

# SAP TechEd

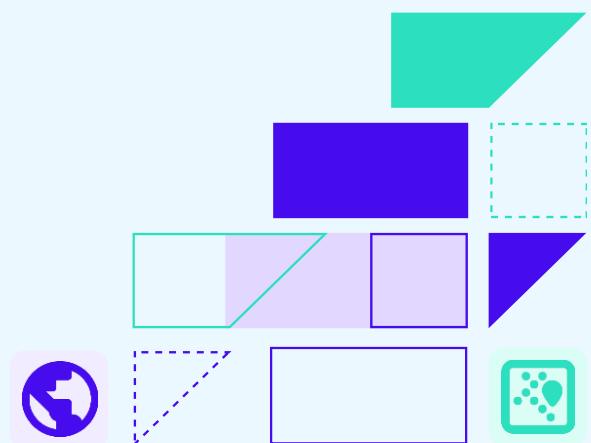


# SAP TechEd



## Delve into ABAP Cloud on SAP BTP, ABAP environment – AD181v

Carine Tchoutouo Djomo, Merve Temel – SAP SE  
November 3, 2023



# Agenda



INTRODUCTION

TODAY'S SCENARIO – **OVERVIEW**

TODAY'S SCENARIO – **EXERCISES**

WRAP UP

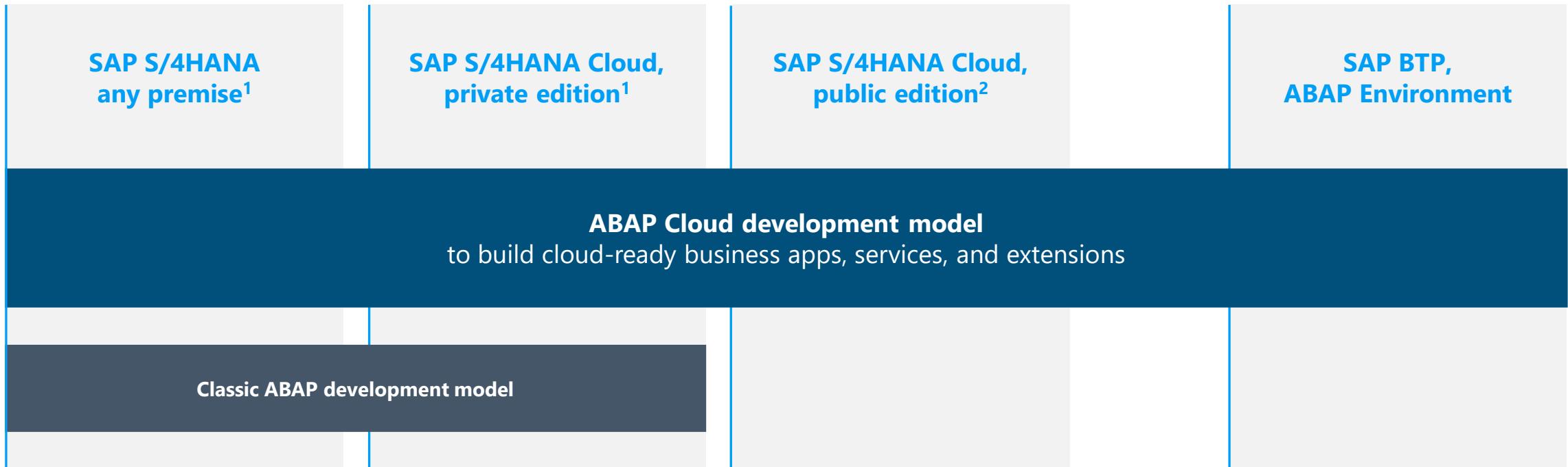
# INTRODUCTION



## ABAP Cloud

- ... is the ABAP [development model](#) to build cloud-ready business apps, services, and extensions
- ... comes with SAP Business Technology Platform (SAP BTP) and SAP S/4HANA
- ... works with public or private cloud, and even on-premise

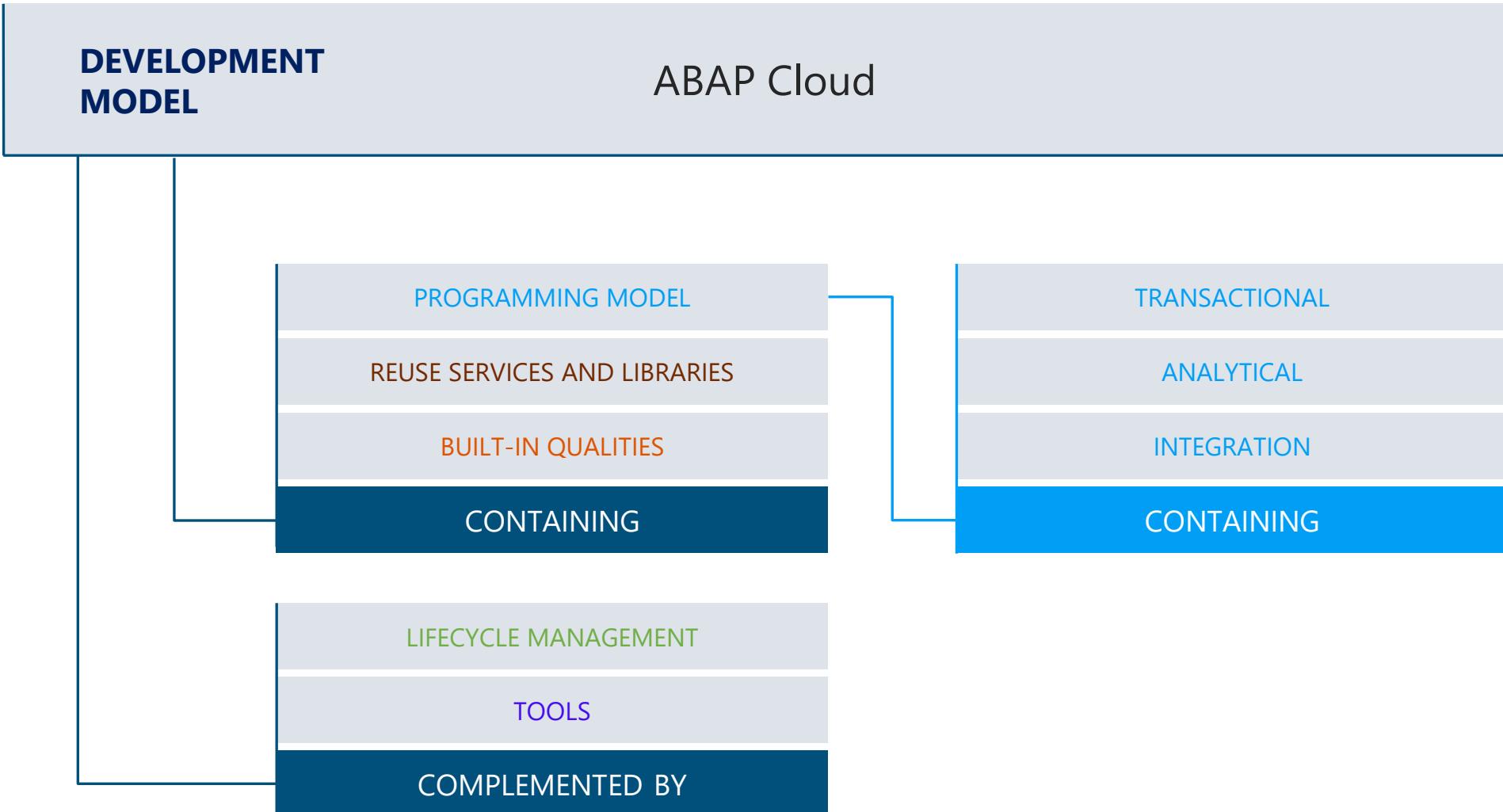
# ABAP Cloud – One development model for SAP S/4HANA and SAP BTP



<sup>1</sup> SAP S/4HANA any premise or SAP S/4HANA Cloud, private edition release ≥ 2022

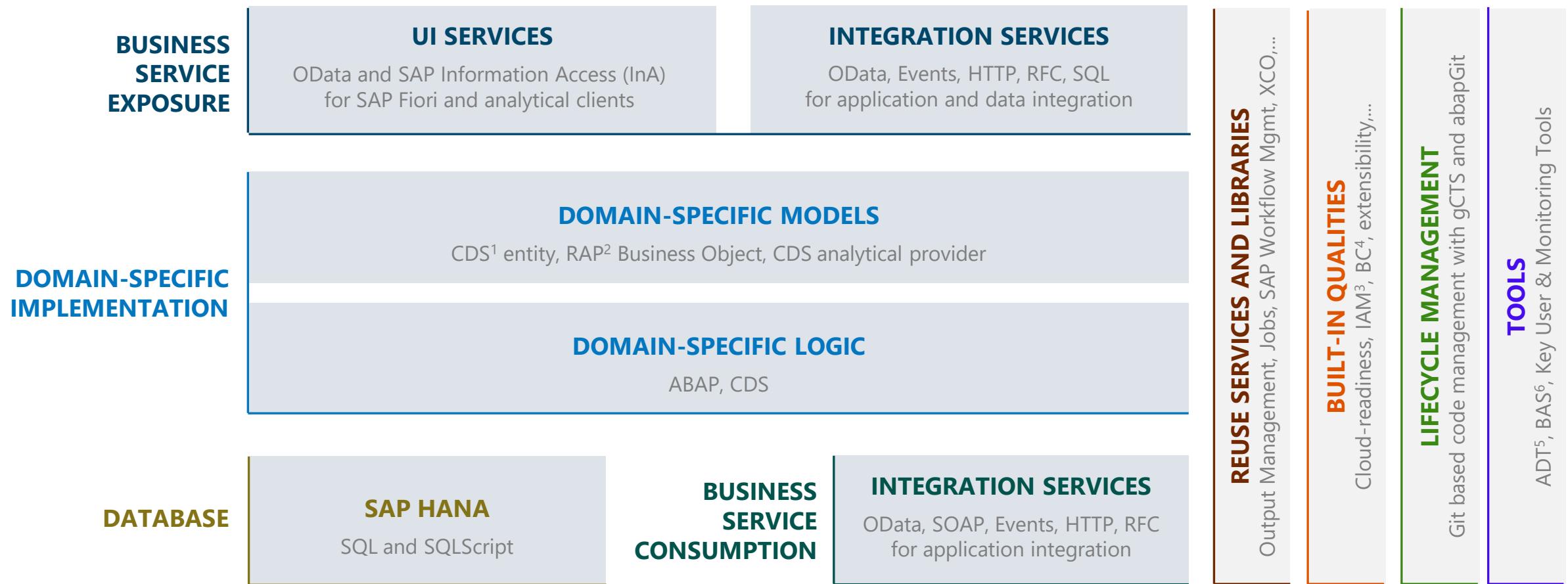
<sup>2</sup> SAP S/4HANA Cloud, public edition release ≥ 2208, 3-system landscape required

# ABAP Cloud – What's in it?



Learn more: [ABAP Cloud - What does it comprise?](#)

# ABAP Cloud map



Related sessions: [AD103v](#), [AD107v](#), [DT187v](#), [DT182v](#), [DT103v](#), [DT200v](#)

<sup>1</sup> Core Data Services

<sup>2</sup> ABAP RESTful application programming model

<sup>3</sup> Identity & Access Management

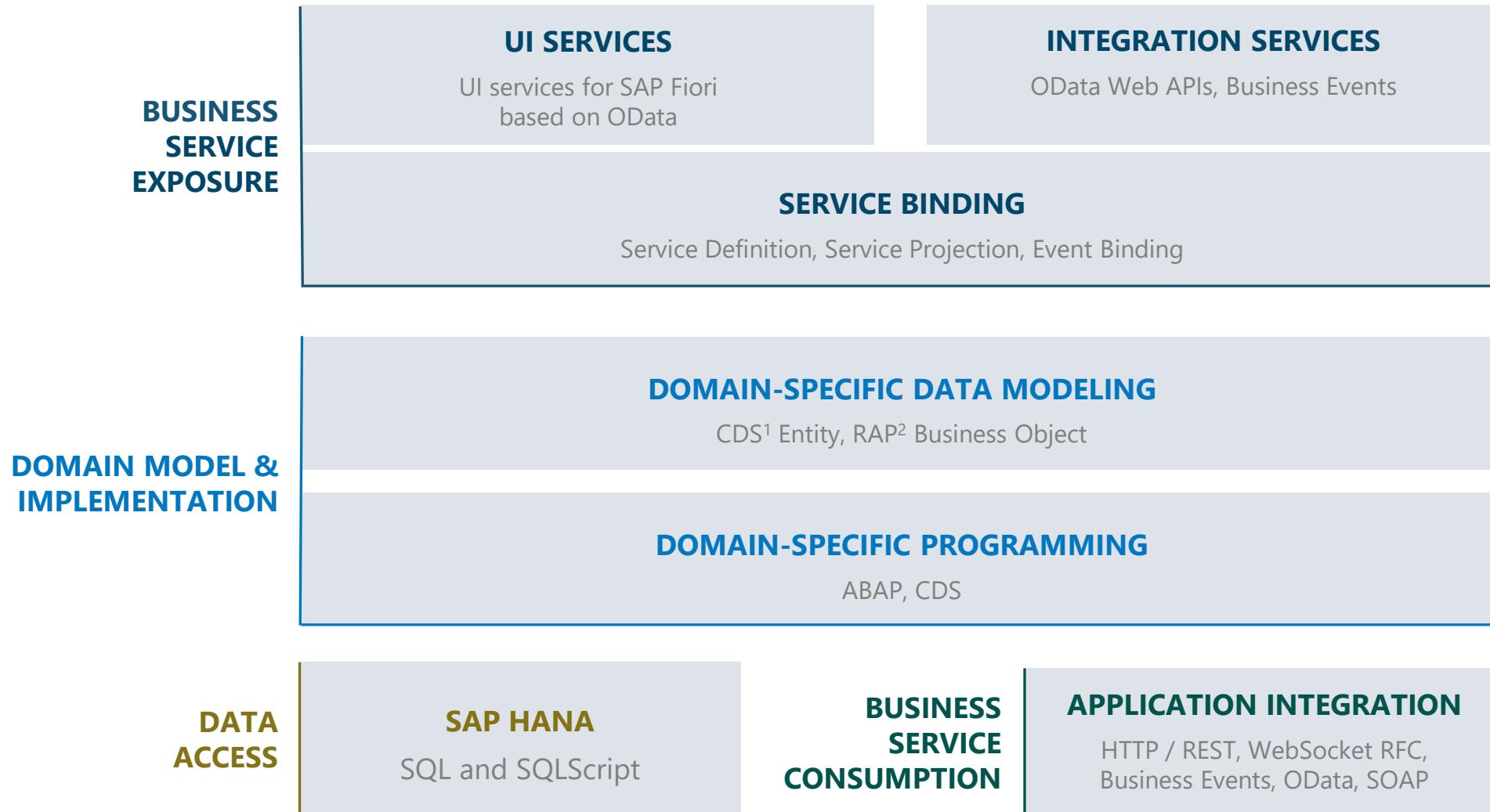
<sup>4</sup> Business Configuration

<sup>5</sup> ABAP Development Tools

<sup>6</sup> SAP Business Application Studio

# ABAP Cloud – Transactional scenarios

## The ABAP RESTful application programming model (RAP)



<sup>1</sup> Core Data Services

<sup>2</sup> ABAP RESTful application programming model

# **TODAY'S SCENARIO – OVERVIEW**

# Building transactional SAP Fiori apps with RAP

## with search, filter, and draft capabilities

**LIST REPORT PAGE**

**Standard\*** ▾

Editing Status: Travel ID: Agency ID: Customer ID:

Search  All     Go Adapt Filters (1)

Travels (7)

Travel ID	Agency ID	Customer ID	Overall Status	
4153	Everywhere (70024)	29 (Jeremias)	⚠ Open	>
4142	Bavarian Castle (70015)	1 (Buchholm)	⚠ Open	>
4141	Travel from Walldorf (70010)	6 (Buchholm)	✓ Accepted	>
4140	Travel from Walldorf (70010)	16 (Vrsic)	✓ Accepted	>
4139 Draft	Hot Socks Travel (70007)	4 (Buchholm)	⚠ Open	>
4138	Happy Hopping (70003)	5 (Buchholm)	✗ Rejected	>
New Object Draft	Pink Panther (70004)	51 (Fischmann)	⚠ Open	>

- Some of the used RAP features:
- ❖ Large objects / OData streams
  - ❖ Virtual elements
  - ❖ Late numbering
  - ❖ Internal and determine instance actions
  - ❖ Static (default) factory action
  - ❖ Side effects
  - ❖ Functions
  - ❖ Business events
  - ❖ etc.

Navigation  
to object page

# Building transactional SAP Fiori apps with RAP

## Travel list report app >> Object page

**OBJECT PAGE**

**4153**

**Travel** **Booking**

**General Information**

Travel ID: 4153	End Date: Nov 17, 2023
Agency ID: Everywhere (70024)	Booking Fee: 100.00 EUR
Customer ID: 29 (Jeremias)	Total Price: 2,749.00 EUR
Starting Date: Nov 3, 2023	Description: -

**Booking**

**Bookings (1)**

Travel ID	Booking Number	Booking Date	Customer ID	Airline ID
4153	10	Nov 2, 2023	Jeremias (29)	Deutsche Lufthansa AG (LH)

Flight Price: 2,649.00 EUR  
Booking Status: ⚠ New  
Remaining Days to Flight: 20 of 20

**Edit, Delete, Actions**

**4153 Draft**

**Travel** **Booking**

**General Information**

Travel ID: 4153	End Date: Nov 17, 2023	Overall Status: Open
Agency ID: Everywhere (70024)	Booking Fee: 100.00 EUR	Upload a File: ABAP_Cloud_Logo.png
Customer ID: 29 (Jeremias)	Total Price: 2,749.00 EUR	
Starting Date: Nov 3, 2023	Description: Trip to Nowhere	

**Booking**

**Bookings (1)**

Travel ID	Booking Number	Booking Date	Customer ID	Airline ID	Flight Number
4153	10	Nov 2, 2023	Jeremias (29)	Deutsche Lufthansa AG (LH)	400

Flight Date: Nov 22, 2023  
Flight Price: 2,649.00 EUR  
Booking Status: New  
Remaining Days to Flight: 20 of 20

**File upload**

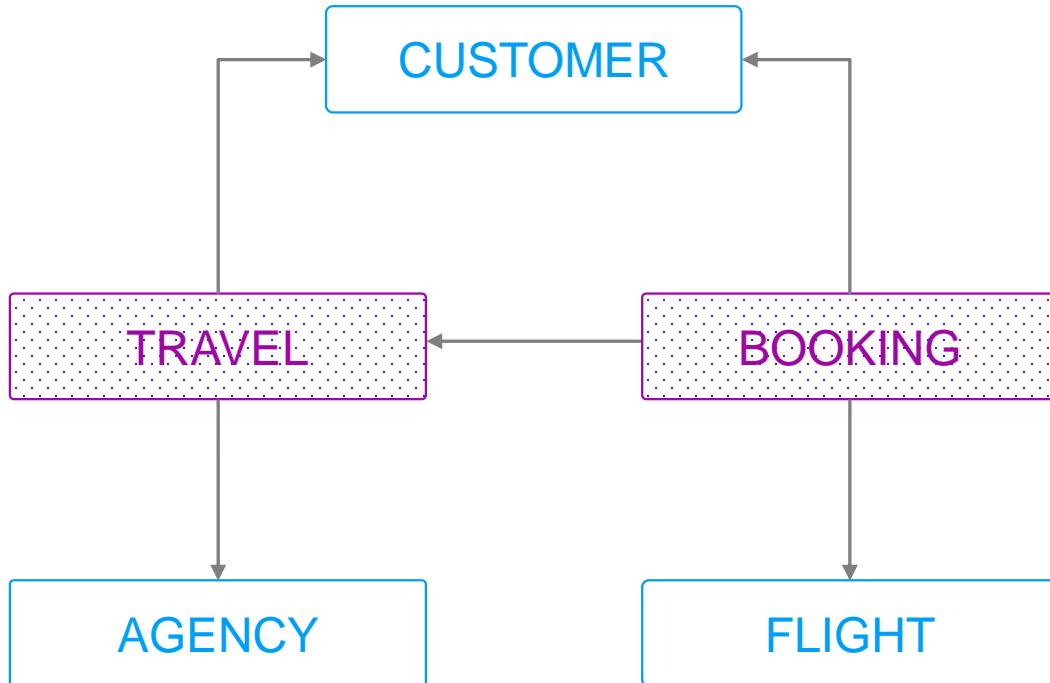
**Draft**

**Edit mode**

Draft updated Save Discard Draft

# Building transactional SAP Fiori apps with RAP

## Underlying simplified Flight data model



A **Travel entity** defines general travel data, such as the agency ID or customer ID, the overall status of the travel booking, and the total price of the travel.

A **Booking entity** comprises general flight and booking data, the customer ID for whom the flight is booked as well as the travel ID to which the booking belongs.

A **Customer entity** provides a detailed description of a flight customer, or passenger, such as the name, the address, and contact data.

An **Agency entity** defines travel agency data, such as the address and contact data.

A **Flight entity** defines the general flight data for each connection.

Main business entities in current scenario

Secondary business entities in current scenario

# DEMO



# **TODAY'S SCENARIO – EXERCISES**

# The AD181v hands-on exercises

## Exercises

[^Top of page](#)

Follow these steps to enhance an existing OData UI service developed with RAP for a transactional SAP Fiori elements-based Travel Processing app.

Exercises	Boosters
Getting Started	--
Exercise 1: Inspect your Exercise Package - Generated RAP BO & UI Service	--
Exercise 2: Enhance the Data Model of the Base and Projected BO	--
Exercise 3: Enhance the BO Behavior Definition and Projection	
Exercise 4: Implement the Base BO Behavior - Late Numbering	--
Exercise 5: Adjust the UI Semantics in the Metadata Extensions	
Exercise 6: Implement the Base BO Behavior - Validations	
Exercise 7: Implement the Base BO Behavior - Actions	
Exercise 8: Implement the Base BO Behavior - Determinations	--
Exercise 9: Enhance the BO Behavior with Side Effects	--
Exercise 10: Implement the Base BO Behavior - Functions	--
Exercise 11: Enhance the BO Behavior with Business Events	--
Exercise 12: Implement the Base BO Behavior - Dynamic Feature Control	--

BO: Business Object

EML: Entity Manipulation Language

 Exercises with Boosters offer an accelerated way of doing them.

01

Access to the exercises:

<https://github.com/SAP-samples/teched2023-AD181v>

02

Set up your development environment.

1. [Install and set up your ABAP Development Tools for Eclipse](#)
2. [Create an SAP BTP ABAP Environment Trial User](#)
3. [Create an ABAP Cloud Project](#)

03

Move at your own speed!

- Use the provided  boosters if you are already familiar with a particular topic

04

Feel free to ask questions via GitHub issues!

- Provide screenshots to facilitate the support

# The AD181v hands-on exercises – Working on GitHub (1)

Follow the step-by-step instructions provided on [GitHub](#).

## Exercise 6: Implement the Base BO Behavior - Validations

### Introduction

In the previous exercise, you've enhanced the UI semantics of your *Travel* app by enhancing the metadata extensions (see [Exercise 5](#)).

In the present exercise, you're going to implement back-end validations, `validateCustomer`, `validateAgency`, and `validateDates`, to respectively check if the customer ID and the agency name that is entered by the consumer are valid, and if the begin date is in the future and if the value of the end date is after the begin date. These validations are only performed in the back-end (not on the UI) and are triggered independently of the caller, i.e. Fiori UIs or EML APIs.

💡 Similar validations were already handled in RAP100. Therefore, you will simply adopt the provided source code. We will use the validations for playing around with features such as determine actions and side effects.

### Exercises:

- 6.1 - Implement the Validations of the *Travel* BO Entity 💡
- 6.2 - Implement the Validations of the *Booking* BO Entity
- 6.3 - Preview and Test the enhanced Travel App
- Summary
- Appendix

Reminder: Do not forget to replace the suffix placeholder `###` with your chosen or assigned group ID in the exercise steps below.

### About Validations

▶ Click to expand!

#### Exercise 6.1: Implement the Validations of the *Travel* BO Entity 💡

▲ Top of page

Enhance the behavior implementation class of the *travel* entity with the business logic for the validation methods `validateCustomer`, `validateAgency`, and `validateDates`.

💡 There are two (2) ways to complete exercise 6.1:

- Option 1: This is the recommended option. Replace the whole content of your behavior implementation class of the *travel* entity  `ZRAP110_BP_TRAVELTP_###` with the provided source code document linked below and replace the placeholder `###` with your group ID. Save  and activate  the changes, then proceed directly with Exercise 6.2.  
 Source code document: [Behavior Implementation Class ZRAP110\\_BP\\_TRAVELTP\\_###](#)
- Option 2: Carry out the steps described below (6.1) in sequence.

▼  Click to expand!

##### Exercise 6.1.1: Implement the Validation `validateCustomer` of the *Travel* BO Entity

Implement the validation `validateCustomer` which checks if the customer ID (`CustomerID`) that is entered by the consumer is valid. An appropriate message should be raised and displayed on the UI for each invalid value.

▼  Click to expand!

1. In your implementation class of the *travel* entity  `ZRAP110_BP_TRAVELTP_###`, replace the current method implementation of `validateCustomer` with following code snippet.

Replace all occurrences of the placeholder `###` with your group ID.

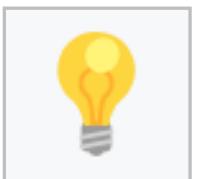
```
METHOD validateCustomer,
  "read relevant travel instance data
  READ ENTITIES OF ZRAP110_R_TravelTP_### IN LOCAL NODE
  ENTITY Travel
  FIELDS ( CustomerID )
  WITH CORRESPONDING #( keys )
  RESULT DATA(travels).
```

# The AD181v hands-on exercises – Working on GitHub (2)



Use the **Outline view** to get a quick overview of the exercises.

A screenshot of a GitHub repository page for 'Exercise 6: Implement the Base BO Behavior - Validations'. The page includes tabs for Preview, Code, and Blame, and displays 347 lines (255 loc) of code at 16.8 KB. A blue box highlights the 'More' button in the top right corner of the header, which opens the 'Outline' sidebar. The sidebar contains a 'Filter headings' input field and a list of sections: 'Exercise 6: Implement the Base BO Behavior - Validations', 'Introduction', 'Exercises:', 'About Validations', 'Exercise 6.1: Implement the Validations of the Travel BO Entity', 'Exercise 6.1.1: Implement the Validation validateCustomer of the Travel BO Entity', and 'Exercise 6.1.2: Implement the'.



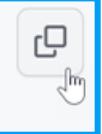
Use provided booster exercises to speed up the steps of familiar exercises

- 3.1 - How to handle this exercise 
- 3.2 - Define the Late Numbering and the Static Field Control
- 3.3 - Define the Validations
- 3.4 - Define the Actions
- 3.5 - Define the Determinations

# The AD181v hands-on exercises – Working on GitHub (3)



Make use of **Copy raw contents** button to easily copy code snippets



```
*****
* Instance-bound action acceptTravel
*****
METHOD acceptTravel.
MODIFY ENTITIES OF ZRAP110_R_TravelTP### IN LOCAL MODE
ENTITY travel
UPDATE FIELDS ( OverallStatus )
WITH VALUE #( FOR key IN keys ( %tky = key-%tky
OverallStatus = travel_status-accepted ) ). " 'A' Accepted
```

###

Always replace all occurrences of ### with your assigned suffix in code snippets

ABAP Console

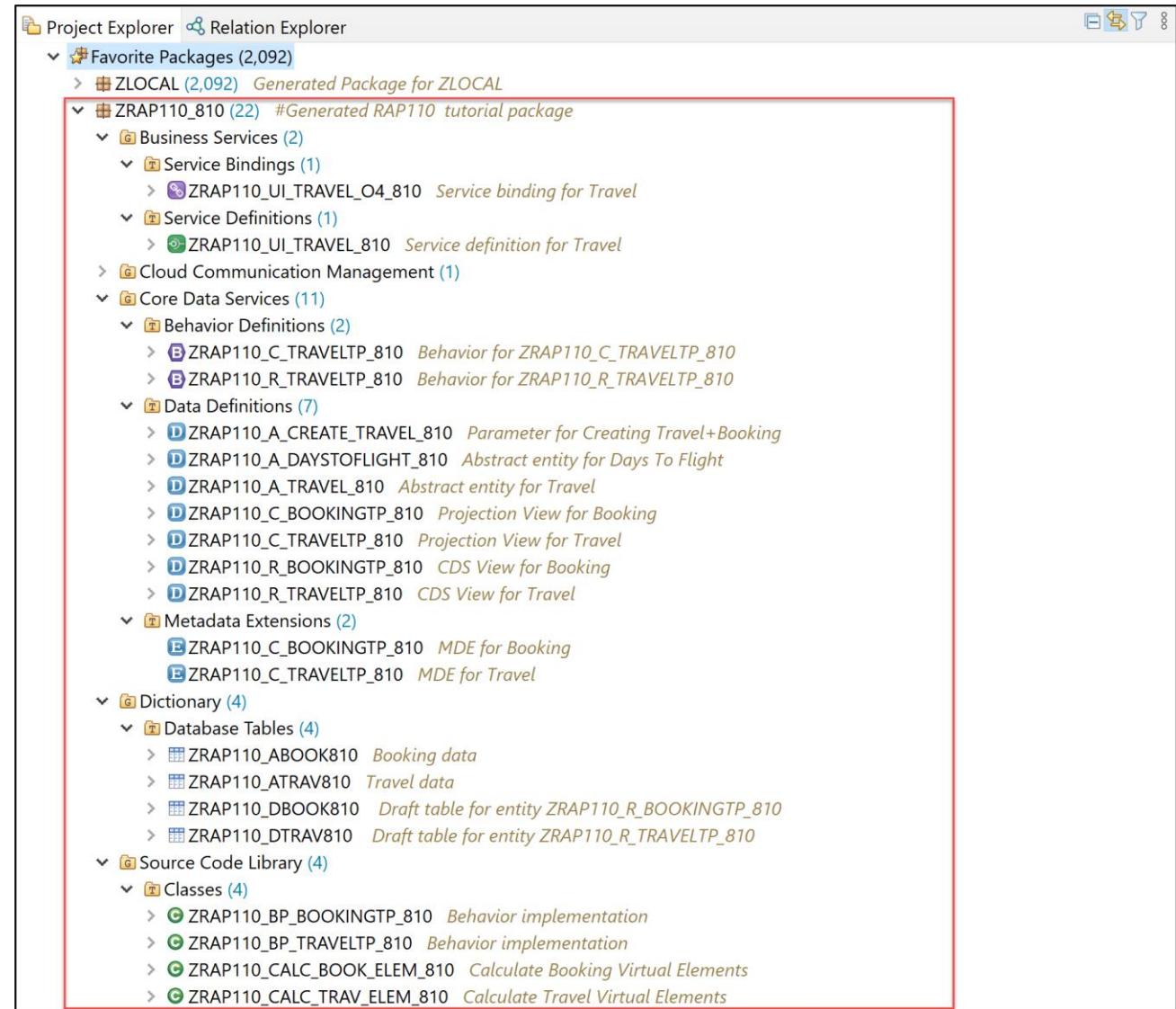
```
RAP110 exercise generator
-----
Use transport D23K901012
Info: Suffix "810" will be used.
The following package got created for you and includes everything you need:
In the "Project Explorer" right click on "Favorite Packages" and click on "
Enter "ZRAP110_810" and click OK.
```

# The AD181v hands-on exercises – Working on GitHub (4)

Execute (F9) the helper class

© ZDMO\_GEN\_RAP110\_SINGLE\_2

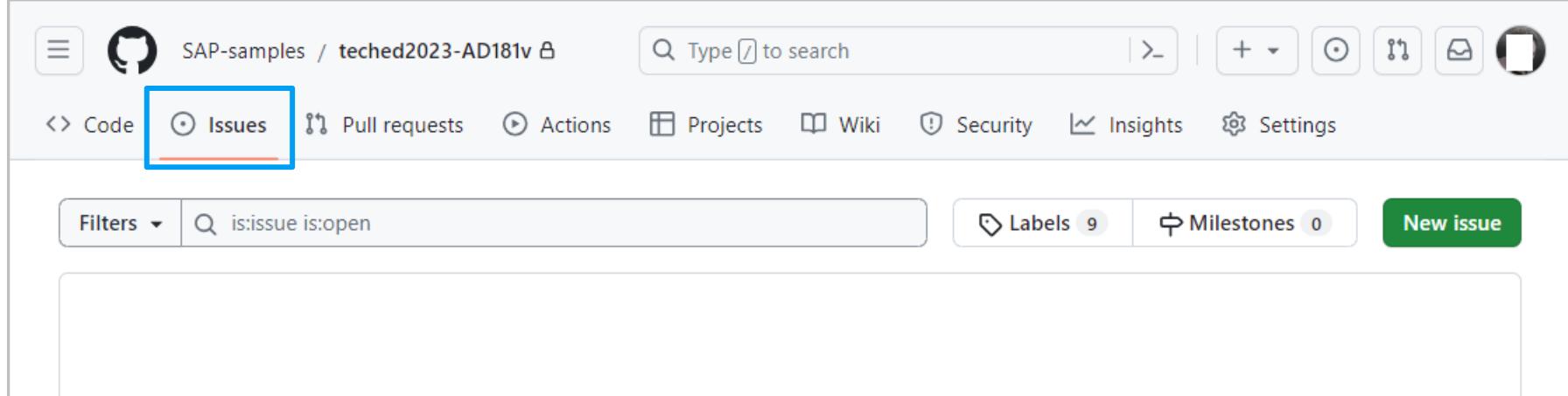
Your generated exercise package will look like this →



# The AD181v hands-on exercises – Working on GitHub (5)

 Issues

Open GitHub Issues to get help from the SAP experts.





→ **COMPACT GLOSSARY**



# **SUMMARY**

# Key takeaways

**ABAP Cloud** is the development model provided to build cloud-ready enterprise services, apps, and extensions on SAP BTP ABAP environment and all editions<sup>1</sup> of SAP S/4HANA, in the cloud and on-premises.

The **ABAP RESTful application programming model** (RAP) is at the **heart of ABAP Cloud** for efficiently building **transactional** OData-based services and SAP Fiori apps with built-in cloud qualities.

RAP best support **SAP HANA** and **SAP Fiori elements**.

RAP is available on **SAP BTP ABAP Environment**, **SAP S/4HANA Cloud**, and **SAP S/4HANA** as of edition 1909.

The **RAP feature set** is enhanced **quarterly** in SAP BTP ABAP environment, **twice a year** in SAP S/4HANA Cloud, and **every two years** in SAP S/4HANA and SAP S/4HANA Cloud, private edition.

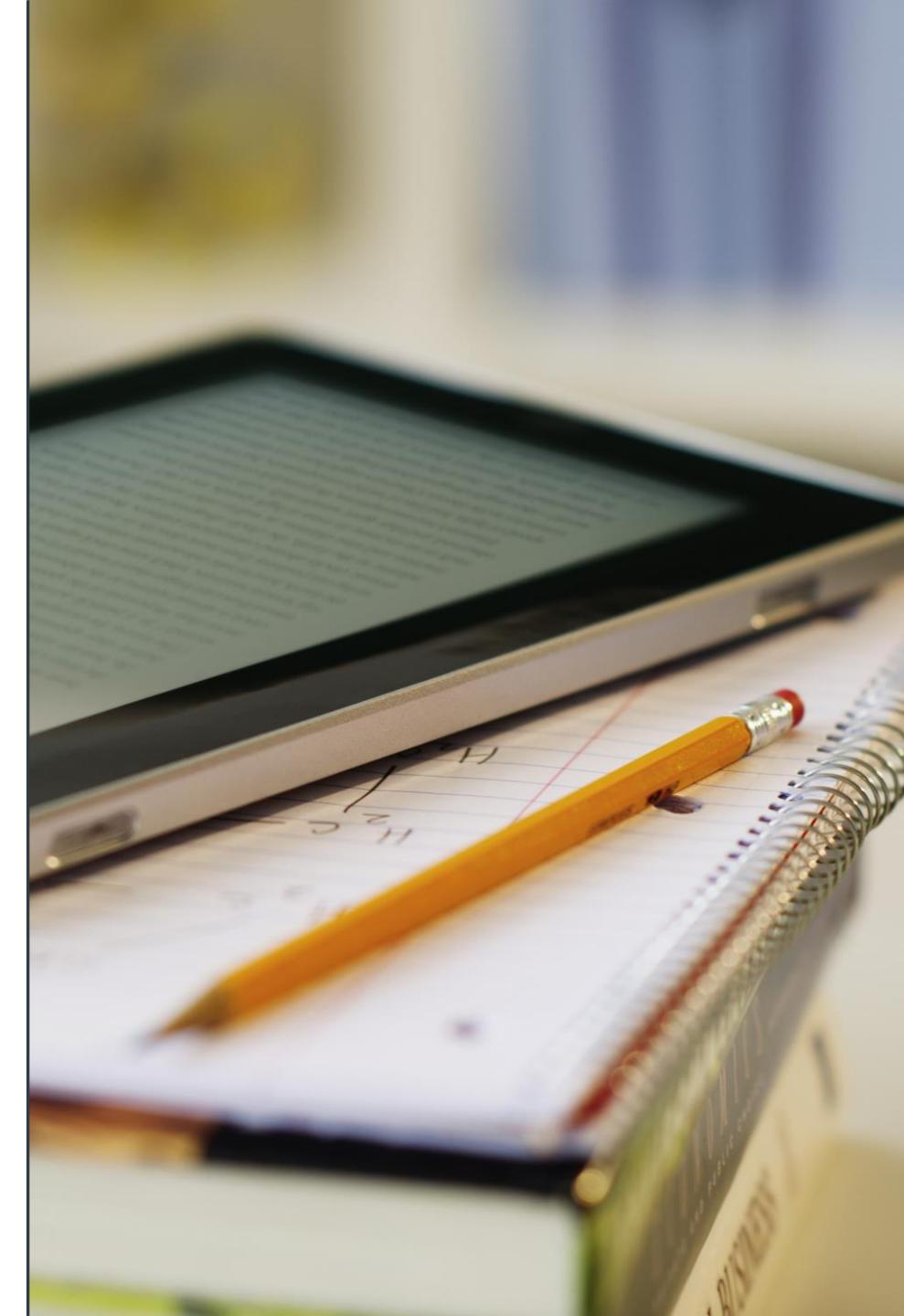


What's New: [SAP BTP ABAP environment](#) | [SAP S/4HANA](#) | [SAP S/4HANA Cloud](#)



What's Next: [ABAP Platform Roadmap Information](#) for all SAP products

<sup>1</sup> SAP S/4HANA any premise or SAP S/4HANA Cloud, private edition release ≥ 2022  
SAP S/4HANA Cloud, public edition release ≥ 2208, 3-system landscape required



# Learn more about ABAP Cloud at SAP TechEd 2023

Check the virtual Session Catalog: [SAP TechEd Virtual in 2023](#)

Check out these insightful virtual sessions to learn more about accelerating development with pro-code tools:  
[AD103v](#), [AD107v](#), [DT103v](#), [DT200v](#), [DT182v](#), [DT187v](#)



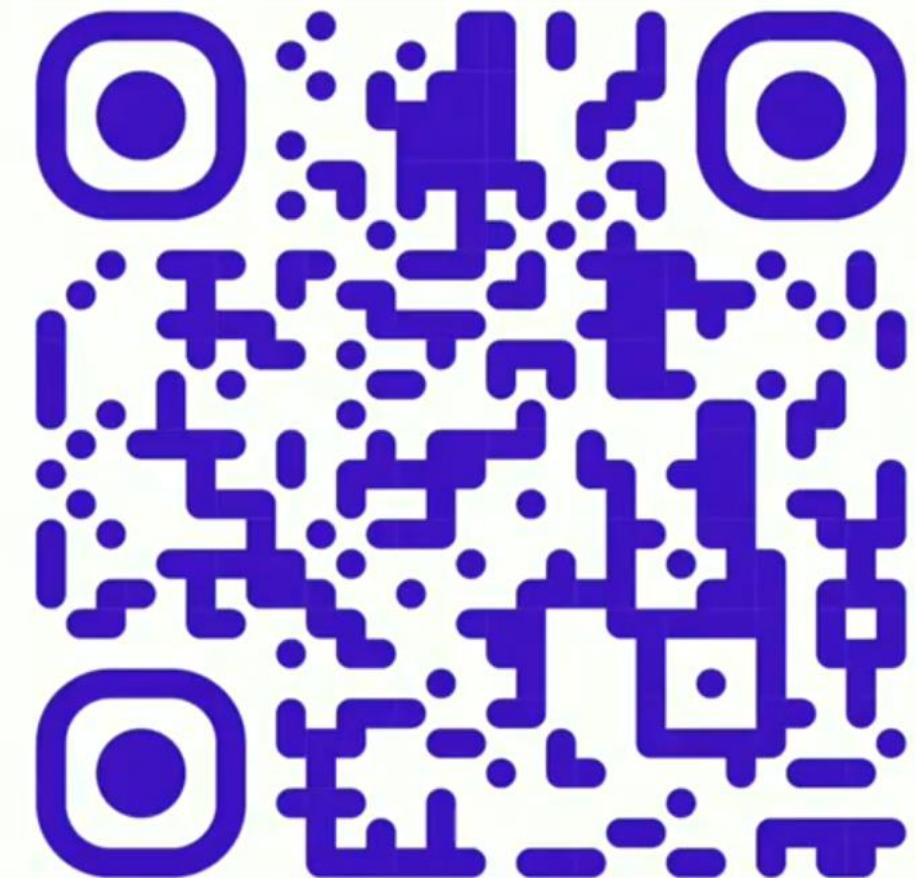
See blog post [ABAP Cloud at SAP TechEd 2023](#)



**NEW!**

# SAP BTP Developer's Guide

<https://url.sap/kr99u2>



# More information on ABAP Cloud

The screenshot shows the SAP Community homepage with a specific focus on the SAP S/4HANA Cloud ABAP Environment. It includes sections for 'Featured Content' featuring images of industrial settings and people working on computers, and links to 'Get overview and learn key facts about SAP S/4HANA Cloud ABAP Environment' and 'Embedded Steampunk - Details for ABAP Developers'.

[SAP Community](#)

This is a blog post by Boris Gebhardt from October 25, 2022. The title is 'How to use Embedded Steampunk in SAP S/4HANA Cloud, private edition and in on-premise – The new ABAP extensibility guide'. The post discusses the release of the first version of the ABAP cloud development model (Embedded Steampunk\*) in SAP S/4HANA editions. It highlights the modern, upgrade-ready, and closer-ready nature of the ABAP cloud development model. The post also mentions the SAP BTP ABAP Environment (Steampunk\*), the public edition of SAP S/4HANA Cloud, and the private edition and on-premise variants of SAP S/4HANA 2022. It explains how these environments support ABAP variants in both cloud and on-premise settings, making it easier to reach a clean core for extensions.

[How to use Embedded Steampunk in SAP S/4HANA Cloud, private edition and in on-premise – The new ABAP extensibility guide | SAP Blogs](#)

This is a screenshot of the ABAP Platform documentation page for 'Developer Extensibility'. It covers topics like classic extensibility, developer extensibility, and key user extensibility. It also includes sections on developer extensibility use cases, benefits, and related information.

[The new ABAP extensibility guide](#)

This is a blog post by Boris Gebhardt from September 5, 2022. The title is 'Embedded Steampunk – Some more details for ABAP developers'. The post provides additional details about Embedded Steampunk for ABAP developers, mentioning the SAP S/4HANA ABAP extensibility guide and the SAP News Center update. It also links to a video by Sven Deneken and Arpan Shah.

[Embedded Steampunk – Some more details for ABAP developers | SAP Blogs](#)

This is a blog post by Boris Gebhardt from December 22, 2022. The title is 'ABAP Cloud'. It summarizes the basics of ABAP Cloud, mentioning its announcement at SAP TechEd 2022, Juergen Mueller's day 1 presentation, and the developer discussion session. It also links to a post by Philipp Hering.

[ABAP Cloud | SAP Blogs](#)

[Developer Discussion: ABAP Cloud](#)

# More information on RAP

[State-of-the-Art ABAP Development with the ABAP RESTful Application Programming Model \(RAP\)](#) | SAP Community

[Modernization with RAP](#) | SAP Blogs

[Acquire Core ABAP Skills](#) | [Practicing Clean Core Extensibility for SAP S/4HANA Cloud](#) | SAP Learning Journey

 [ABAP Cloud at SAP's Devtoberfest in 2023](#) |  [ABAP Cloud sessions at SAP TechEd 2023](#)

[SAP Fiori elements Feature Showcase App with RAP](#)

What's New in RAP: [SAP BTP ABAP Environment](#) | [SAP S/4HANA](#) | [SAP S/4HANA Cloud](#)

Outlook: [ABAP Platform Roadmap Information](#)

---

## Public SAP Web sites

ABAP Development Community: [www.sap.com/community/topic/abap.html](http://www.sap.com/community/topic/abap.html)

SAP BTP ABAP Environment Community: <https://community.sap.com/topics/btp-abap-environment>

SAP S/4HANA Cloud ABAP Environment Community: <https://community.sap.com/topics/s4hana-cloud-abap-environment>

ABAP Testing and Analysis Community: <https://community.sap.com/topics/abap-testing-analysis>

SAP products: [www.sap.com/products](http://www.sap.com/products)

---

## SAP training and certification opportunities

[www.sap.com/education](http://www.sap.com/education) – e.g. trainings S4D437, S4D430, HA400, and S4D400

[learning.sap.com/learning-journey](http://learning.sap.com/learning-journey) – e.g., search for ABAP or ABAP Cloud

# Make your career growth real

## Upskill and engage on Application Development and Automation

**Free learning**  
Upskill and prepare  
for certification

**25% discount**  
On SAP Certification  
exams

**Expand your network**  
Engage with experts and  
share knowledge



GET REAL BENEFITS: [learning.sap.com/teched](https://learning.sap.com/teched)

**37%** Of IT certification candidates  
received salary increases  
after earning a certification\*

**92%** Are more confident  
in their abilities\*



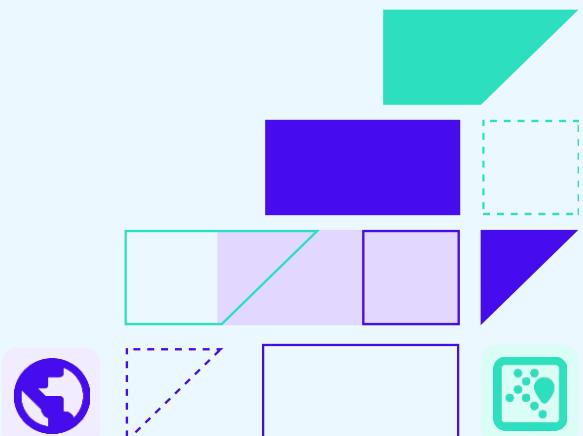


# Thank you

## Contact information:

Carine Tchoutou Djomo  
Product Manager for ABAP Platform

Merve Temel  
Product Manager for ABAP Platform



# **APPENDIX**

## **COMPACT GLOSSARY**



## UI Semantics with CDS Annotations

Various UI-specific CDS annotations can be used to solve the most common UI layout tasks in SAP Fiori elements apps built with RAP. UI annotations represent semantic views on business data through the use of specific patterns that are independent of UI technologies. For more information, see [Develop UI Specifics](#) | [CDS Annotations](#) | [SAP Fiori elements Showcase App for RAP And ABAP CDS](#).

## Support for Large Objects (aka OData Streams)

You can enable your RAP application for maintaining large objects (LOBs). By doing so, you provide end users the option to incorporate external binary files or text files when editing entity instances. For more information, see [Working with Large Objects](#)

## Virtual Elements in CDS Projection Views

Virtual elements represent transient fields in business applications. They are used to define additional CDS elements that are not persisted on the database, but calculated during runtime using ABAP classes that implement the virtual element interface. They are defined at the level of CDS projection views as additional elements within the SELECT list. For more information, see [Virtual Elements](#).

## Late Numbering

Numbering is the process of setting values for primary key fields of entity instances during runtime. Early and late numbering are supported in RAP. In a **late numbering** scenario, the key values are always assigned internally without consumer interaction after the point of no return in the interaction phase has passed, and the SAVE sequence is triggered. For more information, see [Numbering](#).

## Validations

Validations are used to ensure the data consistency. Back-end are defined in the BO behavior definitions and implemented in the respective behavior implementation classes. Front-end validations are used to improve the user experience by providing faster feedback and avoiding unnecessary roundtrips. They can be defined in the BO data model using value helps. For more information, see [Validations](#).

## Determinations

A determination is an optional part of the business object behavior that modifies instances of business objects based on trigger conditions. A determination is implicitly invoked by the RAP framework if the trigger condition of the determination is fulfilled. Trigger conditions can be modify operations and modified fields. A determination can be triggered on modify or on save. For more information, see [Determinations](#).

## Actions

An action in RAP is a non-standard modifying operation that is part of the business logic. Actions are specified in behavior definitions and implemented in ABAP behavior pools. By default, actions are related to instances of a BO entity. The addition static allows you to define a static actions that are not bound to any instance but relates to the complete entity. The addition internal define a private action that can only be called within the given BO. For more information, see [Actions](#).

## Functions

A function in RAP is a custom read-operation that is part of the business logic. Functions perform calculations or reads on business objects without causing any side effects. Functions don't issue any locks on database tables and you can't modify or persist any data computed in a function implementation. For more information, see [Functions](#).

## RAP Business Events

Business events provide the opportunity of light-weight, decoupled process integration based on standardized and stable APIs and they are now a native part of RAP. With the RAP Business Event Bindings Editor, you can create RAP Event Bindings which are needed to provide a mapping between the definition of RAP Events via behavior definition (BDEF) and the external representation of Business Events. For more information, see [RAP Business Events](#).

Business events can be consumed locally using an event handler class or remotely using the SAP Event Mesh.

## Side Effects

Side effects are used to trigger data, permission, or message changes based on data changes in UI scenarios with draft-enabled BOs.

They are useful in UI scenarios based on draft-enabled BOs to notify a Fiori Elements UI that data changes of defined fields require the recalculation of other data values, permissions or messages. For more information, see [Side Effects](#)

## Static and Dynamic Feature Control

Feature control offers developers the possibility to determine, which entities of your business object should be create-, delete- and update-enabled, so that they can be modified during consumption using EML or OData services. It also allows developers to control which (UI) fields of an entity are read-only or which actions in which usage scenarios are enabled or disabled for execution by the end users.

The availability of feature control values is modeled in a behavior definition. Unlike static feature control, instance feature control requires not only a definition but also an implementation in a handler class of the behavior pool. Therefore, we also talk about dynamic feature control in case of instance feature control.

Feature control can be related to an entire entity or to individual elements of an entity, such as individual fields or operations. For more information, see [Feature Control](#).