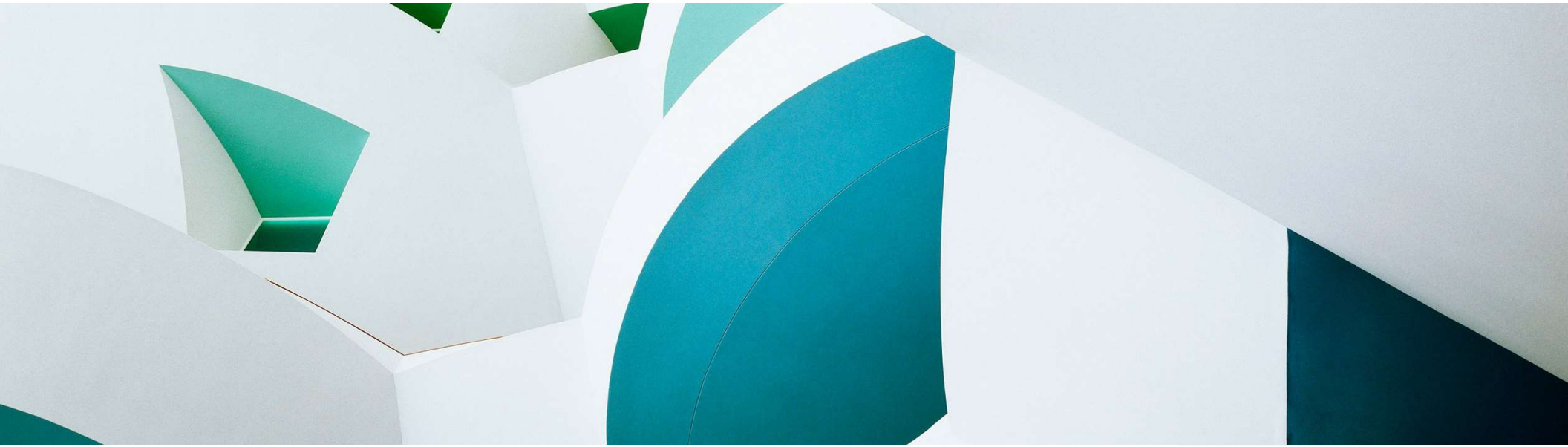


ABAP Cloud & ABAP RESTful Application Programming Model (RAP)

Overview

ABAP Platform Product Management, SAP
May 2023

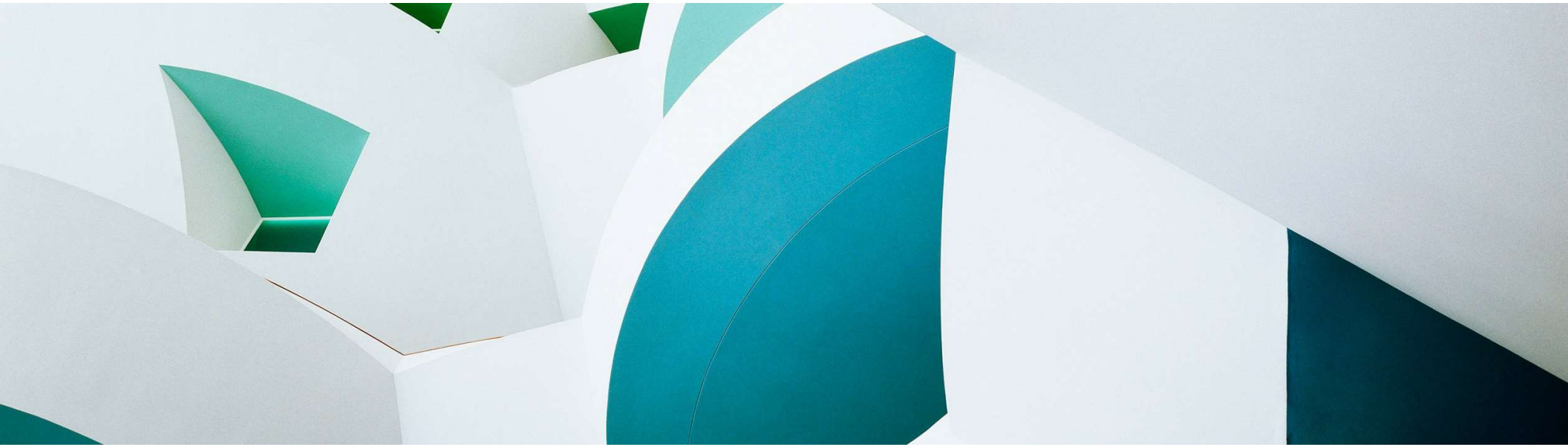
PUBLIC

THE BEST RUN SAP

Agenda

- INTRODUCTION
- BIG PICTURE
- BUSINESS OBJECTS
- BUSINESS SERVICES
- EXTENSIBILITY
- SUMMARY

INTRODUCTION

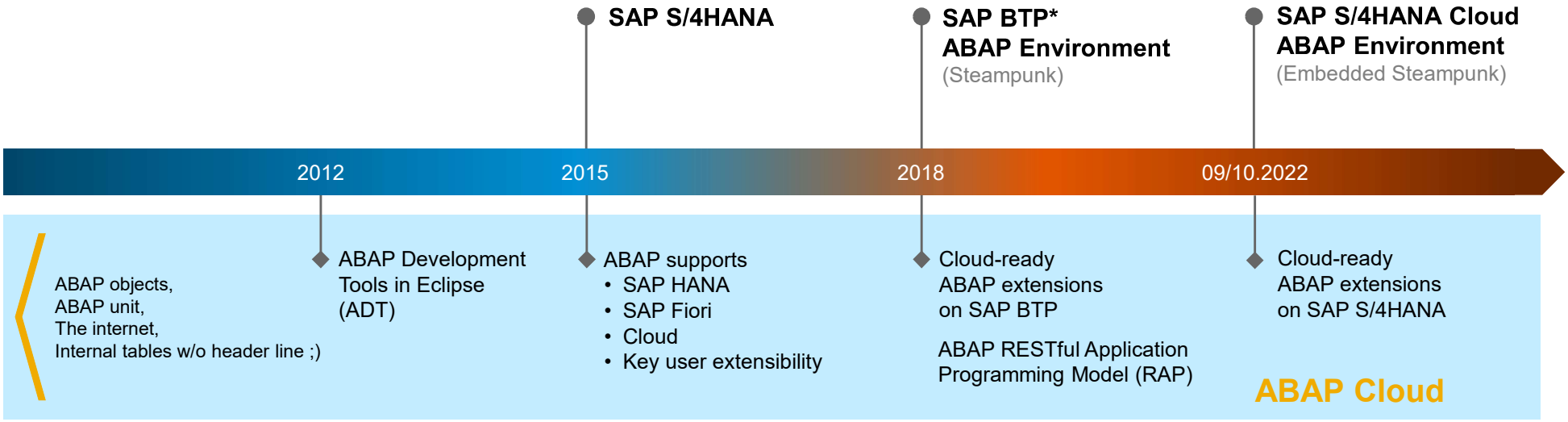


Clean core with the ABAP cloud development model

ABAP Cloud

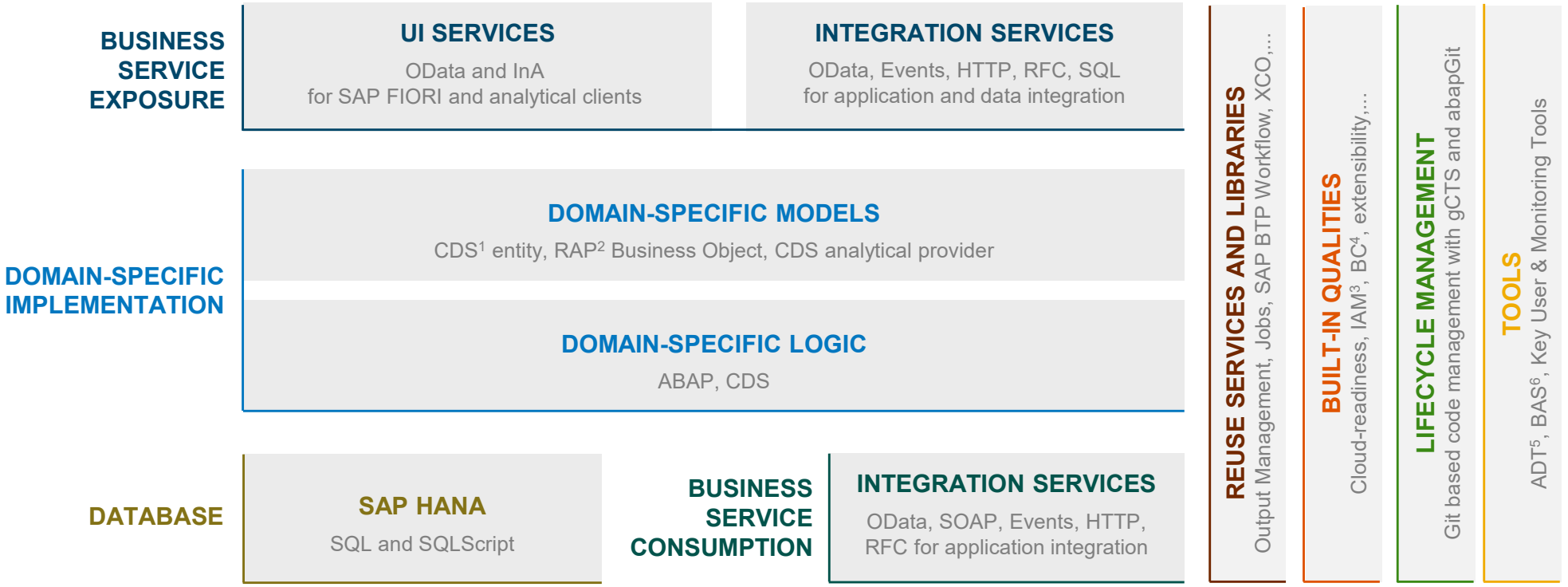
… is the ABAP **development model** to build cloud-ready business apps, services and extensions
… comes with SAP Business Technology Platform (BTP) and SAP S/4HANA
… works with public or private cloud, and even on-premise

The evolution to ABAP Cloud



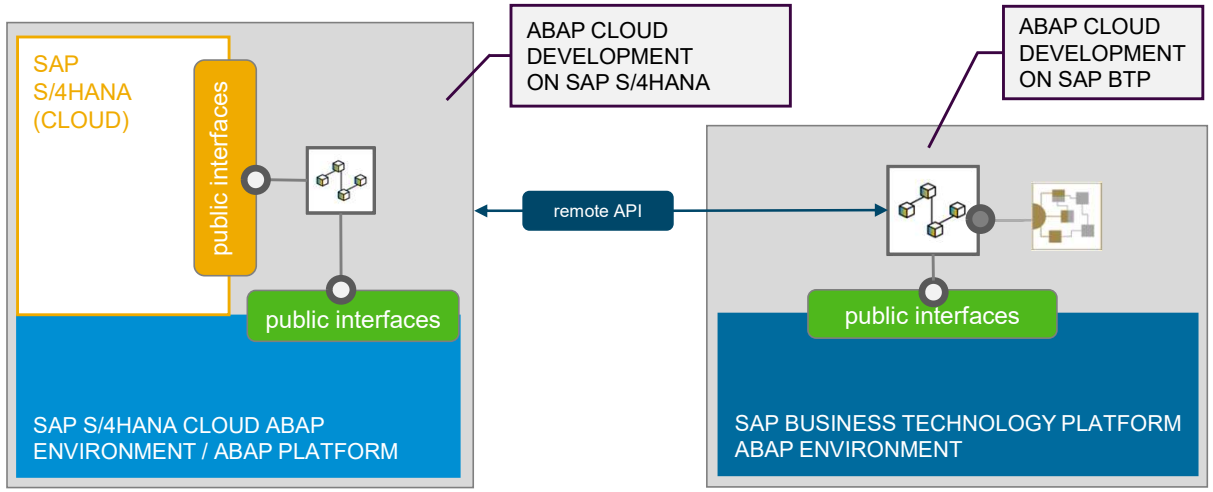
* SAP Business Technology Platform

ABAP Cloud at a glance



[1] Core Data Services
[2] ABAP RESTful application programming model
[3] Identity & Access Management
[4] Business Configuration
[5] ABAP Development Tools
[6] Business Application Studio

Availability of ABAP Cloud



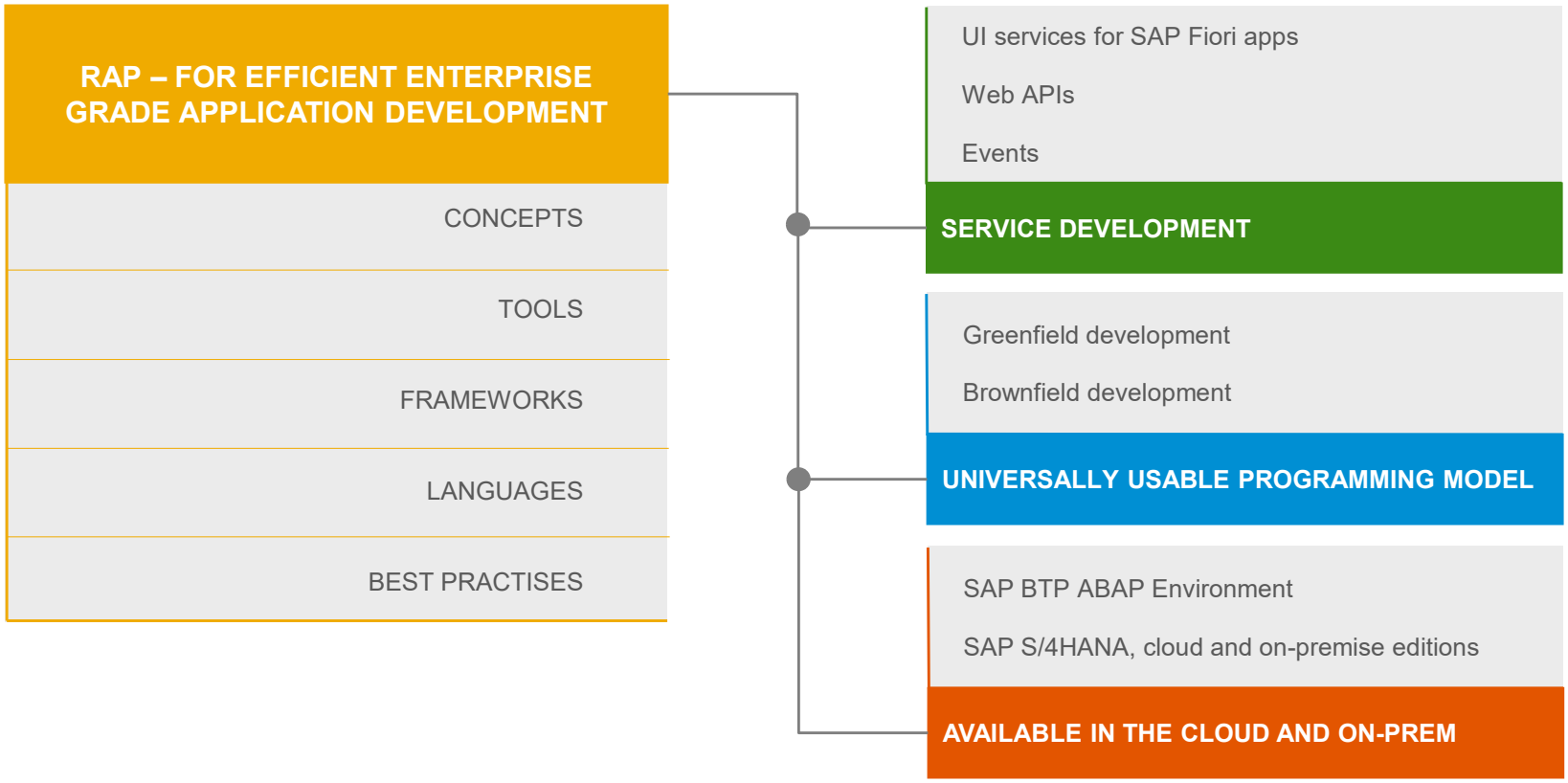
ABAP CLOUD IS AVAILABLE IN THE FOLLOWING PRODUCTS

PRODUCT	RELEASE	ABAP CLOUD USAGE
SAP BTP ABAP Environment	All	**Mandatory**
SAP S/4HANA Cloud, public edition	≥ 2208 (new customers)	**Mandatory**
SAP S/4HANA Cloud, private edition and SAP S/4HANA on-premise	≥ 2022	**Recommended ***

* Classic ABAP can still be used

ABAP RESTful Application Programming Model (RAP) at a glance

The centerpiece of ABAP Cloud for building transactional apps



The key players

ABAP Development Tools in Eclipse for all development tasks

Easy developer onboarding
End-to-end development flow

Languages: ABAP and Core Data Services (CDS)

Standard implementation tasks via typed APIs supporting
static code checks, auto-completion, element info

Powerful frameworks

Take over technical implementation tasks
Business logic added in code exits on protocol-agnostic layers

Efficient ABAP development in Eclipse©

HIGH DEVELOPER PRODUCTIVITY WITH THE ABAP DEVELOPMENT TOOLS (ADT) ON-PREMISE AND IN THE CLOUD

MODERN DEVELOPMENT TOOLSET

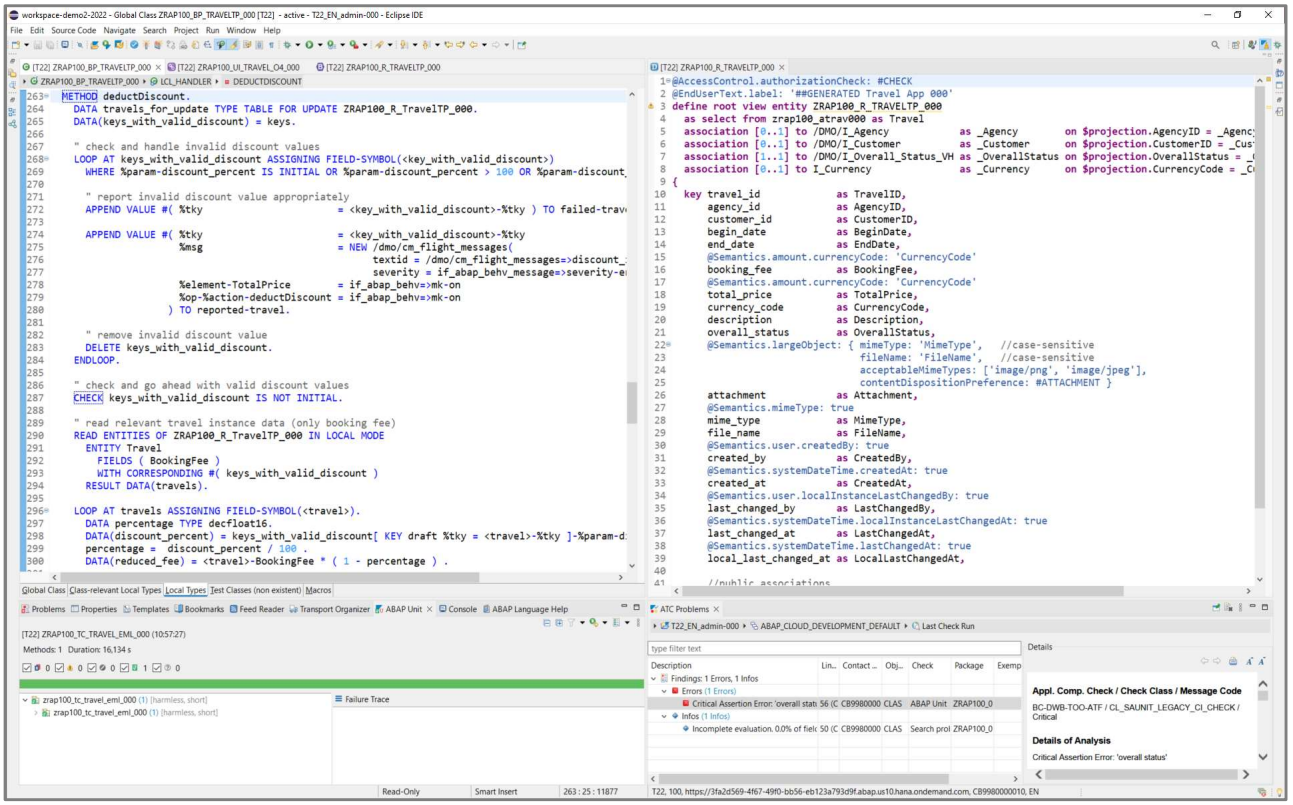
Fully eclipse-based
Syntax check, Code completion
Navigation, Search, Quick Fixes
Full support for the ABAP RESTful Application Programming Model and CDS

QUALITY ASSURANCE

Static code checks (ATC, CVA) with remote and local scenarios
Unit testing incl. isolation frameworks
Test seams and injections

SUPPORTABILITY

Debugging, profiling, tracing
Static and dynamic logging
Runtime monitoring and analysis



Next generation data modeling and access with ABAP CDS

Combine the best of both worlds

VIEW BUILDING

SQL views with restricted feature set for SAP HANA capabilities

LIFECYCLE MANAGEMENT

ABAP lifecycle management e.g. transports

ABAP type system

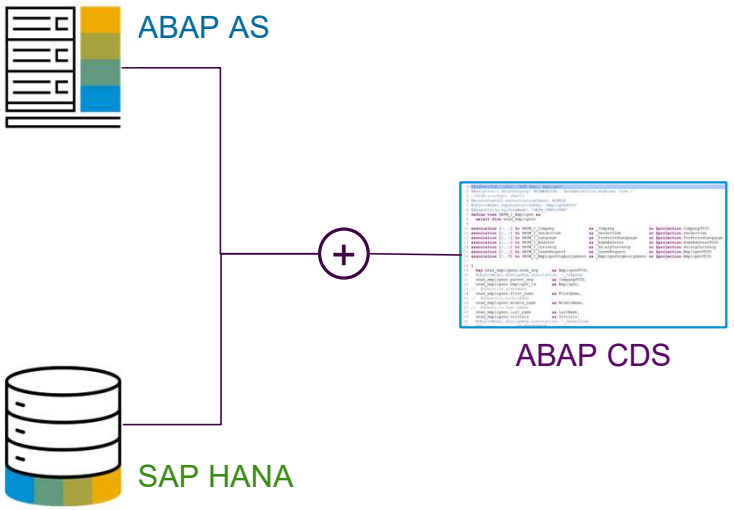
VIEW BUILDING

Specialized views (analytical views, attribute views, calculated views, …)

LIFECYCLE MANAGEMENT

Non ABAP lifecycle management e.g. transports

Non ABAP type system



VIEW BUILDING

Advanced data modelling leveraging DDIC semantics

Code pushdown with various built-in SQL functions and expressions

Code breakouts to utilize native SAP HANA features and capabilities via CDS Table Functions

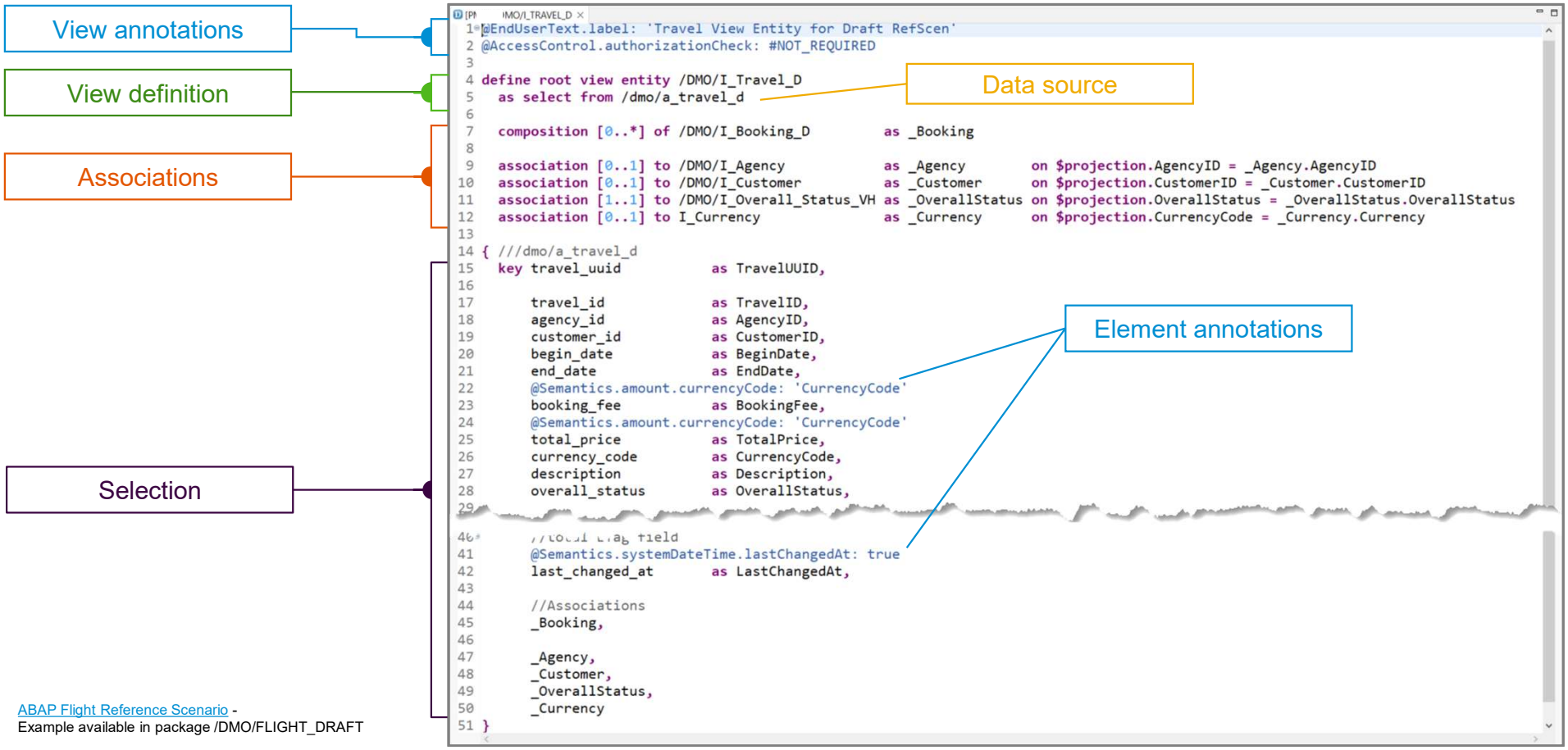
LIFECYCLE MANAGEMENT

Proven and consistent **ABAP** lifecycle management e.g. transports

ABAP type system

Consumption in ABAP SQL and ABAP frameworks

Next generation data modeling and access with ABAP CDS – Example



ABAP Flight Reference Scenario -
Example available in package /DMO/FLIGHT_DRAFT

Declarative and expression-oriented ABAP language

MODERN ABAP

- Simple and concise ABAP code through new language features like inline declarations, constructor expressions
- Extensively expression-oriented syntax
- Advanced table operations like CORRESPONDING( ) operator, grouping and filtering
- Entity Manipulation Language (EML) to control the transactional business object behavior in the RAP context
- JSON support in sXML library
- Inline code documentation with ABAP Doc
- ABAP Unit Testing with test doubles and test seams

More information:
ABAP Keyword Documentation

Entity Manipulation Language (EML) – At a glance

Extension of the ABAP Language with SQL-like syntax

Used to control the transactional behavior of RAP business objects (BOs)

Provides API-based access to RAP BOs, even outside of the RAP context

API reference available in the ABAP keyword documentation (link)

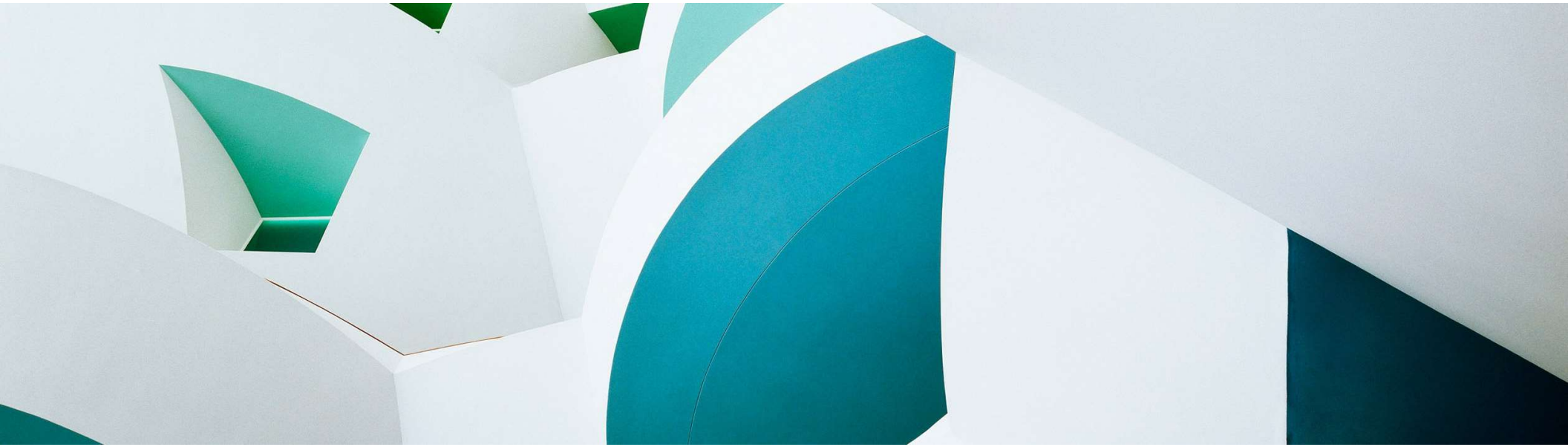
EXAMPLES

```
"Modify travel instance
MODIFY ENTITIES OF /DMO/I_Travel_D IN LOCAL MODE
  ENTITY Travel
    UPDATE FIELDS (  OverallStatus )
    WITH VALUE #( FOR key IN keys ( %tky          = key-%tky
                                    OverallStatus = travel_status-accepted ) ).
```

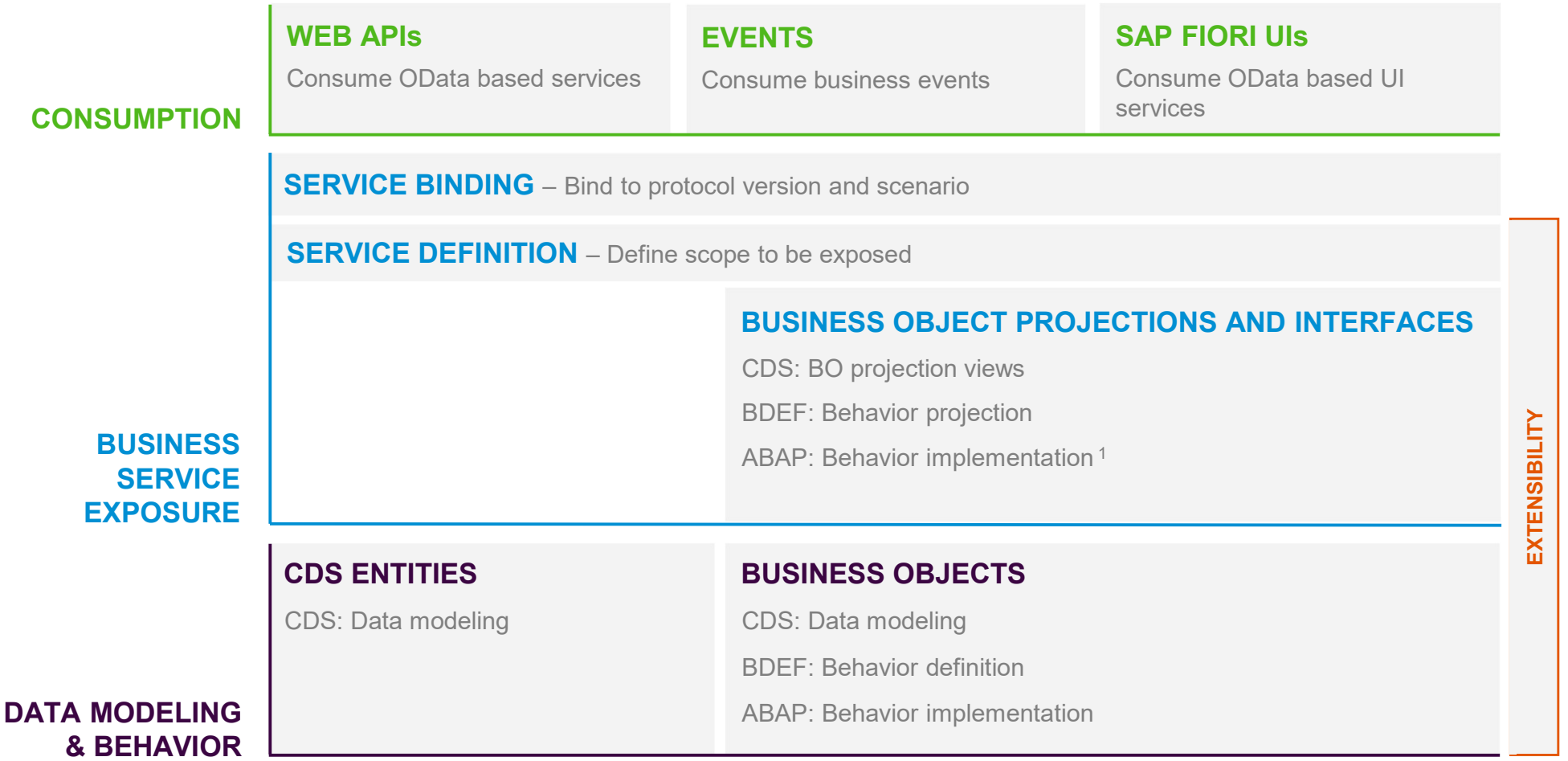
```
"Read changed data for action result
READ ENTITIES OF /DMO/I_Travel_D IN LOCAL MODE
  ENTITY Travel
    ALL FIELDS WITH
    CORRESPONDING #( keys )
  RESULT DATA(travels).

result = VALUE #( FOR travel IN travels ( %tky    = travel-%tky
                                          %param = travel ) ).
```

BIG PICTURE

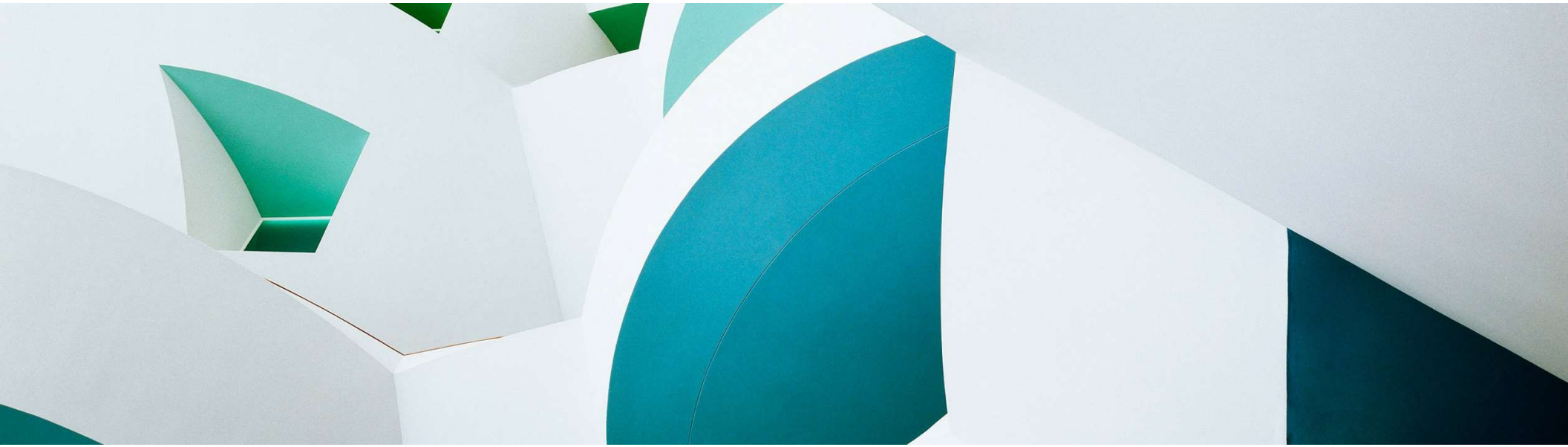


RAP – The big picture

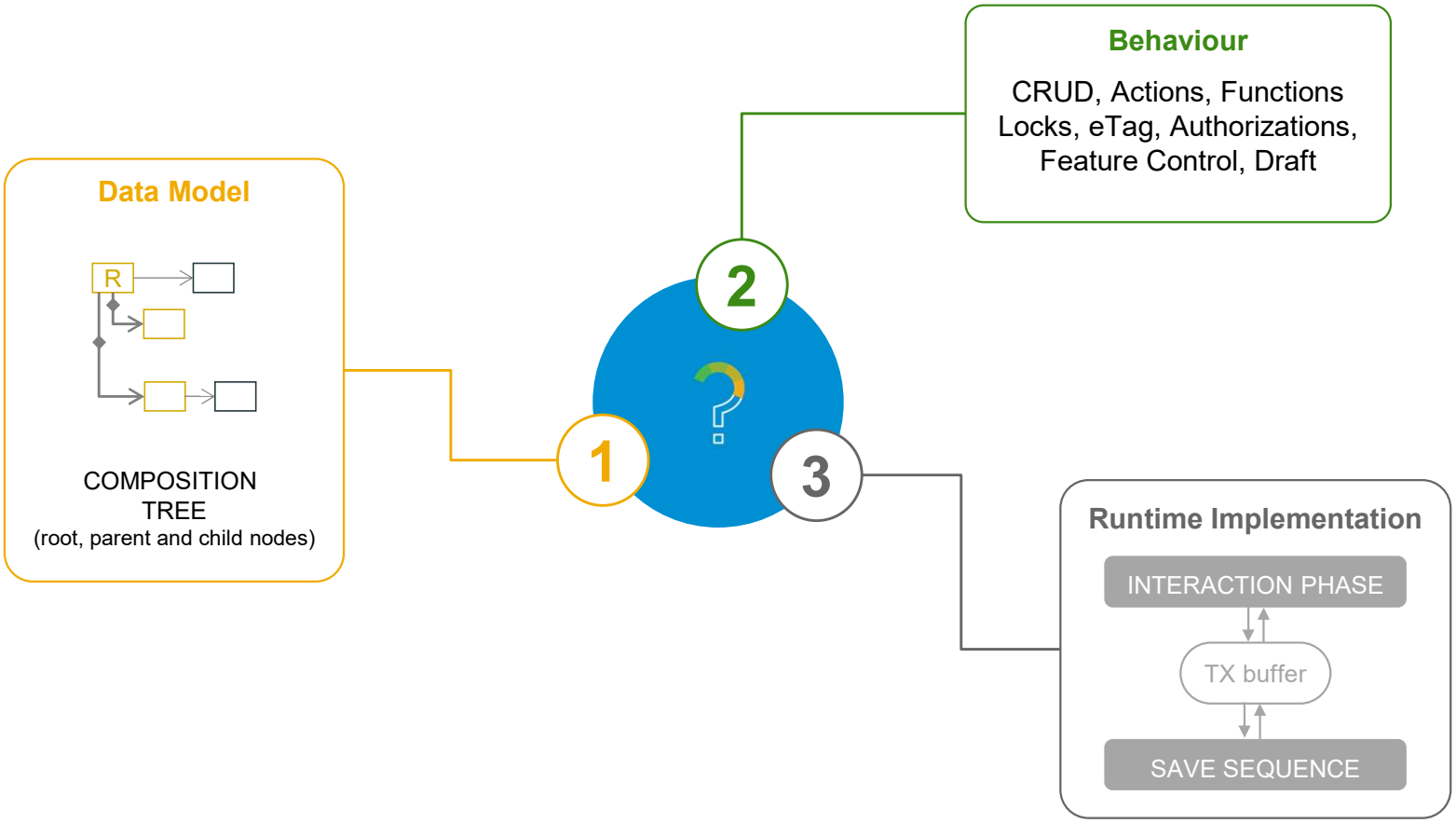


[1] Not applicable for RAP BO interfaces

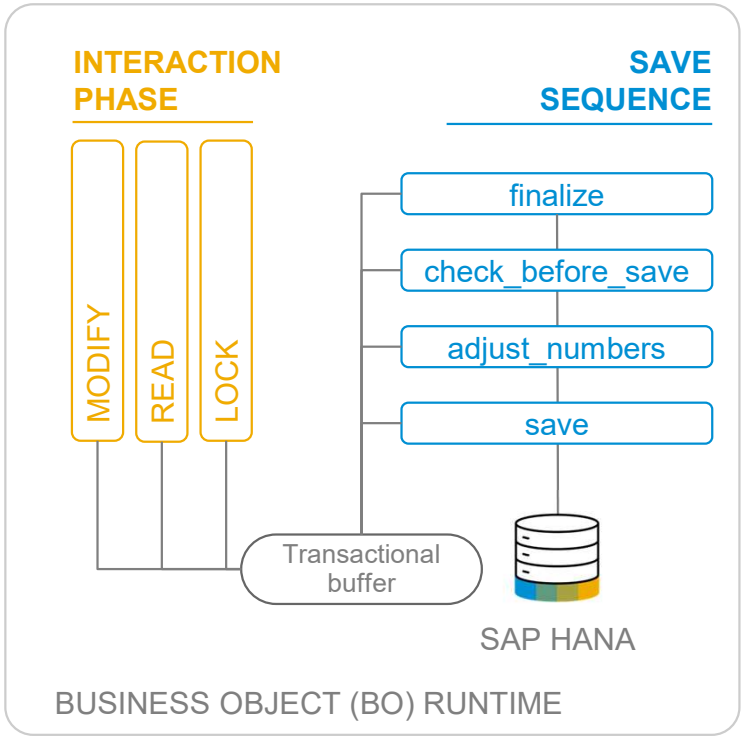
BUSINESS OBJECTS



What is a business object (BO) ?



BO runtime implementation types



UNMANAGED

For brownfield developments with available application code for interaction phase, transactional buffer, and save sequence

➔ Developers in charge of BO runtime: CRUD operations

➔ Adapters needed to integrate the existing code

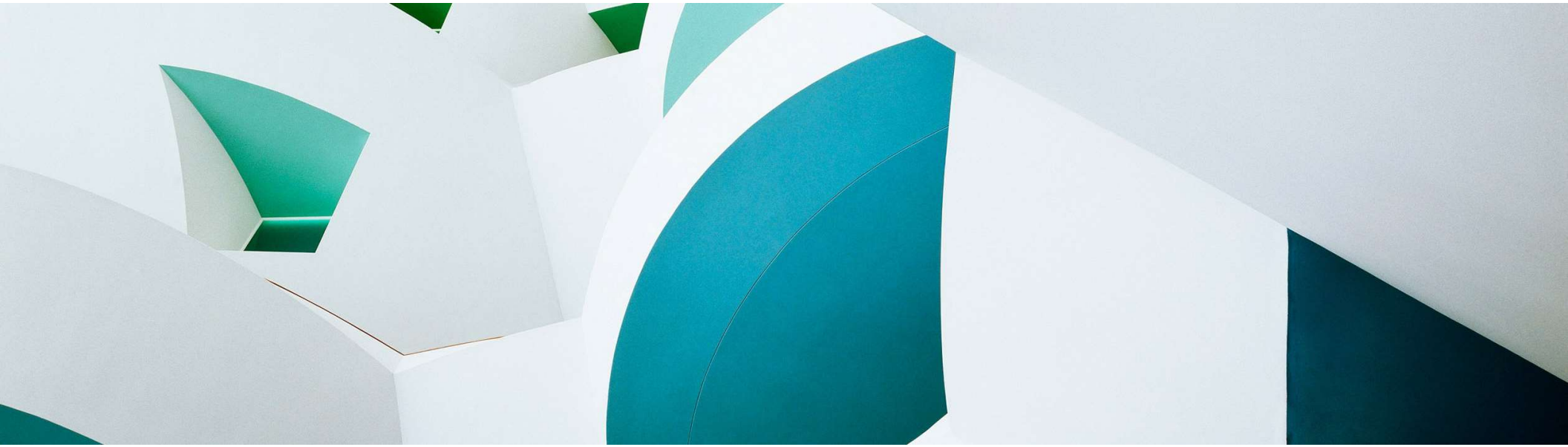
MANAGED

For greenfield developments with standard implementation
(opt. unmanaged appl. components: DB tables, lock/PFCG object, update task FM)

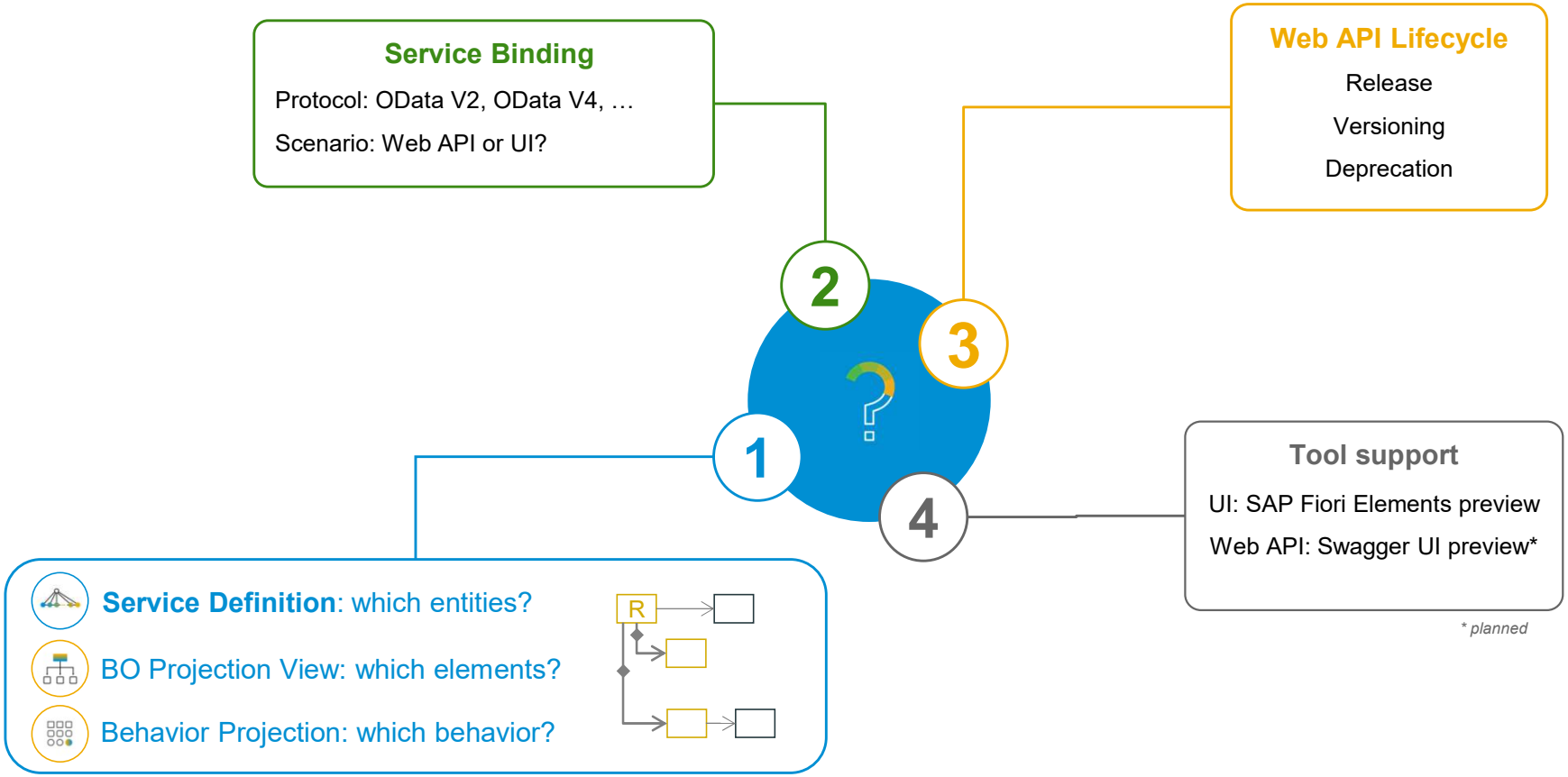
➔ Standard CRUD operations work out of the box

➔ Developers add BO-specific business logic

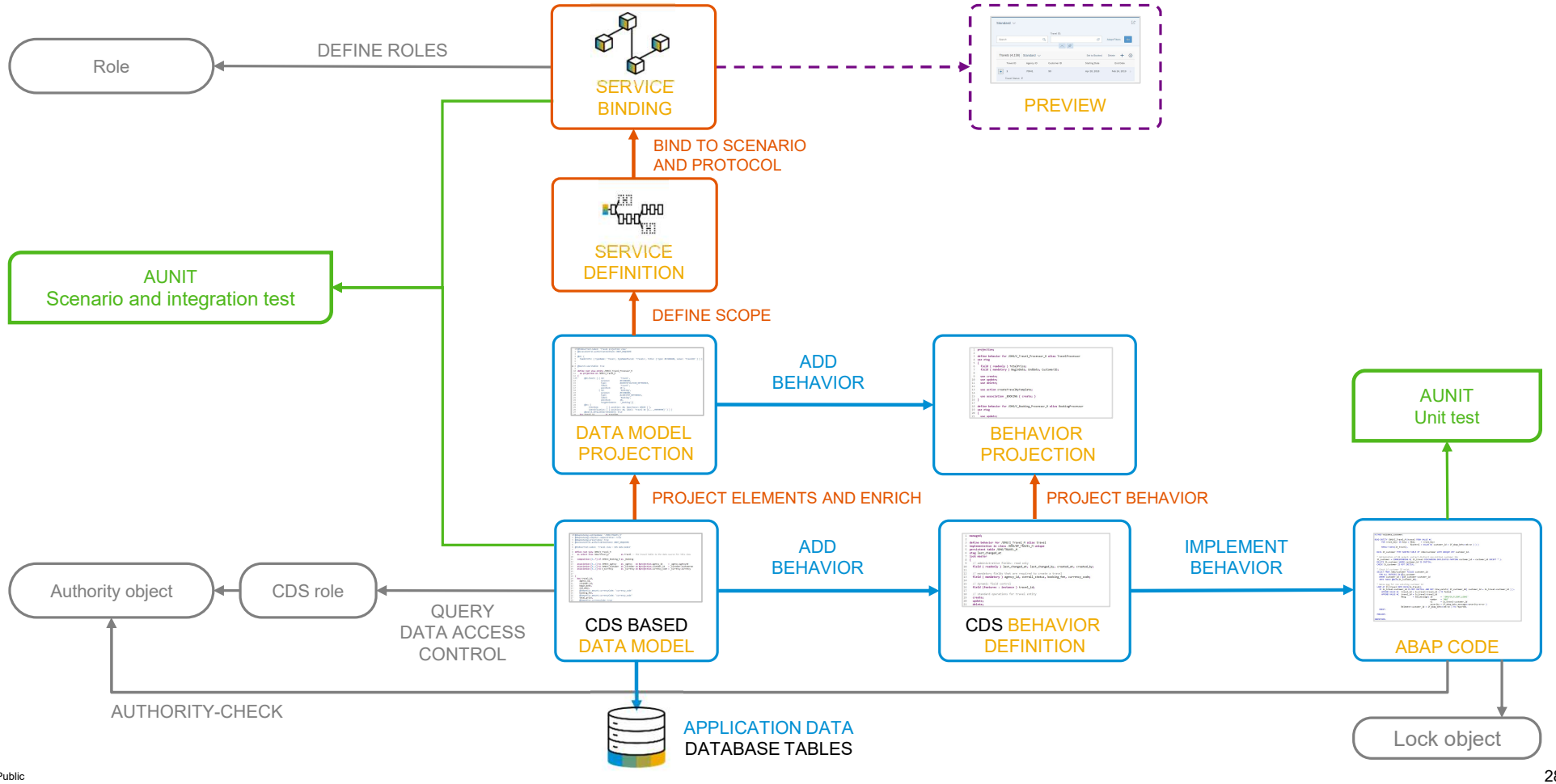
BUSINESS SERVICES



Business service



The development flow

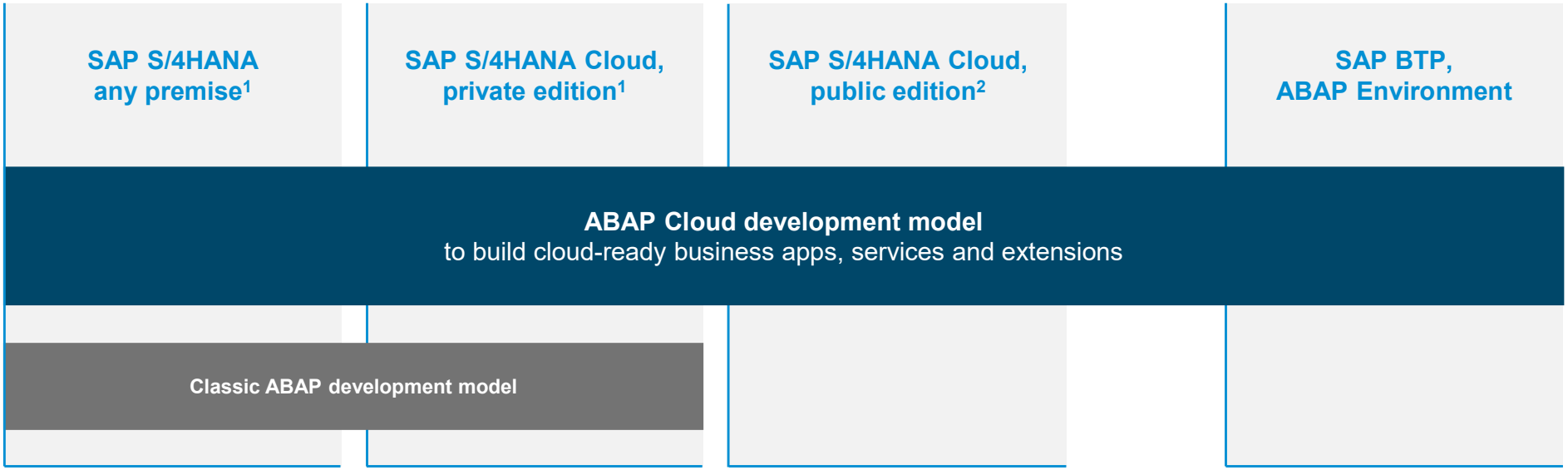


DEMO


Management Dashboard
Gender Ratio
Male
Female
72.4%
27.6%
Promotions
Director
Executive
Expert
75.5%
25.4%
24.6%
21.0%
75.8%
24.2%
70.2%
29.8%
Average Age
41.85
Average Age of New Hires
41.67
42.24
39.98
43.69
42.37
42.61
41.99
41.72
2010
2011
2012
2013
2014
2015
2016
2017
Career Fairs
553,884.44
Recruiter
348,111.73
Corporate Website
199,079.87
Referral
402,012.90
Social Media
473,855.51
Terminations by Quarter
Jun Q2
Jul Q3
Aug
Sep
Oct Q4
Nov
Dec
Jan Q1
Feb
Mar
Apr Q2
2017
Reduce Termination by (%)
Profit
Avg Number of Trips for those who Terminate for Work-Life Bal...
Marketing 51
Corp Dev 49
Product 45
Sales 42
Finance 41
Development 24
Office of CEO 15
Services 12
Legal 5

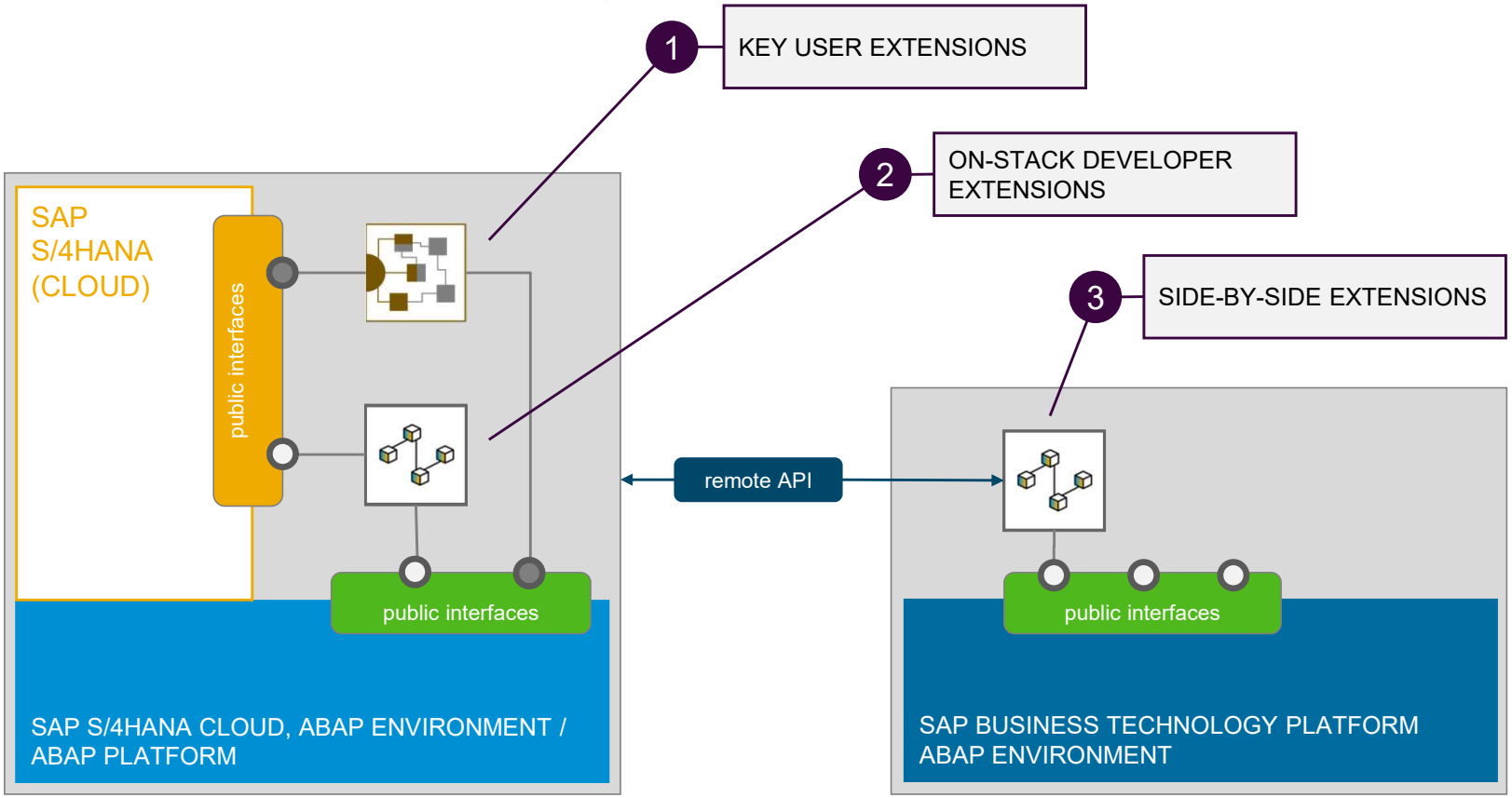
EXTENSIBILITY

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



[1] SAP S/4HANA any premise or SAP S/4HANA Cloud, private edition release ≥ 2022
[2] SAP S/4HANA Cloud, public edition release ≥ 2208, 3-system landscape required

SAP S/4HANA extensibility options



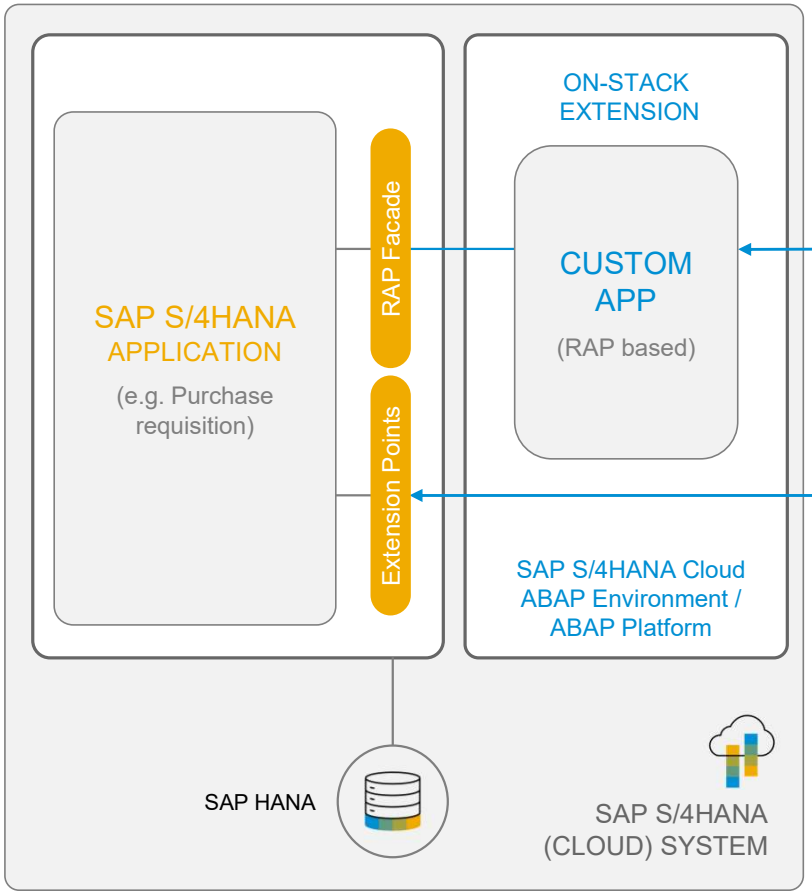
Key-user extensions
low-code/no-code extensions

ABAP custom code or partner extensions
following the cloud extensions model

Public interfaces *released for developer extensibility*

Public interfaces *released for key-user extensibility*

Developer extensibility on SAP S/4HANA, in the cloud and on-premise



ABAP Cloud development

Build cloud-ready business apps, services, and extensions on-stack using

- ABAP RESTful Application Programming Model (RAP)
- Cloud-optimized ABAP language
- Released SAP APIs, reuse services, and extension points – e.g. RAP Facades, BAdIs
- Eclipse-based ABAP Development Tools (ADT)
- SAP Fiori tools for UI development

Clean core rules for extensions to support smoother SAP software updates

SAP S/4HANA Cloud private edition, and on-premise

Upgrade projects will not go away

GOAL

- Easier frequent upgrades
- Future-safe extensions

Follow the public cloud extensibility rules whenever possible (Clean core approach)

Expectation management – no magic!
This is not the public cloud.

RULE for smooth software updates

Extensions must be clearly separated from SAP code

- No modifications to SAP objects allowed
- Only stable public SAP APIs (local or remote) and SAP extension points can be used

Mandatory in public cloud

Recommended in private cloud and on-premise

SAP S/4HANA, private cloud and on-premise editions

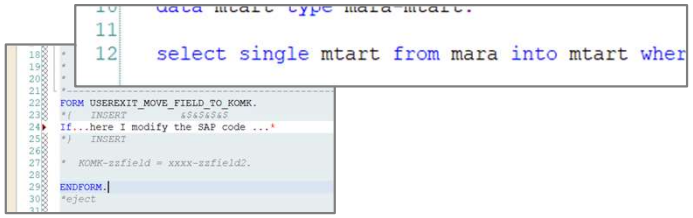
Reuse the SAP S/4HANA Cloud extensibility model

Default for all new extensions	On-stack extensions on SAP S/4HANA Cloud	Side-by-side extensions on SAP BTP
Business expert Key user	SAP S/4HANA Cloud key-user tools	SAP Build
Developer	SAP S/4HANA Cloud, ABAP environment	Java, Node.js, or the ABAP environment

Innovate or modernize

Retire

CLASSIC CUSTOM ABAP CODE (control and minimize)

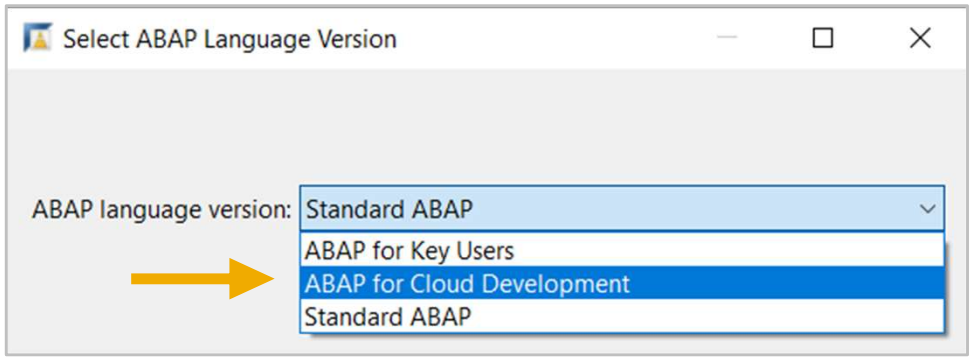


SAP S/4HANA, private cloud and on-premise editions

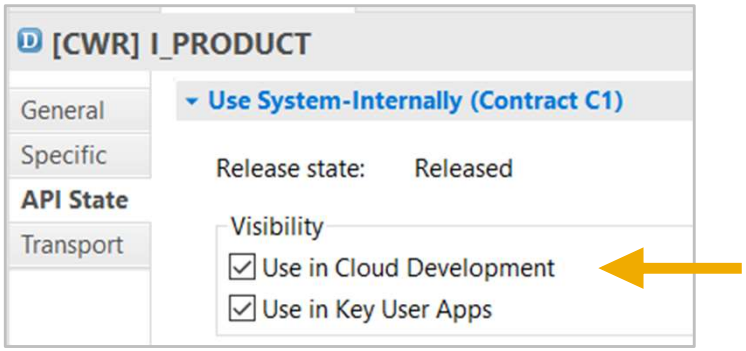
ABAP cloud development – ABAP language version and public SAP APIs

How will I use **ABAP Cloud** in the private cloud and on-premise editions of SAP S/4HANA?

- Switch on the strict ABAP Cloud syntax check for the selected custom ABAP objects (such as a new Z-class)
- Use the public APIs that SAP released for ABAP cloud development (such as the CDS view I_PRODUCT)

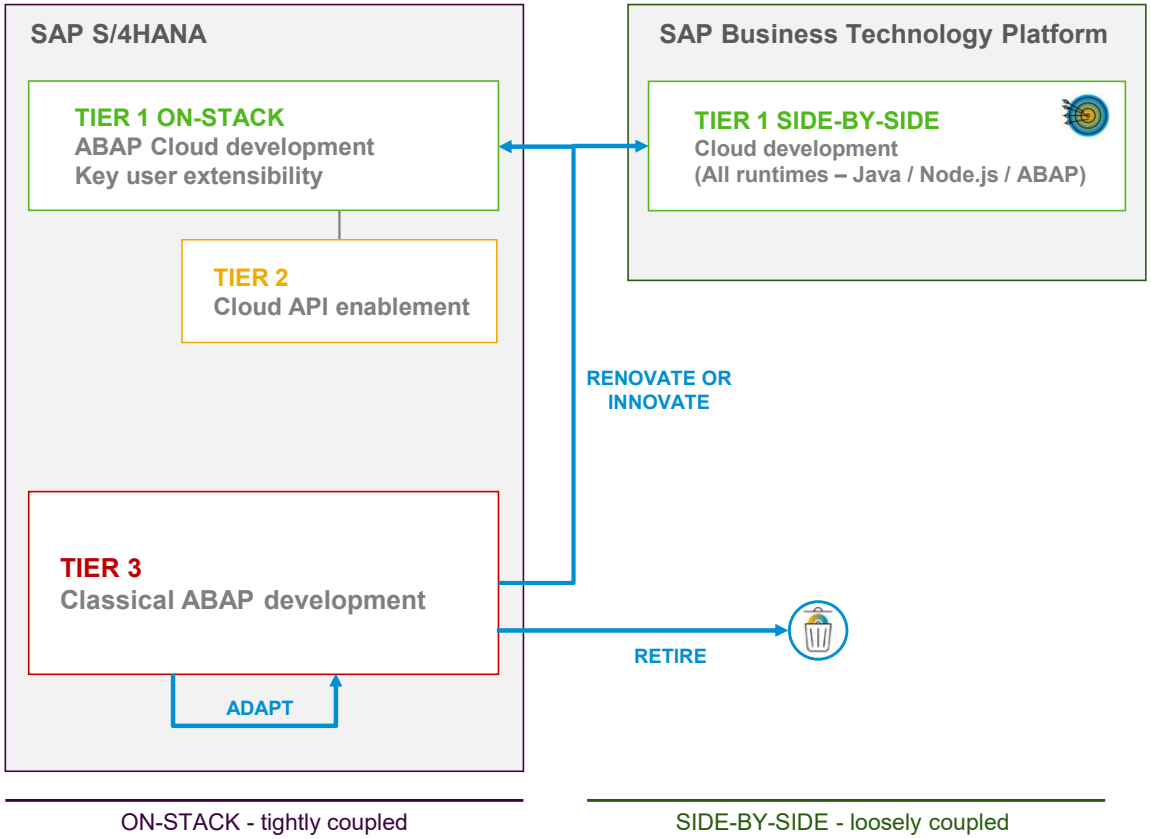


Switch from classic ABAP extensibility (Standard ABAP) to ABAP Cloud (ABAP for cloud development)



SAP released the CDS view for *ABAP Cloud development*

3-tier extensibility model for SAP S/4HANA private cloud and on-premise



TIER 1 – Cloud extensibility model

Development of cloud-ready and upgrade-stable applications and extensions

Same development model as used in SAP S/4HANA Cloud, public edition

Default for new extensions and custom apps

TIER 2 – Cloud API enablement

Extends and enables tier 1 for private cloud and on-premise

Mitigates missing public SAP APIs or extension points:

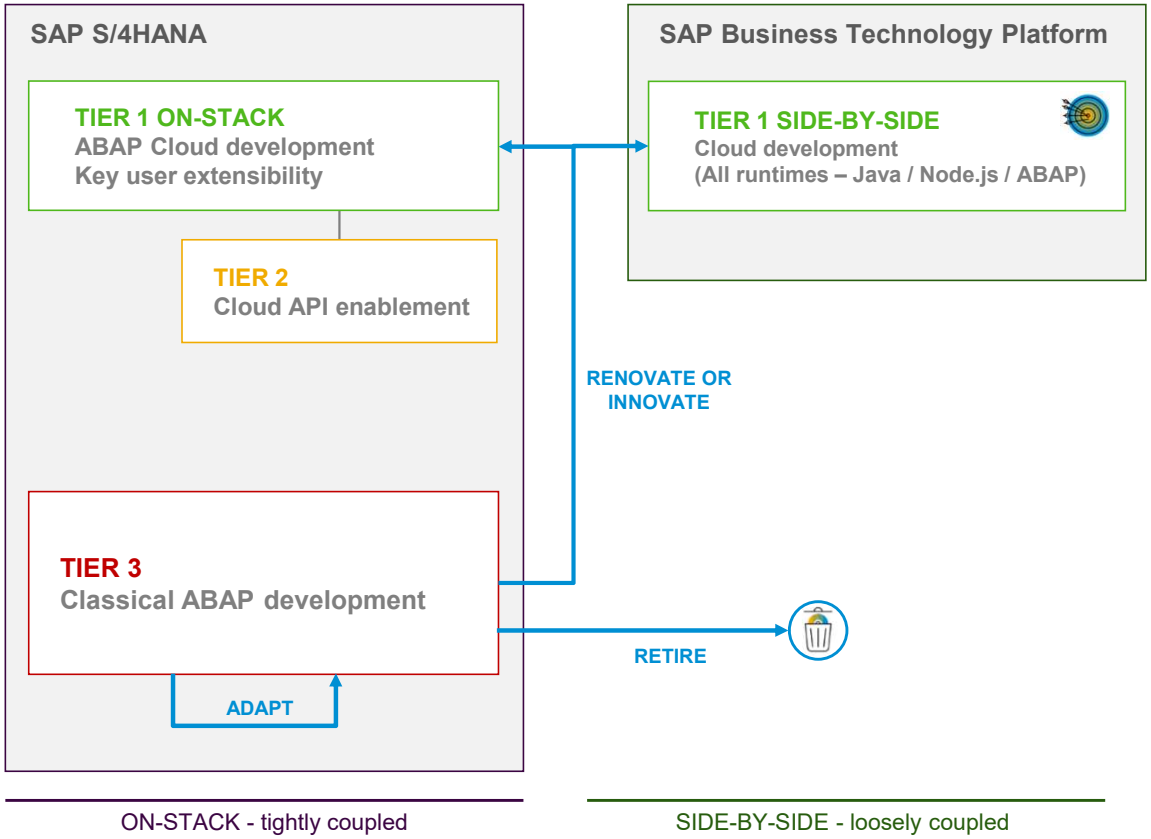
- Develop custom wrapper objects for not released SAP objects to be used in tier 1
- Retire wrapper once a released SAP API is available

TIER 3 – Classic ABAP extensions

Legacy/existing custom ABAP code or new on-stack extensions code that cannot follow the rules of tier 1 and 2

Avoid and reduce the content in tier 3

3-tier extensibility model for SAP S/4HANA private cloud and on-premise



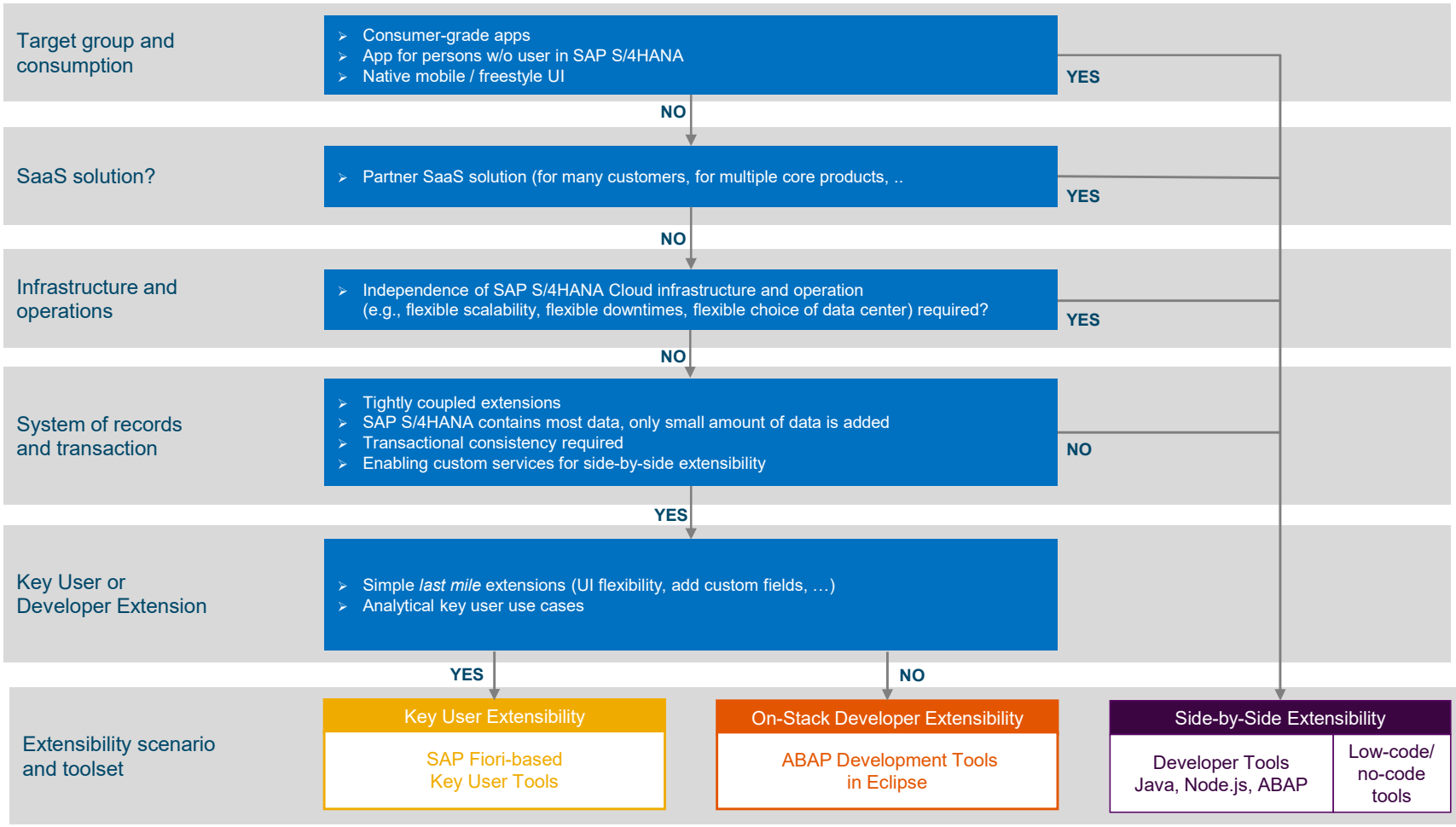
Benefits:

- ✓ Clean core using Tier 1, with clear technical guidance, cloud-ready
- ✓ Upgrade stability for Tier 1 extensions
- ✓ Exploit rich PCE/OP scope, mitigate missing public APIs
- ✓ Controlled violations of clean core principles (Authorizations, ATC)
- ✓ Enables stepwise cloud transformation
- ✓ Greenfield: Tier 3 empty, only use Tier 1 and 2
- ✓ Brownfield: Legacy in Tier 3, new extensions in Tier 1 and 2

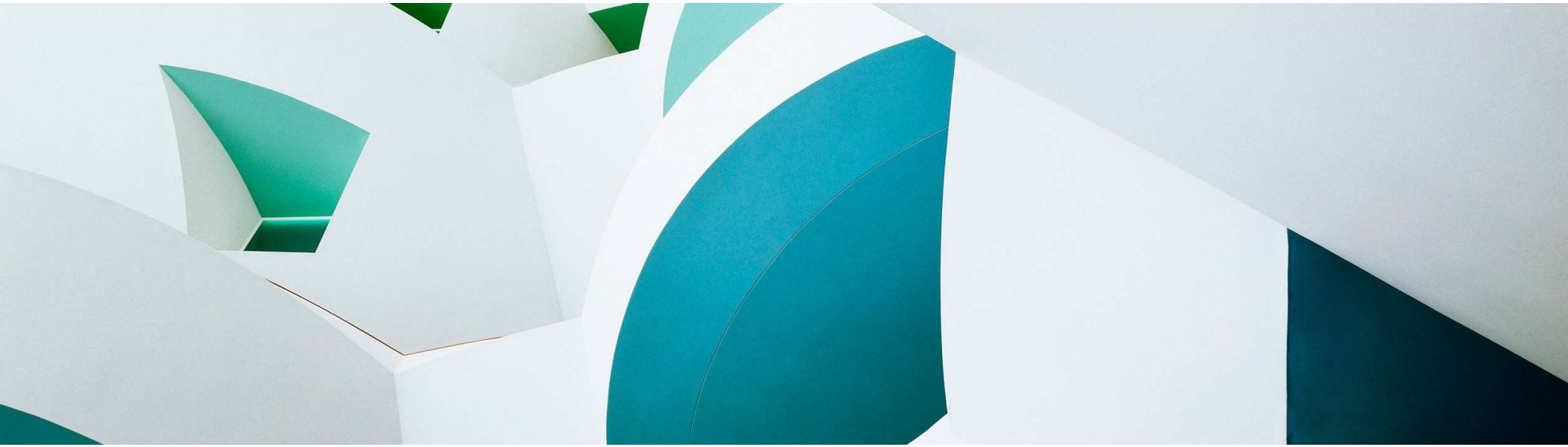
Summary of ABAP-related extensibility options in SAP S/4HANA Cloud

	KEY USER EXTENSIBILITY Business expert, implementation consultant, citizen developer, key user	ON-STACK DEVELOPER EXTENSIBILITY ABAP developer	SIDE-BY-SIDE EXTENSIBILITY ABAP developer
SCENARIO	Low-code/no-code adaptations and extensions of SAP S/4HANA applications	Custom ABAP development projects that need proximity or coupling to SAP S/4HANA data, transactions, or apps	Loosely-coupled applications and partner SaaS solutions
USE CASES	Adapting UIs, adding custom fields, adding custom business objects etc.	Custom applications with frequent or complex SQL access to SAP S/4HANA data Custom extensions running in the same logical unit of work (LUW) as SAP applications Tailored custom remote APIs or services which serve side-by-side SAP BTP apps	Custom applications for a separate target group (no ERP users) Custom application workload that shall run separated from ERP Custom applications needing proximity to intelligent SAP BTP services like machine learning, AI etc. Solutions integrating with several ERP systems and cloud services SaaS applications provided by partners
BENEFIT	Fully managed and integrated in SAP S/4HANA Cloud No or only very basic development skills required	Development of extensions inside the SAP S/4HANA Cloud system No remote access or data replication Use and extend released SAP S/4HANA Cloud objects	Decoupled extensions independent of SAP S/4HANA Cloud operation and lifecycle management
	On-stack extension domain		Side-by-side extension domain

Sequence diagram on how to find the right extensibility options



SUMMARY



Key takeaways

The **ABAP RESTful Application Programming Model** (RAP) helps you efficiently and rapidly build enterprise-grade services 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 scope** is enhanced **quarterly** in SAP BTP ABAP Environment, **twice a year** in SAP S/4HANA Cloud ABAP Environment, and **annually** in SAP S/4HANA.

What's New: SAP BTP ABAP environment | SAP S/4HANA | SAP S/4HANA Cloud

What's Next: ABAP Platform Roadmap Information for all products

Guidance for the usage of RAP in SAP S/4HANA

SAP S/4HANA 1909

FIRST RAP DELIVERY WITH LIMITED FEATURE SET

Managed scenario for greenfield development not supported
No draft support for SAP Fiori development

GUIDANCE

Delivery with SAP S/4HANA 1909 ➟ Use the *ABAP Programming Model for SAP Fiori*

SAP S/4HANA 2020

BASIC RAP DELIVERY

Incl. **managed** scenario (*with major limitations regarding key layout and numbering*)
Draft support for managed or unmanaged BOs to build transactional SAP Fiori apps
OData V4 support for Web APIs and SAP Fiori UIs with FPS01

GUIDANCE

If limitations are crucial ➟ Use the *ABAP Programming Model for SAP Fiori*
If limitations are not critical ➟ Use RAP

SAP S/4HANA ≥ 2021

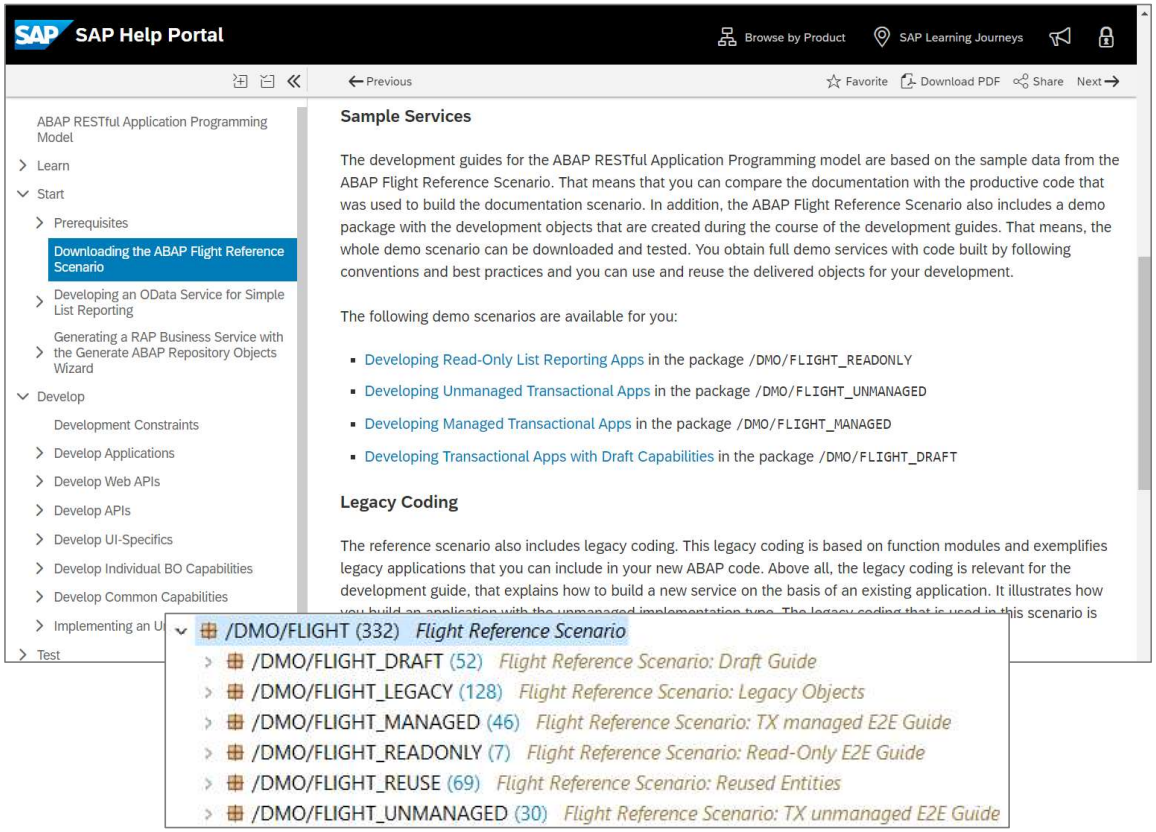
MASS ADOPTION READY RAP DELIVERY

Managed scenario now supports various key layouts
Late numbering for a managed BO (with or without draft)
Enhanced testability, documentability and supportability support
Extensibility options, native **business events** exposure, side effects and more features delivered with **Edition 2022**

GUIDANCE

➟ Exclusively use RAP

Sample implementations with the ABAP Flight Reference Scenario



Demonstrate how to use different RAP capabilities concretely

Based on a simple to use and understand data model: SFLIGHT reloaded

Feature scope regularly enhanced

Downloadable from GitHub

Read more in the RAP documentation: Cloud | SAP S/4HANA

FREE openSAP COURSE

Building Apps with the ABAP RESTful Application Programming Model (RAP)

Self-paced mode

Week 1: Introduction
Week 2: Developing a Read-Only List Report App
Week 3: Enabling the Transactional Behavior of an App
Week 4: Dealing with Existing Code
Week 5: Service Consumption and Web APIs
Week 6: Final Exam

ENROLL NOW!
https://open.sap.com/courses/cp13

More information on RAP

Further information

Modern ABAP Development with the ABAP RESTful Application Programming Model (RAP) | SAP Community

Modernization with RAP | SAP Blogs

Building Apps with RAP | openSAP Course

Acquire Core ABAP Skills | SAP Learning Journey

What's New in RAP: SAP BTP ABAP Environment | SAP S/4HANA | SAP S/4HANA Cloud

Outlook: SAP BTP ABAP Environment on the interactive SAP Road Map Explorer | ABAP Platform Roadmap Information

---

Public SAP Web sites

ABAP Development Community: 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

SAP training and certification opportunities

www.sap.com/education – e.g. trainings S4D437, S4D430, HA400, and S4D400
learning.sap.com/learning-journey – e.g., search for ABAP

SAP CodeJam Program

In a Nutshell

It's a 5-6 **hrs hands-on coding and networking** event where developers share their knowledge and collaboratively develop with SAP platforms and products in a fun and casual environment.

These events…

- Are developer-community oriented
- Led by SAP experts
- Explore products and platforms that have free developer editions available on SAP BTP
- Are not training or certificate programs, no sales presentations are included in the agenda

For more information about the program and how to request an event, visit:
https://community.sap.com/events/codejam

https://groups.community.sap.com/t5/sap-codejam/gh-p/code-jam

Thank you.

Contact information:

Rich Heilman
Developer Advocacy
SAP
rich.Heilman@sap.com