	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	29.11.2014	07:41:50	7	TAG	70	X	20141101	[redacted]	24.11.2014
MR203	15	4MR	M-MR87	M-M10-01	MR Plan, Meldung 10, MFZ WPLA	11.08.2018	08:10:50	7	TAG	70	X	20190201	[redacted]	06.08.2018

Looking Back ‘Task List Manager’

- Core application, in use for more than 10 years.
- Webdynpro ABAP based application



Looking Back ‘Task List Manager’



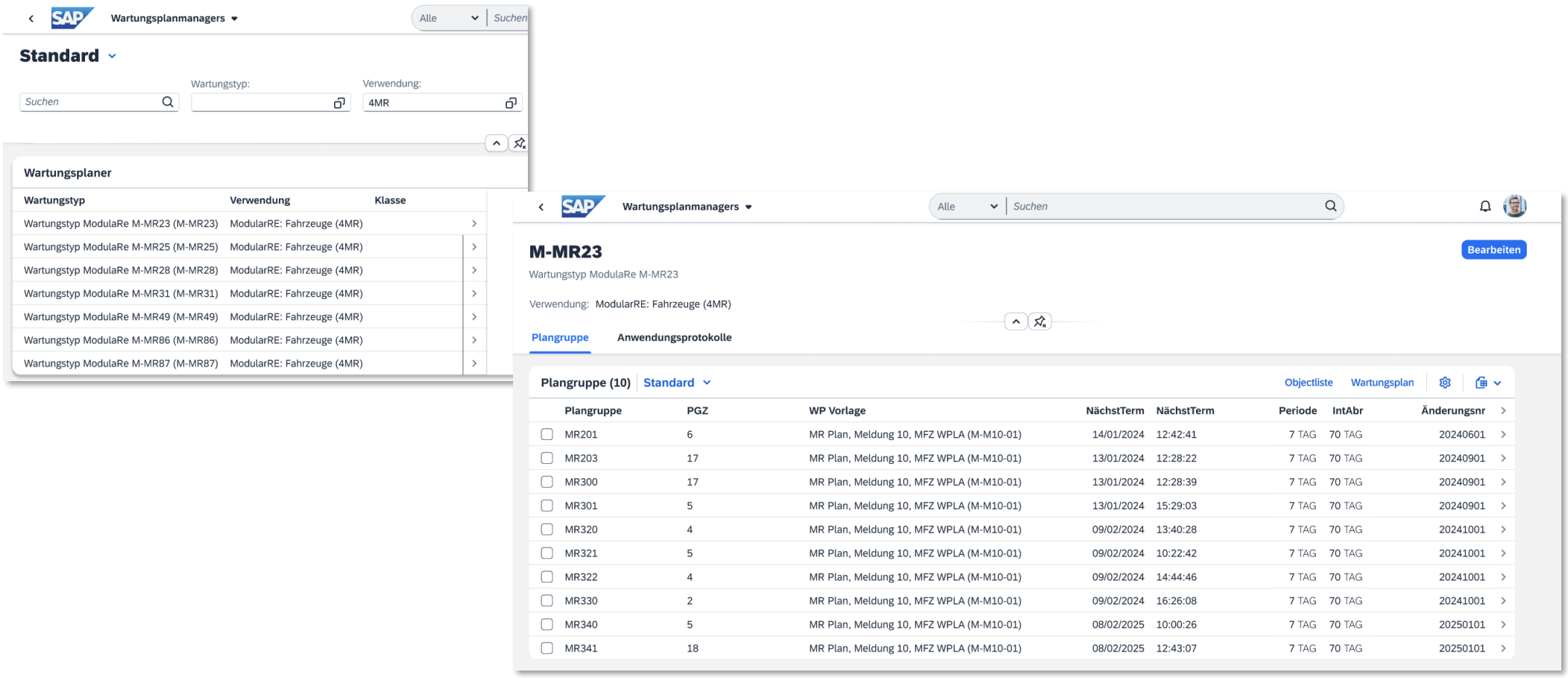
Preparing for the Climb

Change management aspects
- Fiori UX acceptance

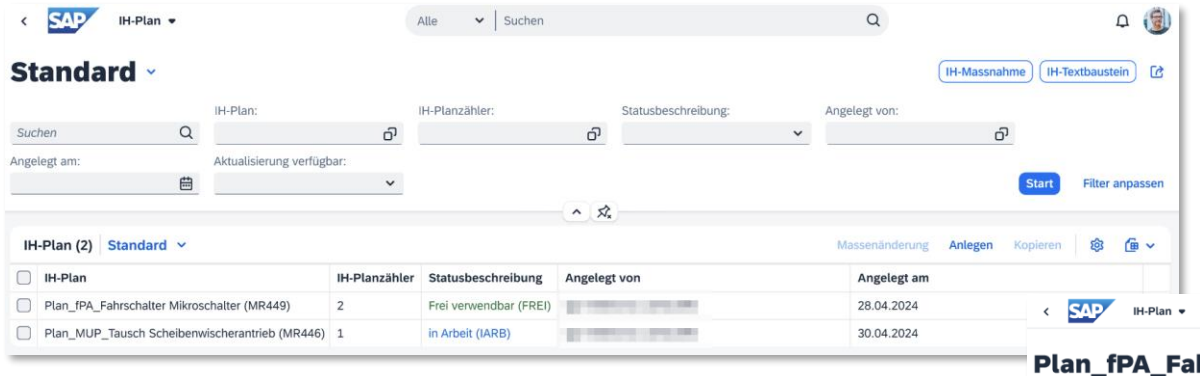
Technical aspects

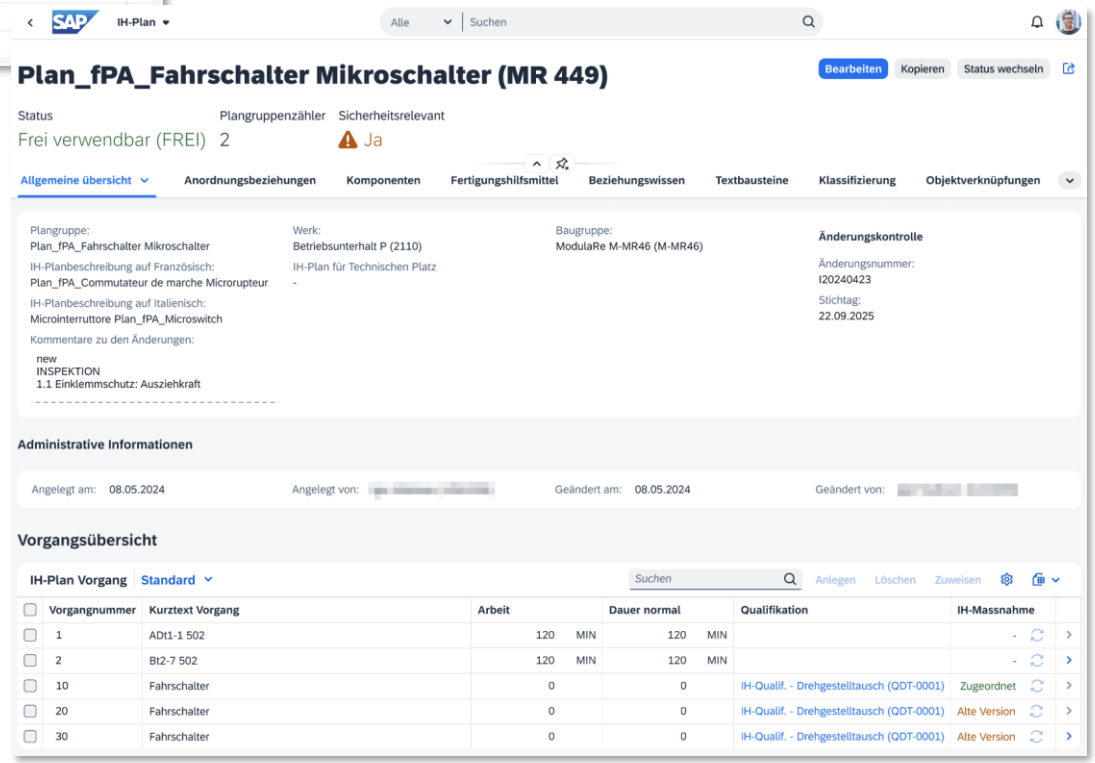
- Low code approach
- Stability across SAP releases.
- Governance, technical debt.

Fiori UX – Mockup for win!



Fiori UX – Mockup for win!





Architecture decision

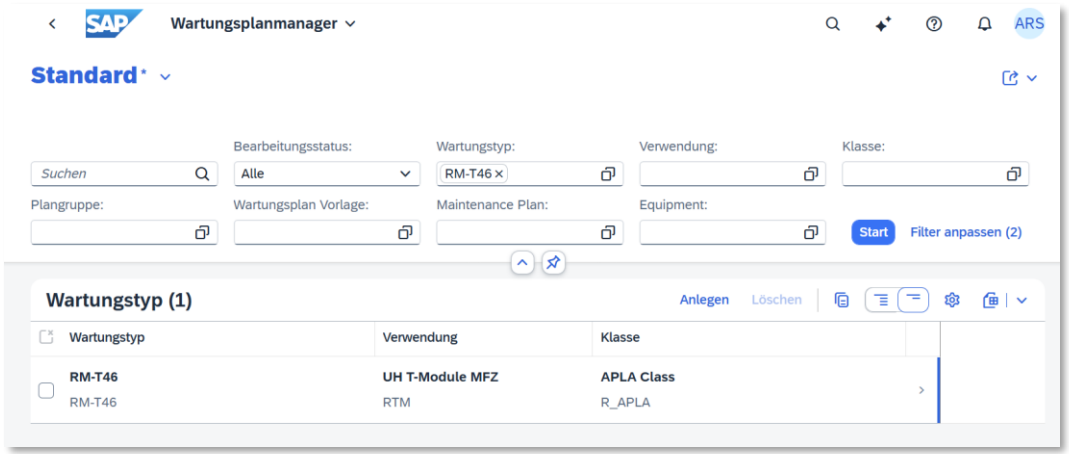
Maintenance Task Manager and Maintenance Plan Manager

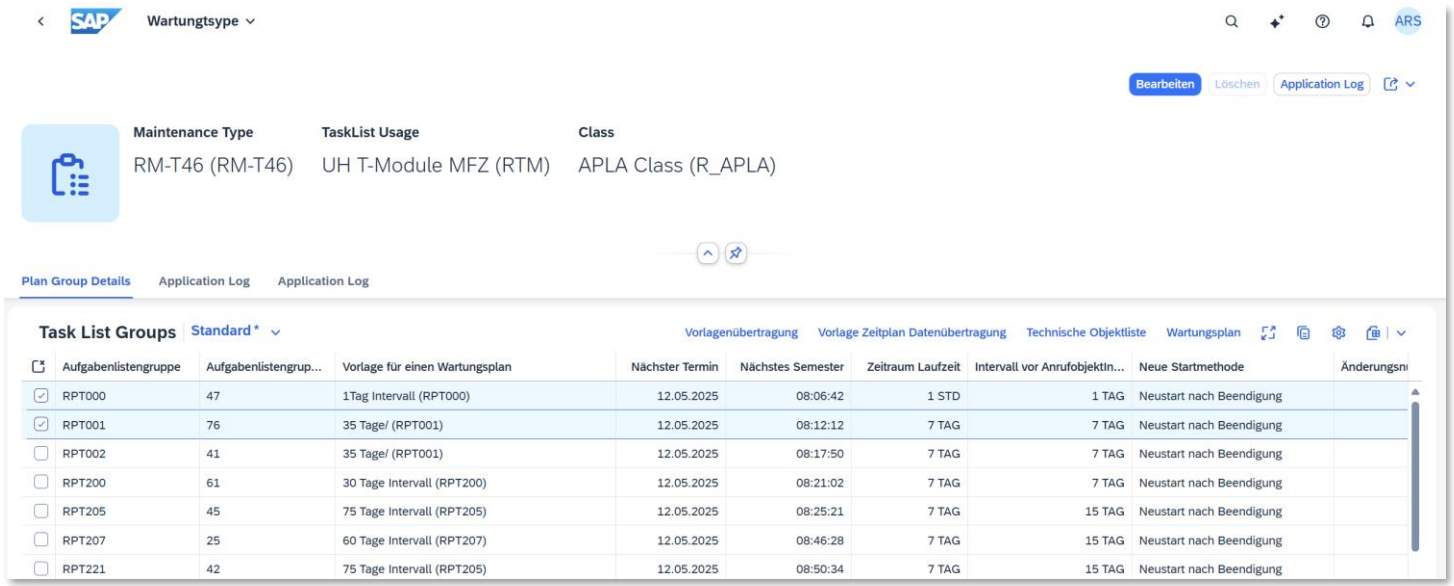
Target development approach
- Frontend: Low code approach
- Backend: ABAP Cloud model + Three Tier extensibility

Technology stack
- Frontend: Fiori Elements V4 with extensions (Building Blocks)
- Backend: OData V4 using ABAP RAP

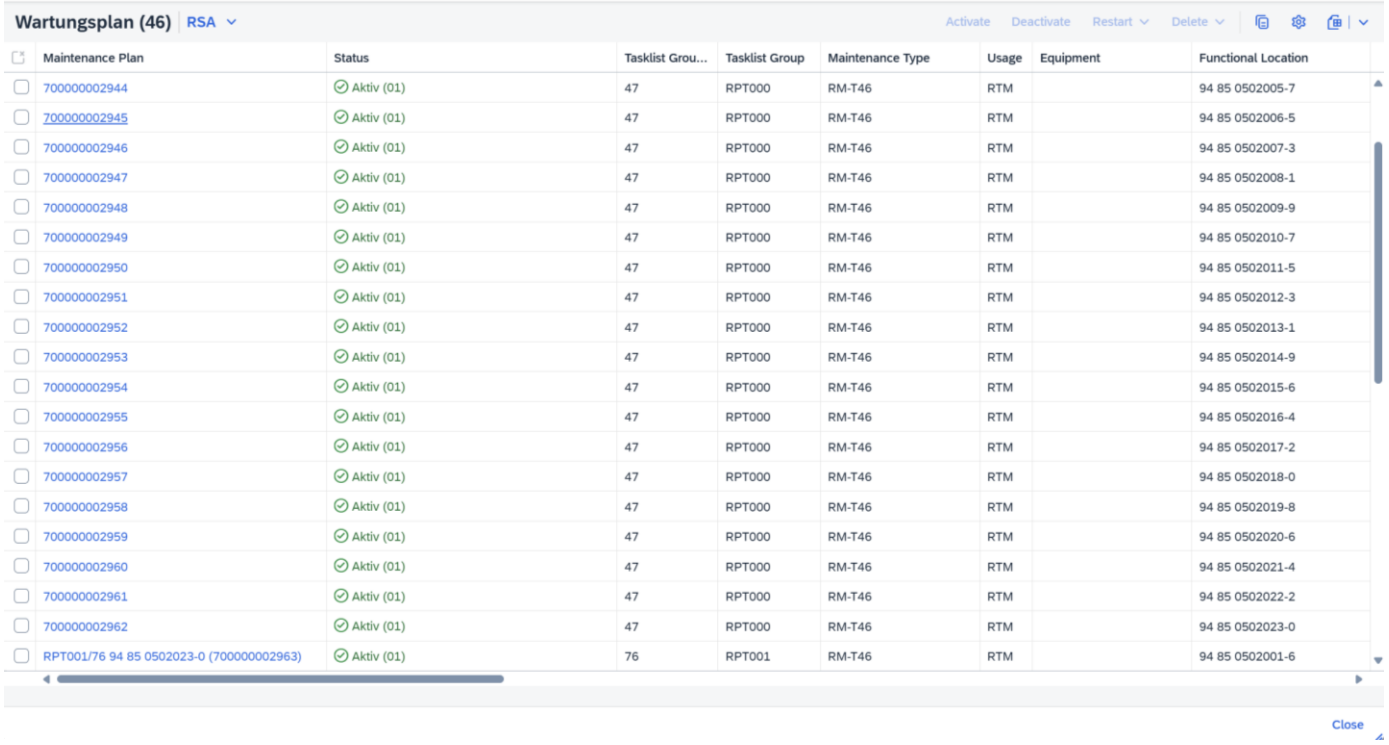
Fiori Low code extension

Fiori Elements





Fiori Elements Building Block



Maintenance Plan	Status	Tasklist Grou...	Tasklist Group	Maintenance Type	Usage	Equipment	Functional Location
700000002944	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502005-7
700000002945	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502006-5
700000002946	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502007-3
700000002947	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502008-1
700000002948	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502009-9
700000002949	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502010-7
700000002950	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502011-5
700000002951	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502012-3
700000002952	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502013-1
700000002953	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502014-9
700000002954	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502015-6
700000002955	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502016-4
700000002956	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502017-2
700000002957	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502018-0
700000002958	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502019-8
700000002959	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502020-6
700000002960	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502021-4
700000002961	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502022-2
700000002962	Aktiv (01)	47	RPT000	RM-T46	RTM		94 85 0502023-0
RPT001/76 94 85 0502023-0 (700000002963)	Aktiv (01)	76	RPT001	RM-T46	RTM		94 85 0502001-6

```
<macros:Table
    id="idBBTecObjTable"
    type="GridTable"
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    headerVisible="true"
    variantManagement="Control"
    filterBar="idTOFilterBar"
    contextPath="/Technicalobject"
    metaPath="/Technicalobject/@com.sap.vocabularies.UI.v1.LineItem"
```
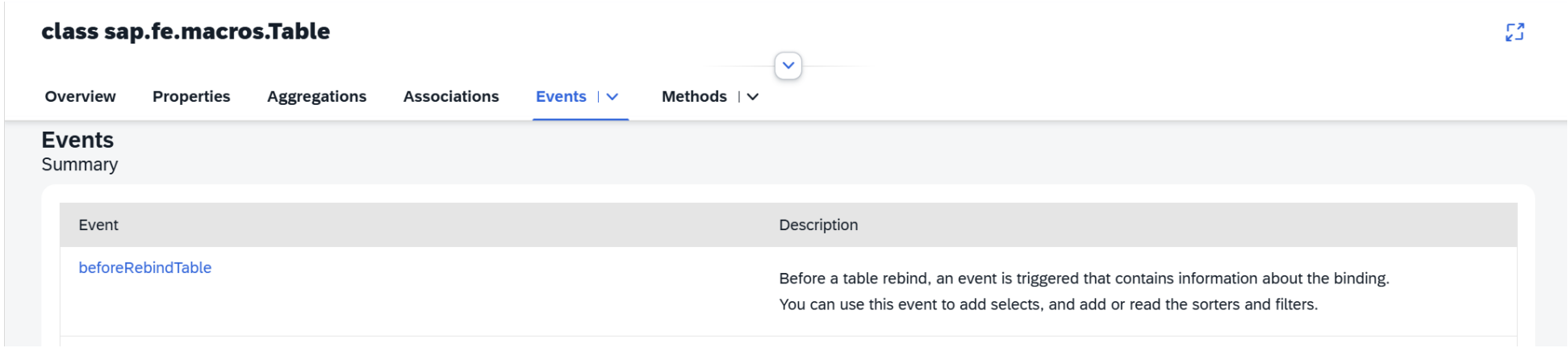

Fiori Elements Building Block UI5 version challenges




```
<macros:Table
    id="idBBTecObjTable"
    type="GridTable"
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    variantManagement="Control"
    filterBar="idTOFilterBar"
    contextPath="/Technicalobject"
    metaPath="/Technicalobject/@com.sap.vocabularies.UI.v1.LineItem"
/>
```
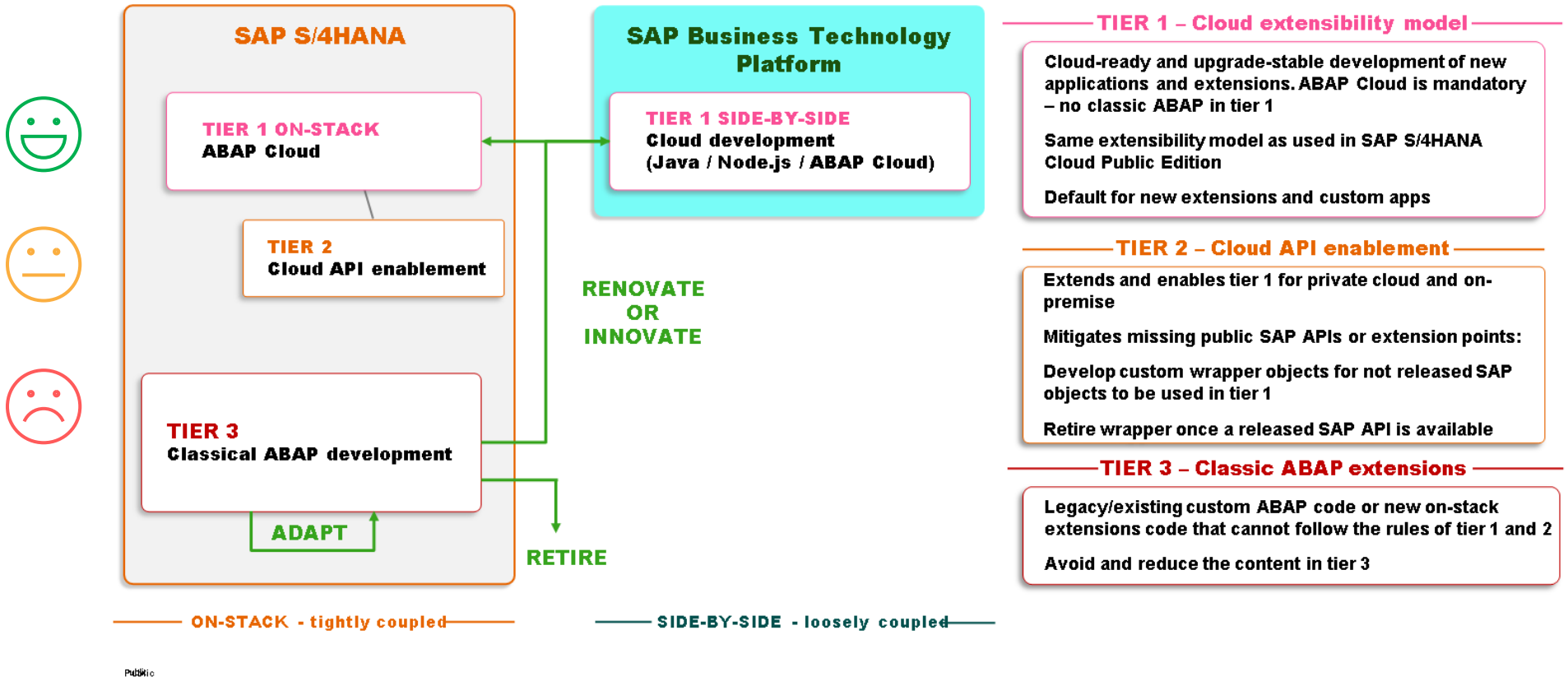
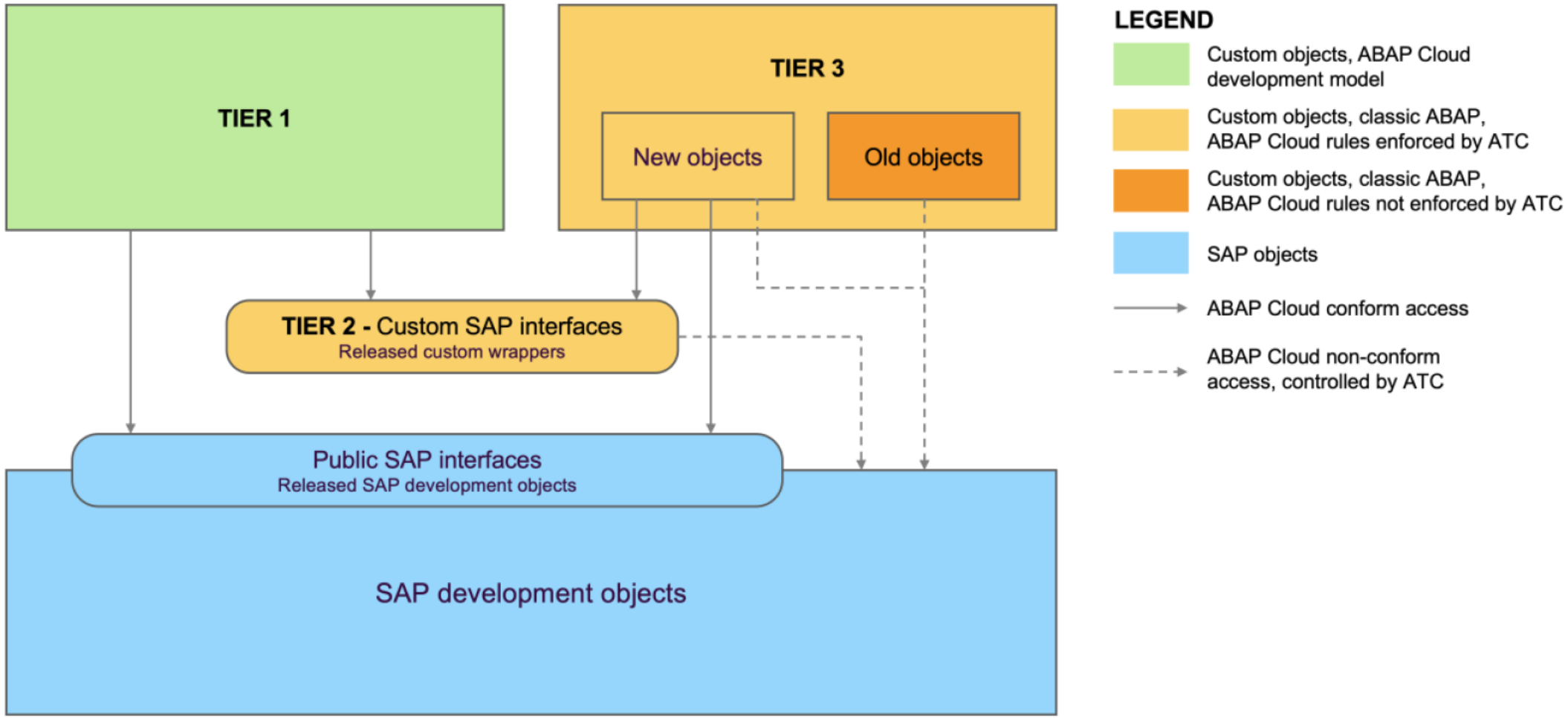

ABAP Cloud model and Three Tier extensibility

Three Tier extensibility recap

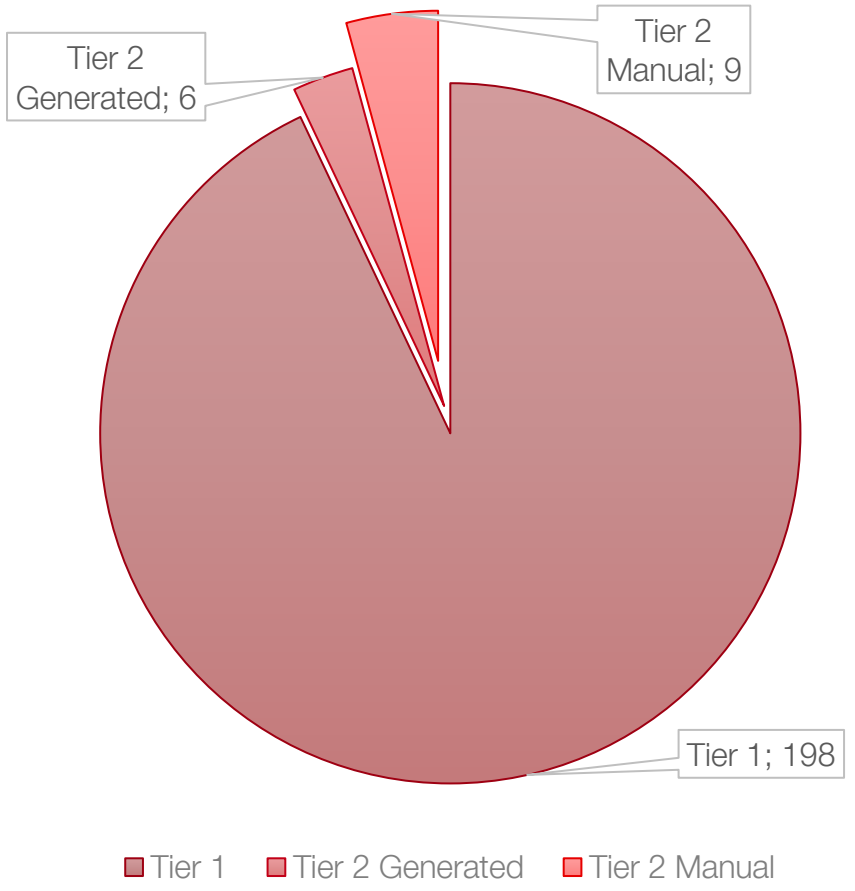


Three Tier extensibility recap



Tier breakdown - Maintenance Plan Manager

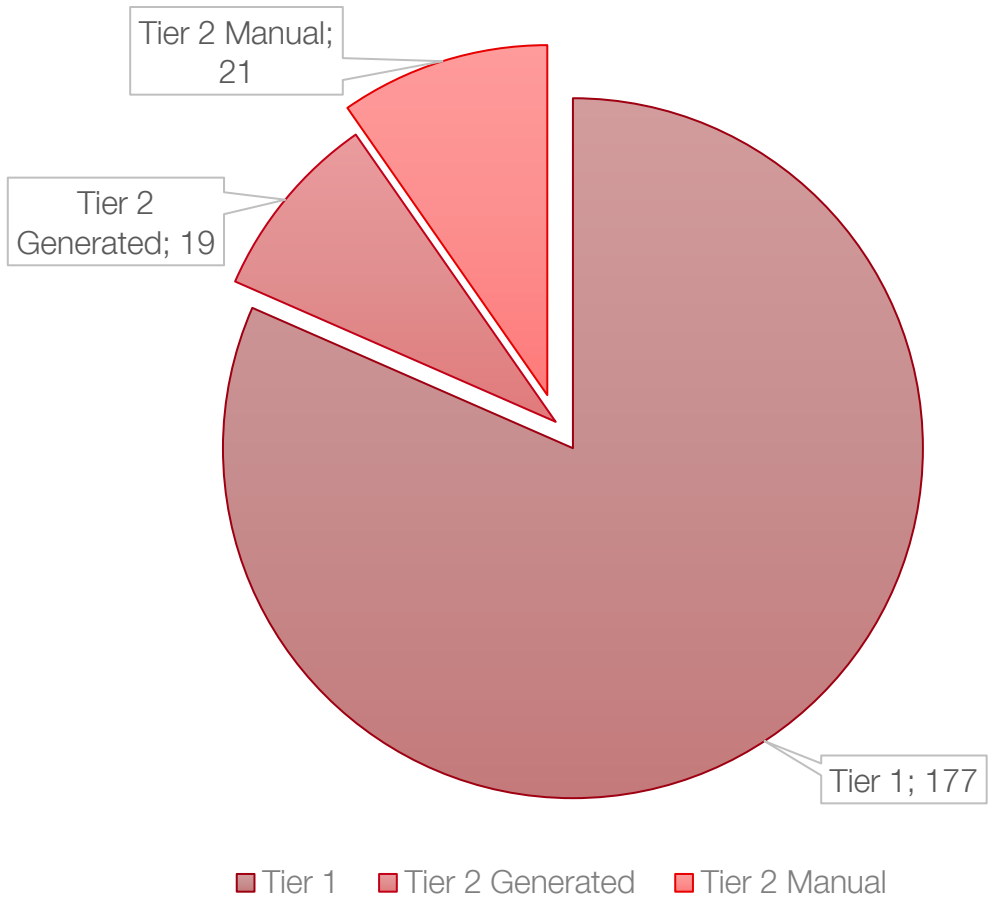
About 7% of the objects are part of Tier 2 and ideally can be swapped in further with a released object with low effort as they do not form core part of the application.



Tier breakdown - Task List Manager

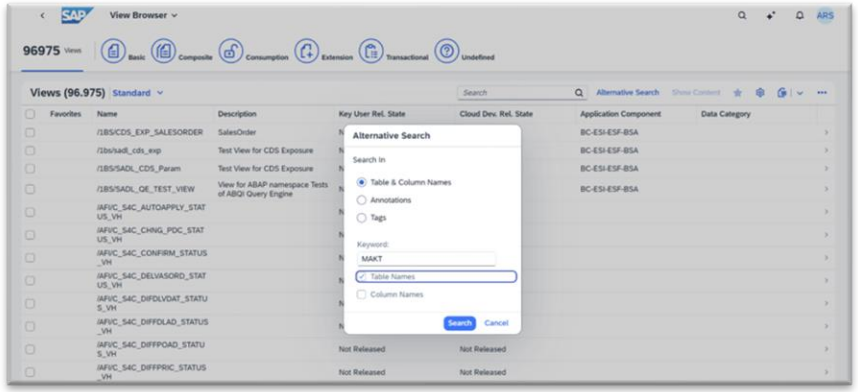
Although only 19% of development is in Tier 2 these objects are providing the core functionality e.g. The CRUD functionality is provided by unreleased/non-classic API (FM) which represents the generated portion.

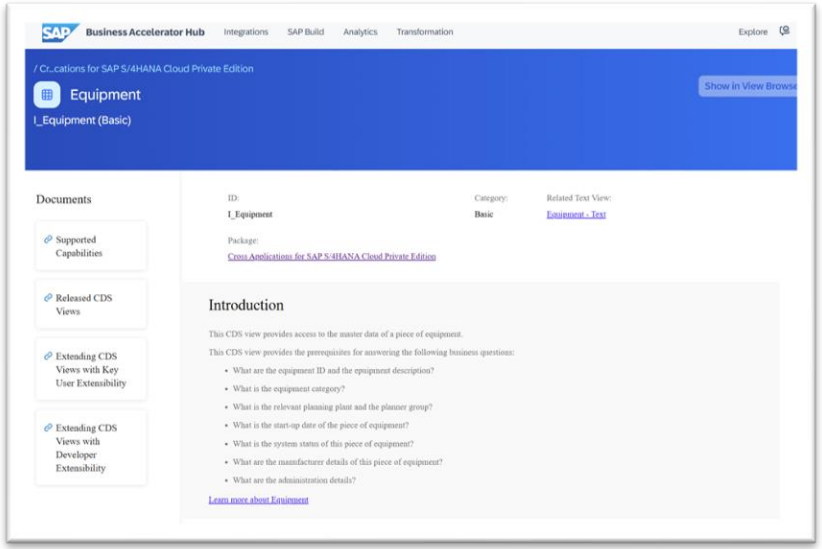
Replacement of these with a Released API is considerably high effort.

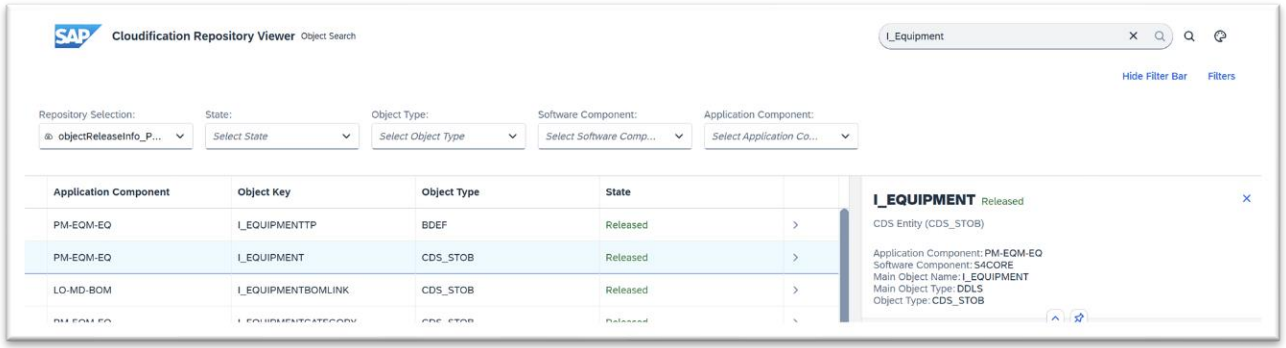


Released Objects Dilemma

Navigating the maze







Data elements not released

```
@AbapCatalog.preserveKey: true
@AccessControl.authorizationCheck: #CHECK
@EndUserText.label: 'Description of Clfn Charc for Key Date'
@VDM.viewType: #COMPOSITE
@VDM.lifecycle.contract.type: #PUBLIC_LOCAL_API
@Metadata.ignorePropagatedAnnotations: true

@ObjectModel.dataCategory: #TEXT
@ObjectModel.representativeKey: 'CharcInternalID'
@ObjectModel.usageType.sizeCategory: #M
@ObjectModel.usageType.serviceQuality: #A
@ObjectModel.usageType.dataClass: #MASTER
@ObjectModel.modelingPattern: #LANGUAGE_DEPENDENT_TEXT
@ObjectModel.supportedCapabilities:
  [  #LANGUAGE_DEPENDENT_TEXT,
     #CDS_MODELING_DATA_SOURCE,
     #CDS_MODELING_ASSOCIATION_TARGET,
     #SQL_DATA_SOURCE                  ]
/*+[hideWarning] { "IDS" : [ "KEY_CHECK" ] } */
define view I_ClfnCharcDescForKeyDate
  with parameters
    @Consumption.hidden: true
    @Environment.systemField: #SYSTEM_DATE
    P_KeyDate : sydate
  as select from I_ClfnCharcDesc as CharcDesc

      association [1..1] to I_ClfnCharacteristicForKeyDate as _Characteristic
        on $projection.CharcInternalID     = _Characteristic.CharcInternalID
{
  key CharcDesc.CharcInternalID,
      @ObjectModel.foreignKey.association: '_Language'
      @Semantics.language: true
  key CharcDesc.Language,
      @Semantics.text: true
      CharcDesc.CharcDescription,
```

Data Element: CHARCDESCRIPTION

Data Type Information

Specify the data type of the data element

Category:	Domain
Type Name: *	TEXT30
Data Type: *	CHAR
Length: *	30

Additional Properties

Probl... | Prop... | Tem... | Trans... | Feed... | ATC ... | Book... | Search | Dicti...

[T04] CHARCDESCRIPTION

General
API State
Transport

Use System-Internally (Contract C1)

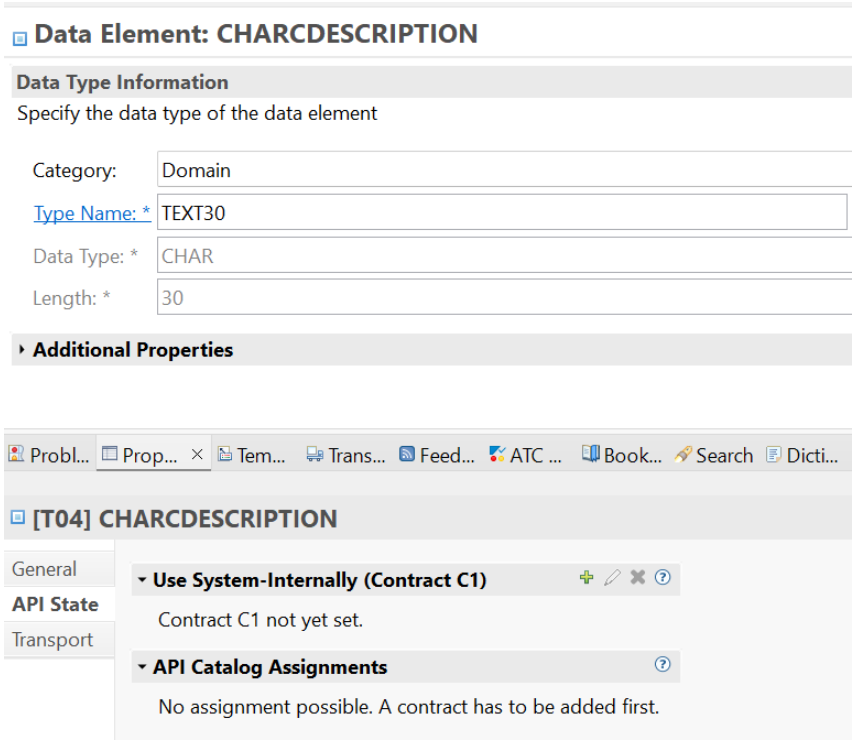
Contract C1 not yet set.

API Catalog Assignments

No assignment possible. A contract has to be added first.

Data elements not released

```
define table zir_3tl_ip_cl {

  key mandt                    : mandt not null;
  key classinternalid          : clint not null;
  key tasklisttype             : abap.char(1) not null;
  key tasklistgroup            : abap.char(8) not null;
  key tasklistgroupcounter     : abap.char(2) not null;
  key tasklistversioncounter : cim_count not null;
  key classtype                : abap.char(3) not null;
  key class                    : abap.char(18) not null;
  key charcinternalid          : atinn_no_conv not null;
  charcvaluepositionnumber     : atzhl;
  tasklistvaliditykeydate      : pph_begda;
  startdate                    : datuv;
  enddate                      : datub;
  charcvalue                   : abap.char(70);
  charcpositionnumber          : kposnr;
  characteristic               : atnam;
  charcdescription             : abap.char(30);
  clfnobjectid                 : cuobn;
  charcvaluedescription        : atwtb;
  "%admin"                     : include sych_bdl_draft_admin_inc;

}
```



Associations not released

```
@ObjectModel.supportedCapabilities:[ #CDS_MODELING_DATA_SOURCE]
@Metadata.ignorePropagatedAnnotations:true


define view I_MaintenanceTaskList
  as select from I_BillOfOperations
    inner join   I_BillOfOperationsChangeState on  I_BillOfOperations.BillOfOperatio
                                               and I_BillOfOperations.BillOfOperatio
                                               and I_BillOfOperations.BillOfOperatio

  association [0..1] to I_MaintenanceTaskListType   as _TaskListType              on

  association [0..1] to I_PMReferenceElement        as _PMReferenceElement        on

  association [0..1] to I_SafetyRelevance           as _SafetyRelevance           on
                                                                                  an

  association [0..1] to P_TaskListToEquipAlloc      as _TaskListEquip             on
                                                                                  an

  association [0..1] to P_TaskListToFuncnlLocAlloc  as _TaskListFuncnlLoc         on
                                                                                  an

  association [0..1] to I_TechObjIsEquipOrFuncnlLoc as _TechObjIsEquipOrFuncnlLoc on

  association [0..1] to I_TechnicalObject           as _TechnicalObject           on
                                                                                  an

  association [0..*] to I_MaintTaskListOperation    as _MaintTaskListOperation    on
                                                                                  an
```

```
define view I_MaintTaskListOperation
  as select from    I_BillOfOperationsOpBasic     as plpo
    inner join      I_BOOSqncOperationAssgmtChgSt as plas
```

Probl... | Prop... | Tem... | Trans... | Feed... | ATC ... | Book... | Search | Dicti

[T04] I_MAINTTASKLISTOPERATION

General
Specific
API State
Transport

Extend (Contract C0)

Contract C0 not yet set.

Use System-Internally (Contract C1)

Contract C1 not yet set.

Use as Remote API (Contract C2)

Released only for Key User

```
10 @ObjectModel.supportedCapabilities: [#SQL_DATA_SOURCE, #CDS_MODELING_DATA_SOURCE, #CDS_MODELING_ASSOCIATION_TARGET]
11 define view I_FunctionalLocationStatus
12   as select from P_FuncnlLocStatusAggrgn as _FuncnlLocStatus
13 {
```

Probl... | Prop... | Tem... | Trans... | Feed... | ATC ... | Book... | Search | Dicti... | Cons... | Varia... | ABA... | ABA... | Quick... | Prog...

[T04] I_FUNCTIONALLOCATIONSTATUS

General
Specific
API State
Transport

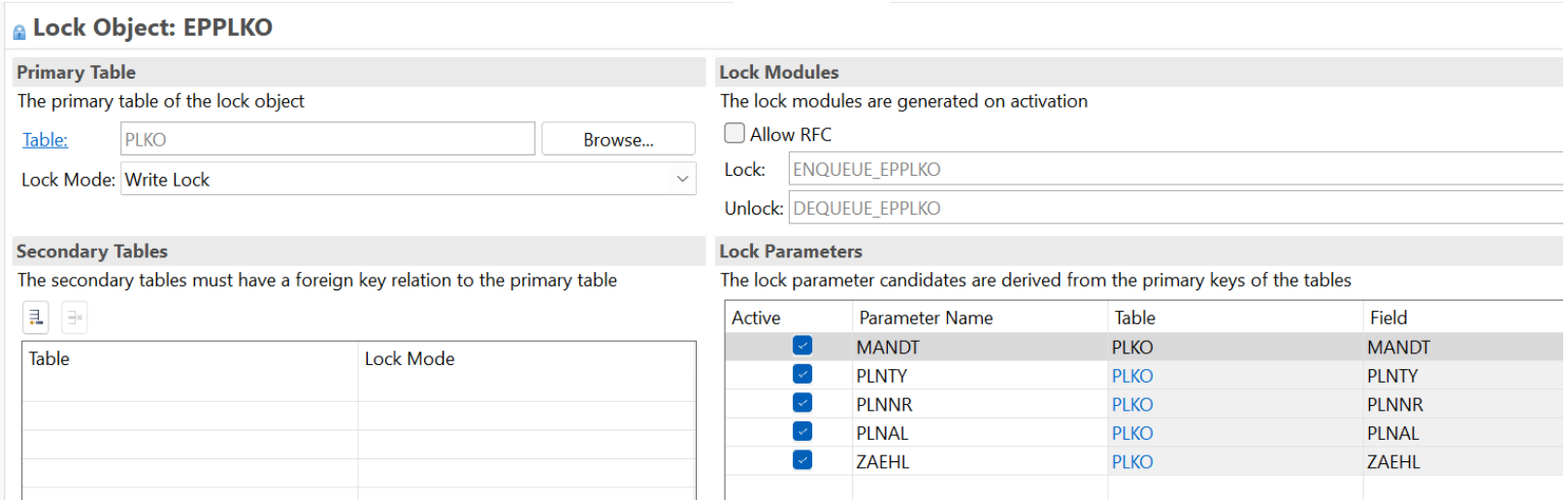
Extend (Contract C0)

Contract C0 not yet set.

Use System-Internally (Contract C1)

Release State:	Released
Local Comment:	
Use in Cloud Development:	No
Use in Key User Apps:	Yes
Last Changed by:	SAP
Last Changed on:	May 26, 2020

Lock Objects



Sample Code

```
CLASS lhc_travel IMPLEMENTATION.

  ...

  METHOD lock.
    TRY.
        "Instantiate lock object
        DATA(lock) = cl_abap_lock_object_factory=>get_instance( iv_name = '/DMO/ETRAVEL' ).
      CATCH cx_abap_lock_failure INTO DATA(exception).
        RAISE SHORTDUMP exception.
    ENDTRY.
```

Wrapper – The chosen ones

CDS wrapper - Key User objects

```
26 define view entity ZIR_CDS_I_3MP_FUNCLOCSTAT
27   as select from I_FunctionalLocationStatus
28 {
29   key FunctionalLocation,
30       MaintObjectInternalID,
31       FuncnlLocIsMarkedForDeletion,
32       FuncnlLocIsDeleted,
33       FunctionalLocationIsActive,
34       FunctionalLocationIsCreated,
35       FuncnlLocIsDeactivated
36 }
```

```
10 @ObjectModel.supportedCapabilities: [#SQL_DATA_SOURCE, #CDS_MODELING_DATA_SOURCE, #CDS_MODELING_ASSOCIATION_TARGET]
11 define view I_FunctionalLocationStatus
12   as select from P_FuncnlLocStatusAggrgn as _FuncnlLocStatus
13 {
14   key _FuncnlLocStatus.FunctionalLocation,
15       _FuncnlLocStatus.MaintObjectInternalID,
16       cast(_FuncnlLocStatus.FuncnlLocIsMarkedForDeletion as xfeld preserving type) as FuncnlLocIsMarkedForDeletion,
17       cast(_FuncnlLocStatus.FuncnlLocIsDeleted as xfeld preserving type)           as FuncnlLocIsDeleted,
18       cast(_FuncnlLocStatus.FunctionalLocationIsActive as xfeld preserving type)   as FunctionalLocationIsActive,
19       cast(_FuncnlLocStatus.FunctionalLocationIsCreated as xfeld preserving type)  as FunctionalLocationIsCreated,
20       cast(_FuncnlLocStatus.FuncnlLocIsDeactivated as xfeld preserving type)       as FuncnlLocIsDeactivated
21 };
22
```

Problems | Properties | Templates | Bookmarks | Feed Rea... | Transport ... | Variables | ABAP Inte... | ATC Probl... | Search | ABAP Lan... | Histor

[T04] I_FUNCTIONALLOCATIONSTATUS

General
Specific
API State
Transport

Extend (Contract C0)

Contract C0 not yet set.

Use System-Internally (Contract C1)

Release State:	Released
Local Comment:	
Use in Cloud Development:	No
Use in Key User Apps:	Yes
Last Changed by:	SAP

CDS wrapper – Internal Private API

```
13 @VDM.viewType: #BASIC
14 @VDM.lifecycle.contract.type: #SAP_INTERNAL_API
15
16 define view I_ObjectDependency
17   as select from    cukb  as Dependency
18     left outer join cukbt as DependencyText on  Dependency.adzhl     = De
19                                             and Dependency.knnum     = De
20                                             and DependencyText.spras = $s
21 {
22   key Dependency.knnum          as ObjectDependency,
23   key Dependency.adzhl          as TimeIntervalNumber,
24       Dependency.knnam          as ObjectDependencyName,
25       Dependency.knart          as ObjectDependencyType,
26       Dependency.knsta          as ObjectDependencyStatus,
27       Dependency.knedt          as CreationDate,
28       Dependency.kneus          as CreatedByUser,
29
30       @Semantics.systemTime.lastChangedAt: true
31       case
32       when Dependency.knadt is null or Dependency.knadt = '00000000'
33       then Dependency.knedt
34       else Dependency.knadt end as LastChangeDate,
35       @Semantics.user.lastChangedBy: true
```

Probl... | Prope... | Templ... | Book... | Feed ... | Trans... | Variab... | ABAP ... | ATC Pr...

[T04] I_OBJECTDEPENDENCY

General
Specific
API State
Transport

Extend (Contract C0)

Contract C0 not yet set.

Use System-Internally (Contract C1)

Contract C1 not yet set.

Manual wrapper - CDS

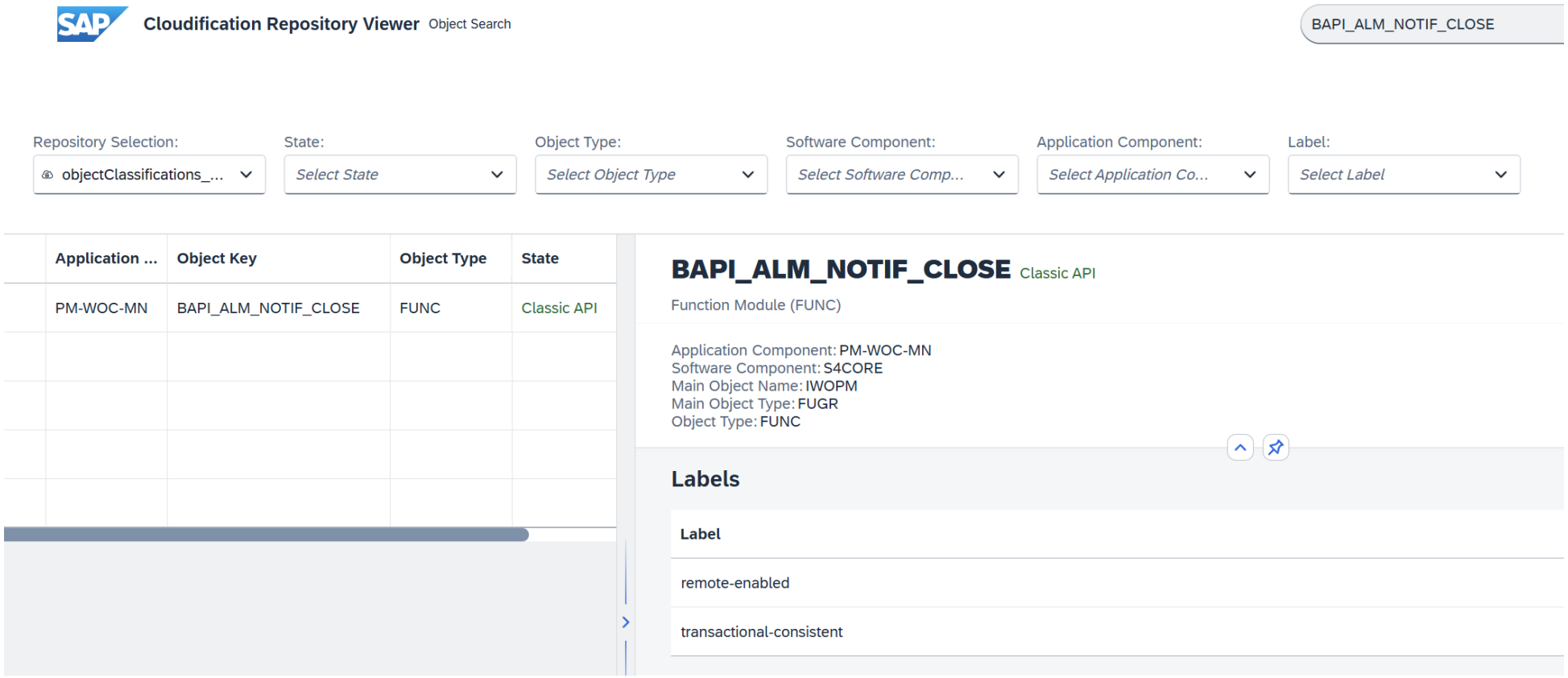
CDS

- Use-case specific wrapper and modular when feasible.

```
define view entity ZIR_CDS_R_3MP_STATUSCODE_TEXT
  as select from ZIR_CDS_I_3MP_STATUSOBJECT as statusobject
  association [1..*] to I_UserStatusText as _statusText on  $projection.StatusCode      = _statusText
                                                        and statusobject.StatusProfile  = _statusText
                                                        and _statusText.Language        = $session.sy
                                                        and statusobject.StatusIsActive is not initia
{

  key StatusObject,
  key StatusCode,
      StatusProfile,
      IsUserStatus,
      StatusIsActive,
      _statusText.UserStatusName,
```

```
define view entity ZIR_CDS_I_3MP_STATUSOBJECT
  as select from I_StatusObjectActiveStatus
{
  key StatusObject,
  key StatusCode,
      StatusProfile,
      IsUserStatus,
      StatusIsActive,
      /* Associations */
      _StatusCode,
      _StatusObject,
      _StatusProfile
}
```

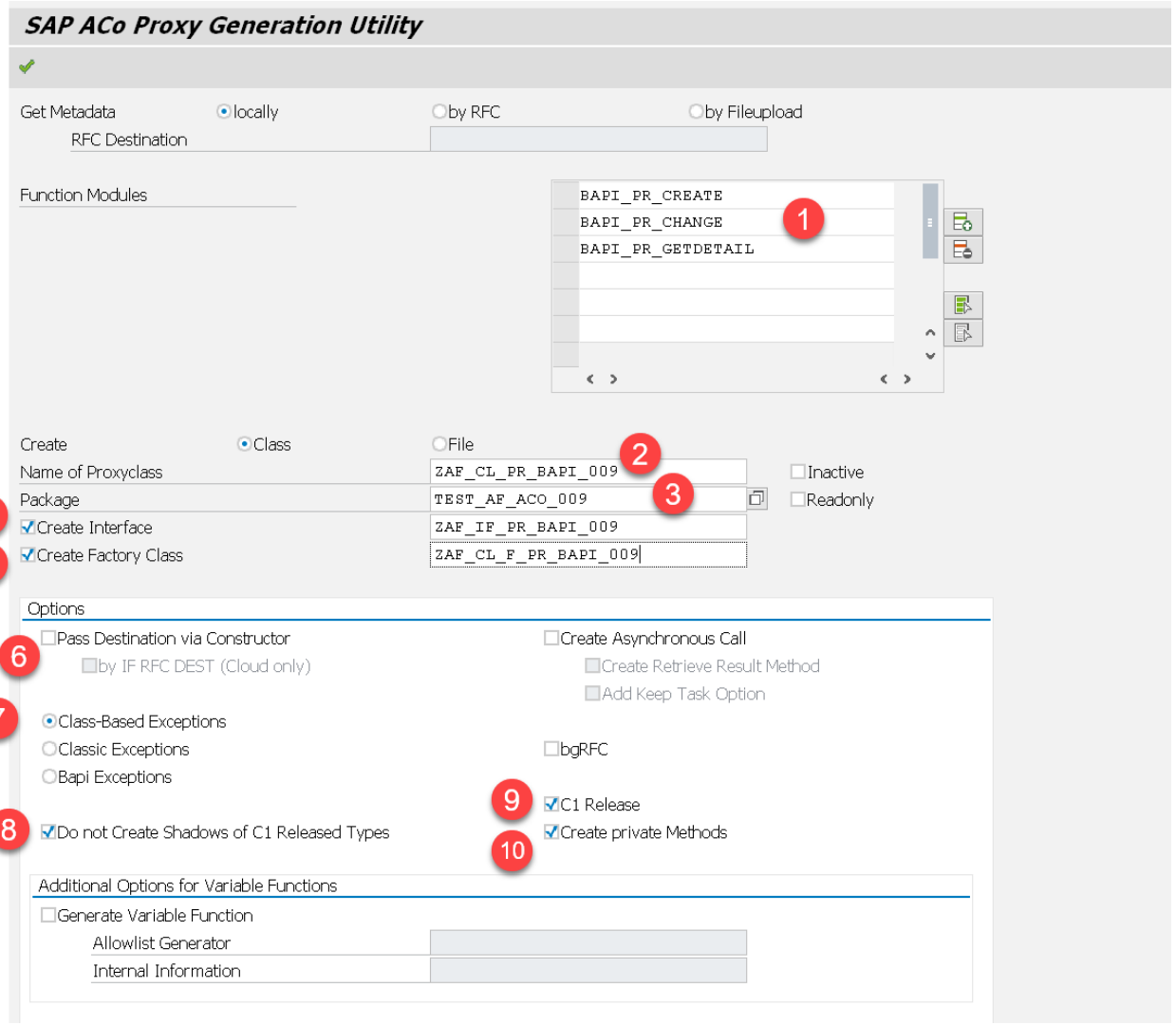
BO wrapper - Classic APIs



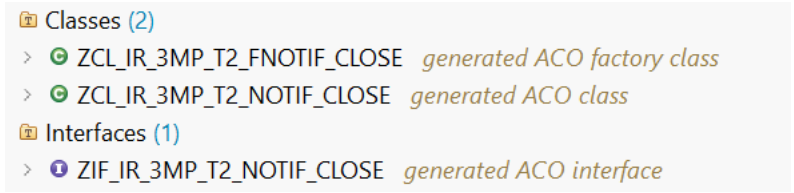
BO wrapper - Classic APIs

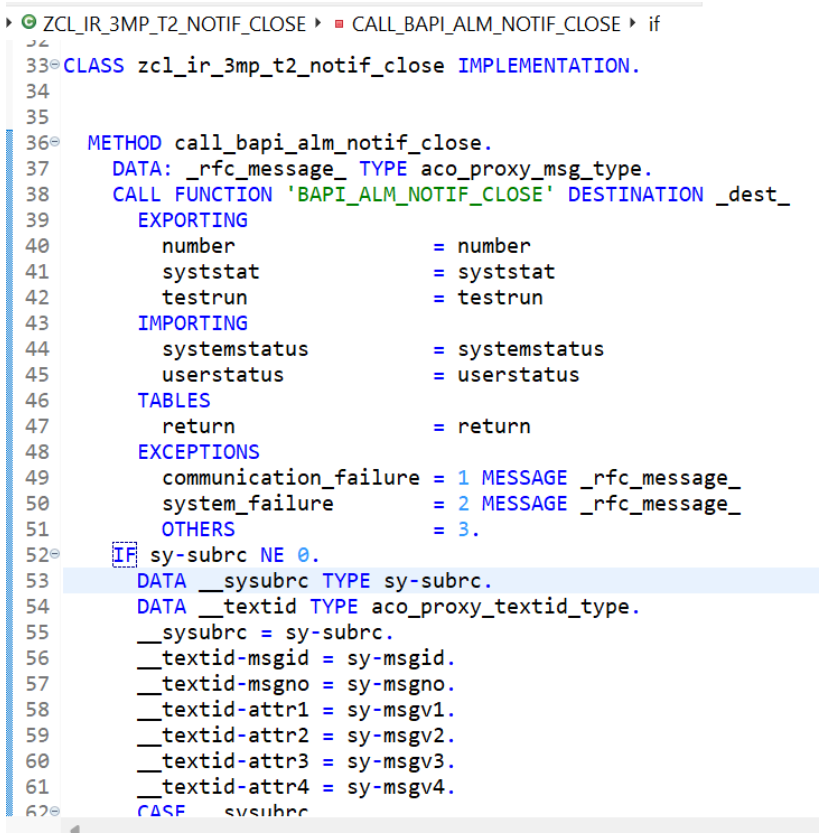
ACO_PROXY

Blog – Andre Fischer



BO wrapper - Classic APIs





Manual wrapper - BO

BO – BAPI/Class

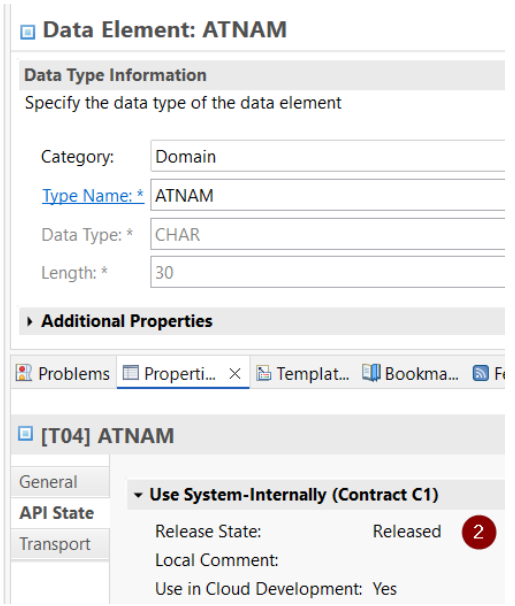
- Encapsulate the types used Tier 2 for usage in Tier 1. Check the generated BO scenario as an example of best practice.

ZIF_IR_3TL_T2_OBJCL_CREATE ▸ BAPI1003_ALLOC_VALUES_CHAR

```
19   TYPES:
20     atwrt30 TYPE c LENGTH 000030 ##TYPSHADOW .
21   TYPES:
22     flinh TYPE c LENGTH 000001 ##TYPSHADOW .
23   TYPES:
24     atzis TYPE n LENGTH 000003 ##TYPSHADOW .
25   TYPES:
26     atwrt70 TYPE c LENGTH 000070 ##TYPSHADOW .
27   TYPES:
28     BEGIN OF bapi1003_alloc_values_char    ,
29       charact         TYPE atnam,
30       value_char      TYPE atwrt30,
31       inherited       TYPE flinh,
32       instance        TYPE atzis,
33       value_neutral   TYPE atwrt30,
34       charact_descr   TYPE atbez,
35       value_char_long TYPE atwrt70,
36       value_neutral_long TYPE atwrt70,
37     END OF bapi1003_alloc_values_char     ##TYPSHADOW .
```

2

1



Complicated life of a BO

RAP BO
- Be aware of restrictions
- Mix n match with other BOs not always feasible

Classic API – BAPI/Class
- Standalone LUW can complicate logic
  - manual commit handling
  - lock handling

Unreleased FMs
- wild west …

SAP LUW in RAP context

Wrapping Up

Define the goal before you begin your journey.

Time to market
- Leverage modern SAP frameworks and tooling.
  - Fiori Elements, Building Blocks, RAP

Product lifecycle
- Prioritize stability, simplify governance and extensibility across releases.
  - ABAP Cloud model, Released API, Three Tier extensibilty

Wish list

Influence requests

Wrapper lifecycle management

Bon Voyage!


Thank you!

References

- Three Tier Extensibility Model
- ABAP Cloud API Enablement Guidelines
- Wrapper generator for BAPI/RFC FM
- Classic API for Tier 2
- Cloudification Repository
- ATC and ABAP Cloud

Speaker

Archish is an SAP professional with about 20 years of experience in development and architecture, specializing in ABAP, SAP Business Technology Platform and Fiori. He is passionate about leveraging the latest technologies to drive innovation and excellence in his work.

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