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⚠ **Important SAP Community Log-in Update!**

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Starting on September 5, the SAP Community will switch to SAP Universal ID as the only option to login. Create your SAP Universal ID now! If you have multiple S- or P- accounts, link your accounts to SAP Universal ID.

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State-of-the-Art ABAP Development with the ABAP RESTful Application Programming Model (RAP)

The ABAP RESTful Application Programming Model (RAP) is the centerpiece of the ABAP Cloud development model for efficiently building cloud-ready, transactional business apps and extensions on SAP BTP ABAP Environment, SAP S/4HANA Cloud, SAP S/4HANA Cloud ABAP environment, and SAP S/4HANA 1909 and higher.

ABAP for Newbies

Are you familiar with ABAP?

If you're not, don't worry, just check this page before you go ahead: ABAP for Newbies.

Are you familiar with ABAP Cloud?

If you're not, don't worry, just check out this blog post before you go ahead: ABAP Cloud.

RAP Overview

Why learning RAP?

The requirements for SAP business applications and their associated technologies have evolved significantly over the past years. Besides increasing requirements for embedded analytics and artificial intelligence, the main drivers of this evolution are:

- **SAP HANA** – the high-performance in-memory database for real-time transactional and analytical processing.

- **SAP Fiori** – the chosen, modern, intuitive, and cross-device UX design for the Intelligent Enterprise.

- **Cloud** – with the increasing business needs for cloud operation support, ranging from hybrid, i.e., cloud and on-premise, to exclusively cloud operation models.

End users expect enhanced product qualities such as continuous and collaborative work – e.g., to start working at home, continue during commuting, and finalize the task at the company, or to accomplish tasks on different device types or collaboratively.

Product qualities - such as scalability, testability, supportability, extensibility, verticalization, and documentability - must be available out-of-the-box.

To meet these various requirements on the ABAP platform, SAP offers the **ABAP RESTful Application Programming Model (RAP)** on SAP BTP ABAP Environment and SAP S/4HANA, on-premise as well as in the cloud.

What is RAP?

The **ABAP RESTful Application Programming Model (RAP)** is an essential element of ABAP Cloud, the ABAP development model for building cloud-ready business apps, services, and extensions on SAP BTP, SAP S/4HANA Cloud, and SAP S/4HANA. RAP is the heart of ABAP Cloud for building transactional apps and extensions.

RAP consists of a set of concepts, tools, languages, and powerful frameworks which help developers both to build innovative, cloud-ready, enterprise applications and Web APIs; and to easily extend SAP standard applications on the ABAP platform, in the cloud as well as on-premise.

RAP offers a standardized development flow based on Core Data Services (CDS), the ABAP language, and business services in the modern, Eclipse-based ABAP Development Tools (ADT).
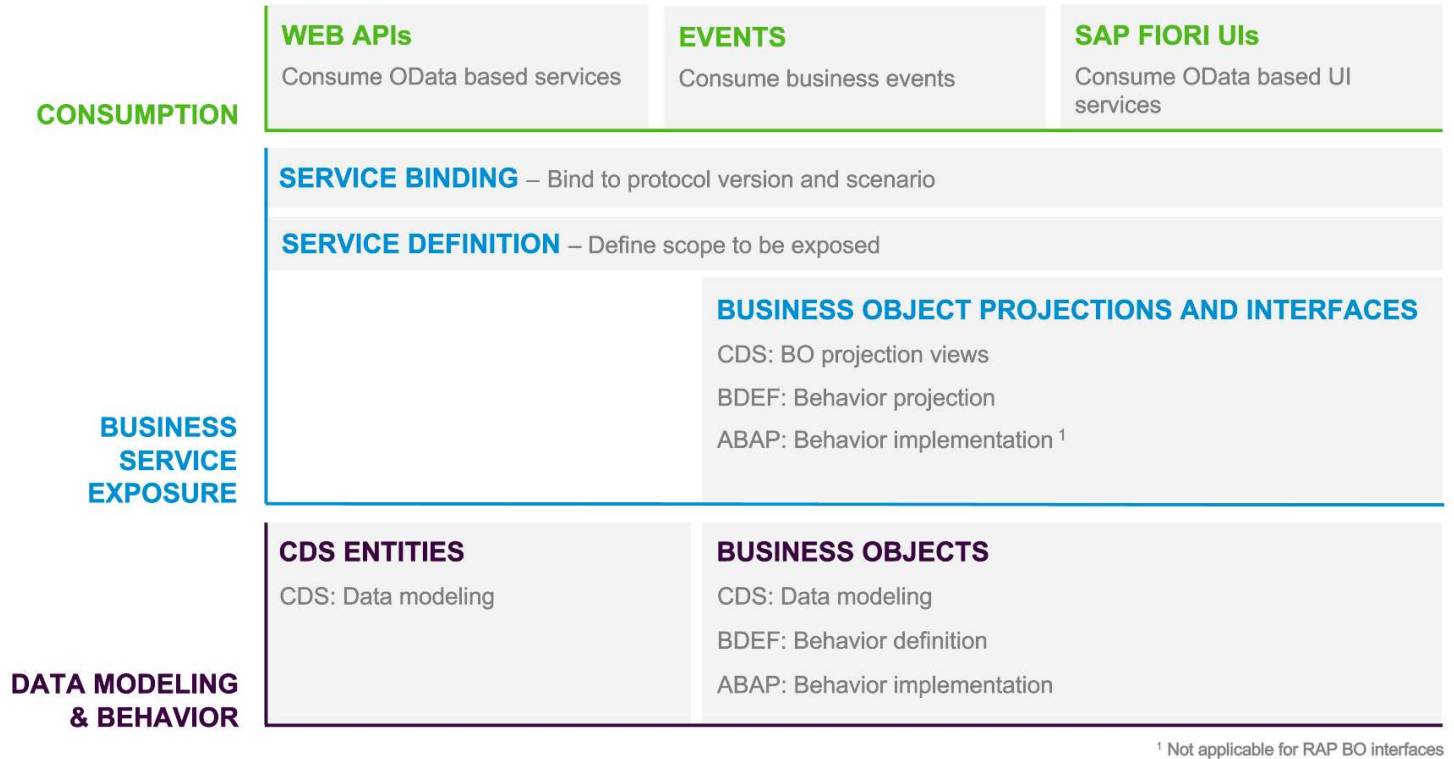
Different types of services, local APIs, and business events can be developed and modeled with RAP:

- OData-based services for UI development to build delightful, role-based, responsive, and draft-enabled SAP Fiori apps

- OData-based services for exposure as Web APIs

- Lifecycle-stable and upgrade-safe local APIs can be provided via released RAP business objects interfaces

- Business events that can be used for asynchronous communication to notify a consumer that a RAP BO has changed

Built-in options for testability, supportability, documentability, and extensibility such as ABAP unit tests, the ABAP cross trace tool, and knowledge transfer documents are provided along the RAP development stack.

A seamless integration of reuse components such as business events and change documents in the RAP framework is offered to lower the total cost of development. Developers can for instance easily enable the exposure of business events and allow the creation of change documents within RAP based applications.

SAP uses RAP to build new and modernize existing standard applications and recommends its customers and partners to use it for their custom developments.

Learn more: Evolution of the ABAP Programming (blog post) | Modernization with RAP (blog post)

CONSUMPTION	**WEB APIs** Consume OData based services	**EVENTS** Consume business events	**SAP FIORI UIs** Consume OData based UI services
BUSINESS SERVICE EXPOSURE	**SERVICE BINDING** – Bind to protocol version and scenario		
	SERVICE DEFINITION – Define scope to be exposed		
		BUSINESS OBJECT PROJECTIONS AND INTERFACES CDS: BO projection views BDEF: Behavior projection ABAP: Behavior implementation [1]	
DATA MODELING & BEHAVIOR	**CDS ENTITIES** CDS: Data modeling	**BUSINESS OBJECTS** CDS: Data modeling BDEF: Behavior definition ABAP: Behavior implementation	

[1] Not applicable for RAP BO interfaces

RAP Availability

SAP Product	Available as of	Release Notes and Roadmap	Documentation
SAP BTP, ABAP environment	All releases	• RAP - What's New? • Product Release Notes • Product Roadmap • SAP Road Map Explorer	• RAP Documentation • Further Dev. Guides • Analytical data modeling • Data access via ODBC
SAP S/4HANA Cloud	All releases	• RAP - What's New? • Product Release Notes • Product Roadmap	• RAP Documentation • Further Dev. Guides • Analytical data modeling • Data access via ODBC

SAP Product	Available as of	Release Notes and Roadmap	Documentation
SAP S/4HANA and SAP S/4HANA Cloud, private edition	≥ 2021 (7.56) (Limited feature set available with 1909 and 2020)	• RAP - What's New • Product Release Notes • Product Roadmap	• RAP Documentation • Further Dev. Guides • Analytical data modeling • Data access via ODBC

💡 Core Concepts in RAP

Business Object

Common term to represent a real-world business entity – such as *Product*, *Travel*, or *SalesOrder* – in enterprise application development.

On a conceptual level, a business object (BO) consists of a data model, aka composition model, and its transactional behavior. In general, a business object contains:

- several nodes, for example, the root node *SalesOrder* and the child nodes *SalesOrderItems* and *ScheduleLine*

- standard transactional operations for creating, updating, and deleting business data

- non-standard, application-specific transactional operations

RAP offers different runtime implementation types for the implementation of the transactional business objects' behavior. The main ones are the *managed* BO runtime implementations and the *unmanaged* BO runtime implementations – typically used for greenfield and brownfield implementations respectively.

Learn more

Query

A query is the connecting interface for read-only access to the database in OData services. It is used for list reports or analytical reports to process data.

As the non-transactional counterpart of a business object, it consists of a data model, generic and modeled query capabilities and a runtime. This threefold division is known from the BO concept. However, a query provides only read access to the database. Its runtime never modifies data, but only executes structured data retrieval, for example for filtering.

Learn more

Business Service

The ABAP development platform can act in the roles of a service provider and a service consumer (such as SAP Fiori UI client).

In the context of the ABAP RESTful application programming model, a business service is a RESTful service which can be called by a consumer. It is defined by exposing its data model together with the associated behavior. It consists of a service definition and a service binding.

Learn more

Implementation Languages

ABAP Core Data Services (CDS)

ABAP CDS offers a data modelling infrastructure for defining semantically rich data models and easy access to advanced SAP HANA libraries and features using CDS table functions. The data definition language of ABAP CDS has been enhanced to natively support the definition of composition and behavior models of RAP BOs.

Learn more: ABAP CDS Overview (pdf) | Getting Started (blog post) | ABAP Data Models Guide | CDS Development Tools Guide | CDS Keyword Documentation

Modern ABAP Language

The ABAP language has gone through various evolutions since its inception. Its recent modernization – with a focus on simplification – has turned it into a more declarative and expression-oriented language, which allows developers to write more simple and concise ABAP code using language features such as inline declarations with type inference, new operation constructors, and filtering, grouping and virtual sorting operations for internal tables. The ABAP language has also been extended with the Entity Manipulation Language (EML), which is used to control the transactional behavior of RAP BOs.

Learn more: ABAP Keyword documentation for cloud-ready development

Entity Manipulation Language (EML)

EML offers an SQL-like syntax that allows developers to implement the transactional behavior of RAP business objects. It also offers a type-safe, API-based access to RAP BOs within and outside the RAP context.

Learn more: EML@RAP Development Guide | EML@ABAP Keyword Documentation

Tools

ABAP Development Tools in Eclipse

The **ABAP Development Tools** (ADT) is the integrated development environment on the well-known Eclipse platform for all standard ABAP development, quality assurance, and supportability tasks, both on on-premise and on cloud ABAP systems.

ADT offers a modern development toolset with many goodies such as syntax highlighting, code completion, code templates, advanced search and navigation, and quick fixes to increase developer productivity. Various eclipse-based editors, views, and features are provided. For instance, the Relation Explorer view is provided to explore the structure and capabilities of development objects such as RAP BOs. The ADT wizard *Generate ABAP Repository Objects* can be used to generate all required RAP artefacts for an OData service with managed implementation type based on a database table.

Moreover, powerful options and tools for testability and troubleshooting are provided in ADT.

Learn more: ABAP Development User Guide (Cloud | On-Premise) | Tips and Tricks for ABAP CDS Tools (Cloud | On-Premise) | SAP's Central Update Site for Eclipse-based Tools

Testability

As an application developer, you want to verify the behavior of an application as a whole by writing and executing unit, scenario, and integration tests.

The ABAP platform and ADT provide powerful frameworks and tools to ensure high quality applications throughout the software development lifecycle. These include the ABAP Test Cockpit for performing static checks, the ABAP Unit test framework for testing, various Test Doubles Frameworks – e.g., for ABAP, SQL, CDS, and RAP business objects – for isolating the code under test, and the local OData client proxy for the API-based testing of OData services.

Learn more: Ensuring Quality of ABAP Code | RAP Testability Guide

Troubleshooting

As an application developer, you want to be able to search for the origin of occurring semantic, functional, and performance issues and fix them.

ADT supports you in this by offer several advanced analysis and troubleshooting options and tools in the form of ADT views, for instance:

- *ABAP Debugger* – used for troubleshooting the business logic implement in the backend.

- *ABAP Cross Trace* – used for a semantic end-to-end analysis of OData-based services or business objects built with RAP.

- *ABAP Profiling* – used for analyzing the runtime behavior of an ABAP program.

- Various ABAP CDS Tools – used to define and analyze CDS-based data models.

Learn more: Troubleshooting Tools for RAP-based Apps

✳️ Extensibility

About the RAP Extensibility

RAP provides built-in, modification-free extensibility options for data models, behaviors, and nodes of RAP BOs and service definitions.

Based on these RAP extensibility options, full-fledged and upgrade-stable extensions can be built on SAP S/4HANA Cloud using developer extensibility, where previously only limited key user extensibility options were available.

Learn more: RAP Extensibility Guide (cloud) | RAP Extensibility Guide (on-premise)

📺 Videos

Description	Links
ABAP Cloud	• Developer Discussion on ABAP Cloud (from 2022-11-29)
Understand the purpose of RAP	• RAP - What's in it for you?
RAP at SAP TechEd events	• ABAP at SAP TechEd in 2022 • ABAP at SAP TechEd in 2021
RAP feature teaser videos	Find videos on various ABAP Cloud features, incl. RAP • ABAP Cloud playlist @SAP Developers channel
RAP at SAP's Devtoberfest	Devtoberfest in 2022 • A Beginner's Guide to RAP • Troubleshoot RAP-based Fiori Apps in ADT • Developer Extensibility and Business Events with RAP • Dealing with Legacy Code and Transactional Consistency in RAP • More replays from Devtoberfest in 2022

👩‍🏫 Learn & Develop

Getting Started Ressource	Description	Links
RAP Reference Scenario	Check out RAP end-to-end scenarios or build your own app based on the sample data.	• ABAP Flight Reference Scenario

Getting Started Ressource	Description	Links
RAP Feature Showcase App	Get an overview of how to build UIs with UI annotations and other features. The RAP feature showcase app shows you how to easily build UIs for your data model.	• RAP Feature Showcase App
openSAP Course	Learn the core concepts of RAP at your on space.	• Building Apps with RAP • Further reading
SAP Learning Journeys	Various free learning journeys on ABAP and RAP such as • Learn the Basics of ABAP Programming • Acquire Core ABAP Skills	• SAP Learning Journeys Navigator
ABAP Cloud and RAP Tutorials	Various tutorials on ABAP Cloud and RAP in the SAP Developer Center.	• SAP Tutorials Navigator
Build an SAP Fiori App Using the ABAP RESTful Application Programming Model [RAP100]	Learn how to create a managed RAP BO using the ADT based RAP Generator starting from one table. This can only be performed in on-prem systems as of 2022 or higher and in ABAP environment systems.	• RAP100 (Tutorial group)
Use ABAP Cloud for SAP S/4HANA (Cloud) extensions [RAP610]	Implement will an online shop for employees which will allow for the creation of Purchase Requisitions by using a released RAP BO interface from Procurements.	• RAP610 (GitHub)
Further RAP hands-on materials	Various RAP workshops on GitHub	• RAP workshops
Clean ABAP Style Guide	Clean ABAP Style Guide on GitHub	• Clean ABAP Style Guide
SAP Training and Certification opportunities	Various SAP Training and Certification opportunities – e.g., HA400, S4D400, S4D430, and S4D437	• training.sap.com

▓ Try it Now!

Setup your development environment

You can try out the latest and greatest ABAP platform capabilities and features right now; for example, the modern ABAP language syntax, the ABAP RESTful Application Programming Model (RAP), and the Entity Manipulation Language (EML).

You would need:

1. Access to a suitable ABAP system – e.g., SAP BTP ABAP Environment Trial (see tutorial)
2. The latest ADT plugin on the latest Eclipse platform (see tutorial)

❓ FAQs

Frequently Asked Questions

Find answers to the most frequently asked questions around topics such as RAP, ADT, ABAP Cloud, and ABAP Language Versions.

- FAQ – ABAP Cloud
- FAQ – ABAP RESTful Application Programming Model (RAP)
- FAQ – ABAP Language Versions
- FAQ – ABAP Development Tools (ADT) in Eclipse
- FAQ – For SE80 Experts Using ADT
- FAQ – SAP BTP ABAP Environment

📍 Featured Content

Related Community Topics

- ABAP Development
- ABAP Testing and Analysis
- ABAP Connectivity
- ABAP Extensibility
- SAP BTP ABAP Environment
- SAP S/4HANA Cloud ABAP Environment

ABAP Development

About ABAP Cloud – The development model for building cloud-ready extensions in the cloud and on-prem.

- ABAP Cloud | SAP Blogs

- [ABAP Cloud - What does it comprise?](#) | SAP Blogs

- [FAQ – ABAP Cloud](#)

- [Replay of the Developer Discussion "ABAP Cloud" from Nov 29, 2022](#) | 🎞️

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

- [The SAP LUW (Logical Unit of Work) in ABAP Cloud](#) | SAP Blogs

About the Unmanaged BO Implementation Type

- [Conversion Exits and RAP](#) | SAP Blogs

- [Using BAPIs (Business Application Programming Interfaces) in RAP](#) | SAP Blogs

About Business Events

- [Introducing RAP Business Events](#) | SAP Blogs

- [Introduction to Enterprise Event Enablement](#) | SAP Blogs

SAP Fiori Development

- [SAP Fiori Design Guidelines](#)
- [SAP Fiori elements Feature Showcase App for RAP and ABAP CDS](#) | SAP Blogs
- [Demo Kit - SAPUI5 SDK](#) | SAP documentation
- [Developing Apps with SAP Fiori Elements](#) | SAP documentation
- [Learning the Basics of SAP Fiori](#) | SAP Learning Journey
- [SAP Fiori Overview: Design, Develop and Deploy](#) | openSAP course
- [Developing and Extending SAP Fiori elements Apps](#) | openSAP course

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Introduction to Business Object Processing Framework

SAP NetWeaver 7.5 Maintenance Strategy

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