



Updates on Application Development from SAP TechEd 2023

Thomas Jung, SAP
December 05, 2023

Public



System Access Sign Up

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<https://github.com/SAP-samples/abap-exercises-codejam>

Agenda

BTP General

- BTP Runtimes
- SAP Business AI

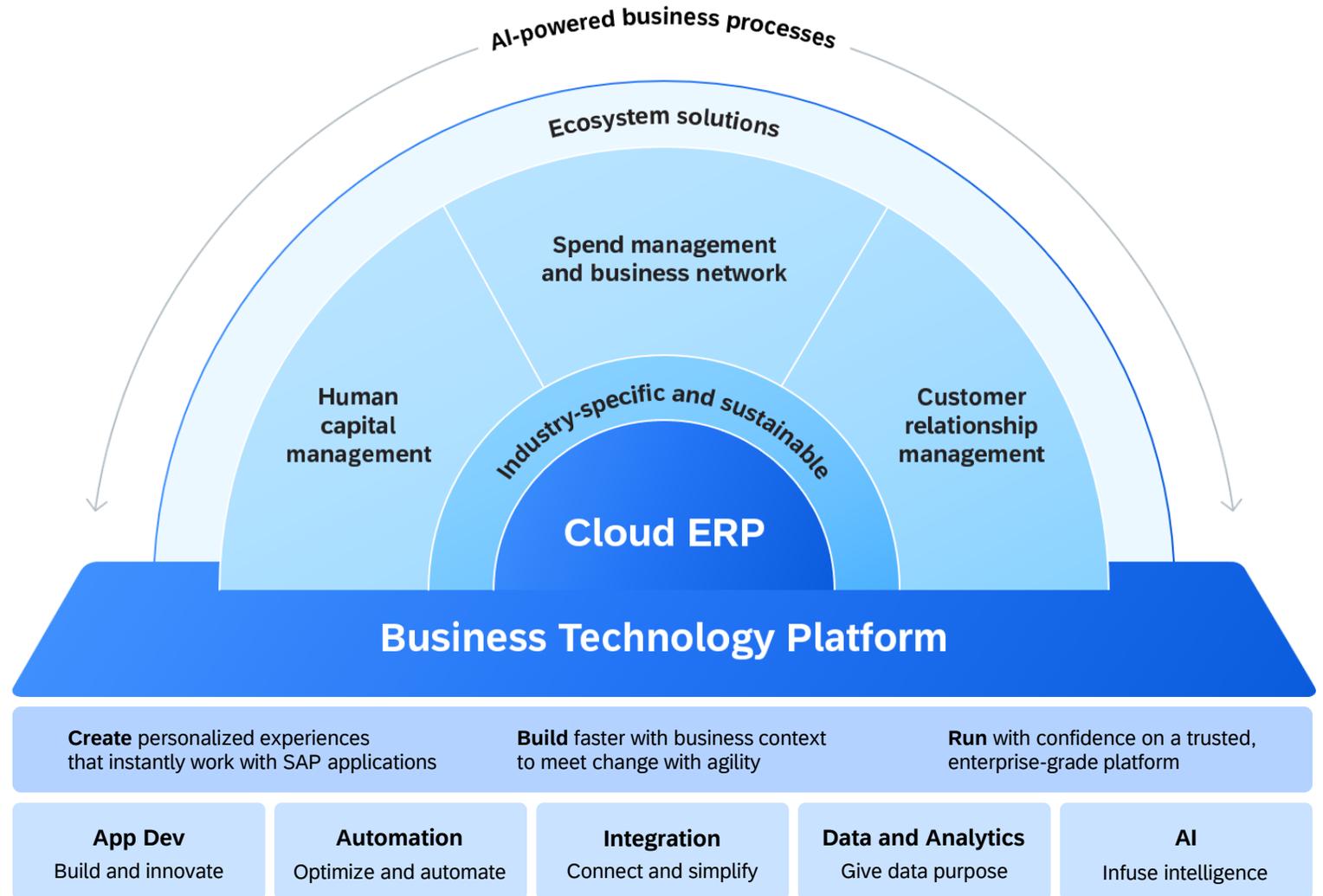
SAP Build Code

SAPUI5

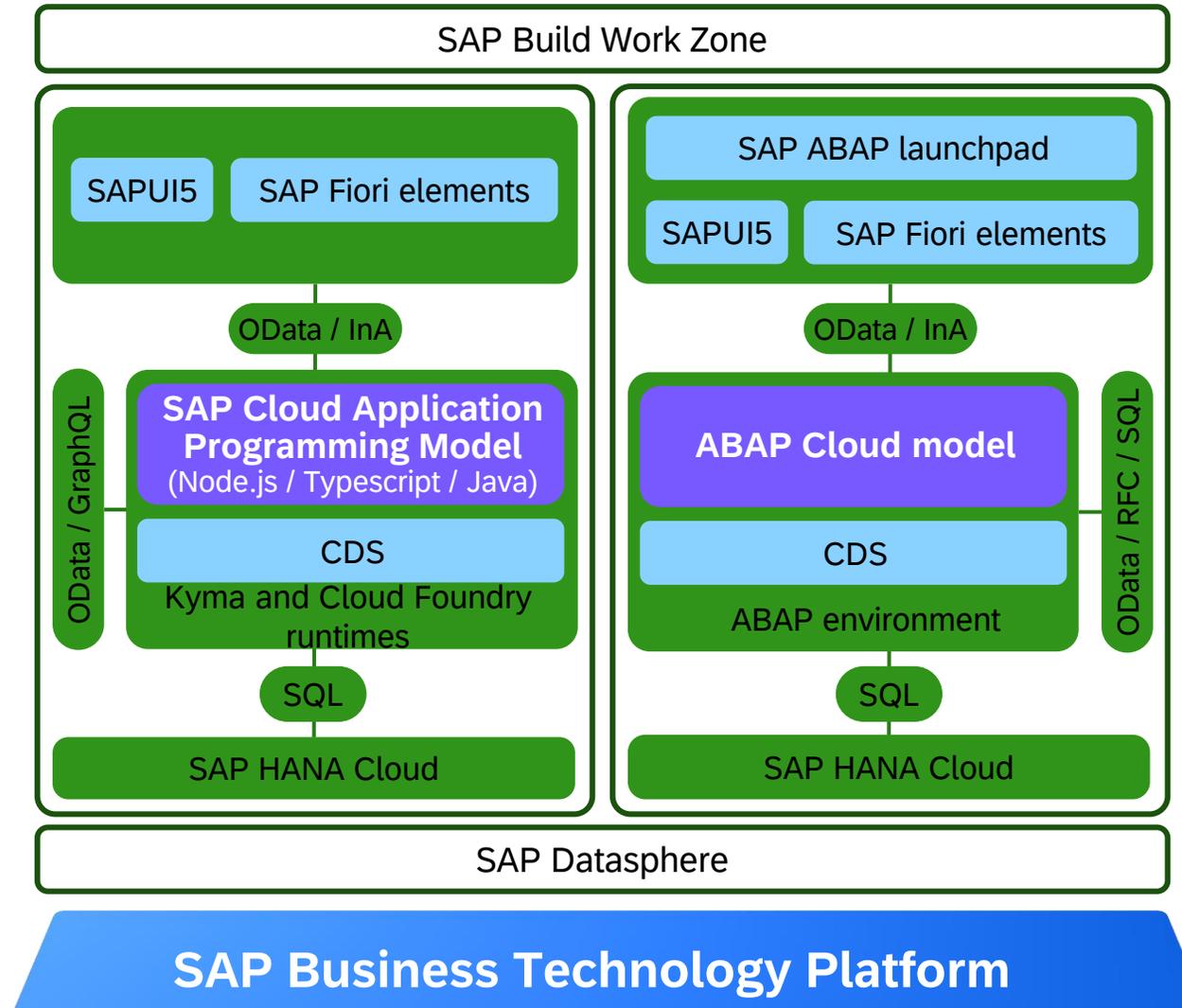
SAP Cloud Application Programming Model

ABAP Cloud

SAP Business Technology Platform (SAP BTP) is the foundation for a smoothly integrated SAP portfolio and the platform for SAP, customers, and partners to innovate and transform.



Master the building blocks



Our strategic priorities for SAP BTP

Application development

Integrated app dev solutions enabled by AI

Enhanced fusion development

Enterprise trust and governance

Automation

Enhanced integration and process extensibility

AI-based process design and execution

Orchestration and monitoring

Integration

Elevate to SAP Integration Suite

Flexible deployment options

Event-driven integrations

Data and analytics

Easily produce and consume data products

New ecosystem approach

Integrated portfolio

Artificial intelligence

Embedded business AI

AI-powered SAP BTP services

AI foundation on SAP BTP

Cross-platform priorities

Optimization for SAP solutions

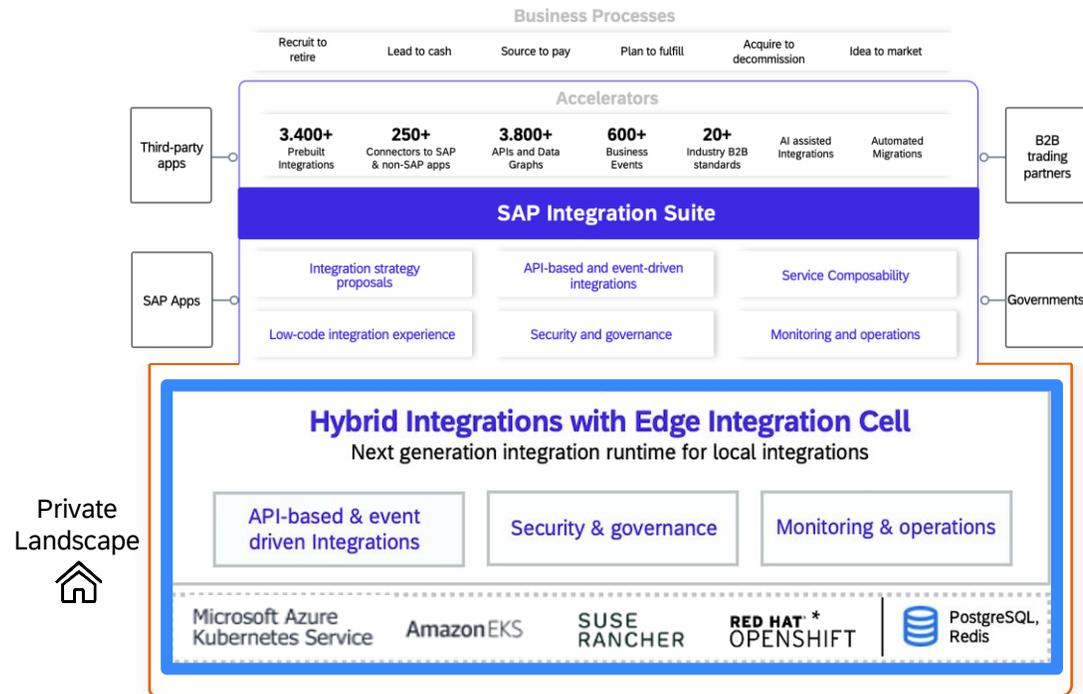
Business accelerators and marketplace

Simplified platform experience

Availability and resilience

Data protection and security

Integration – Edge Integration Cell: Next Generation „Hybrid“ Integration Runtime



Flexible deployment
in customer environments

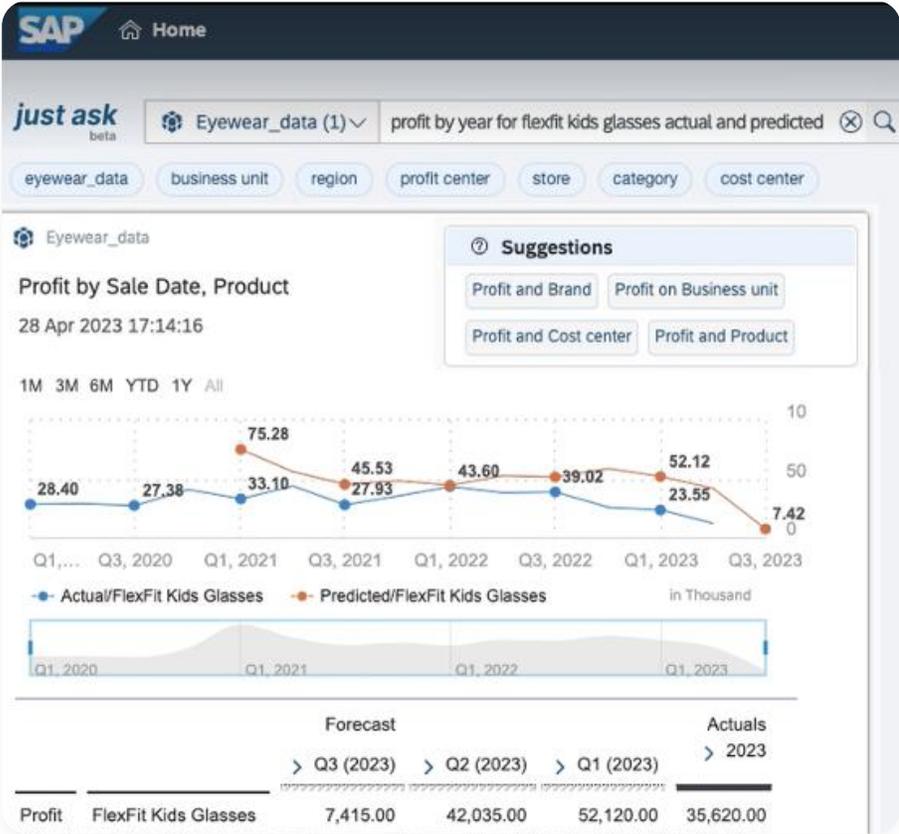


Data compliance and governance
by processing data locally



Operations
(installation, software updates, and so on) managed by customer

Data and analytics – AI-powered queries for analytics in natural language



Accelerate

access to relevant insights



Increase

analytics adoption for the 70% occasional users

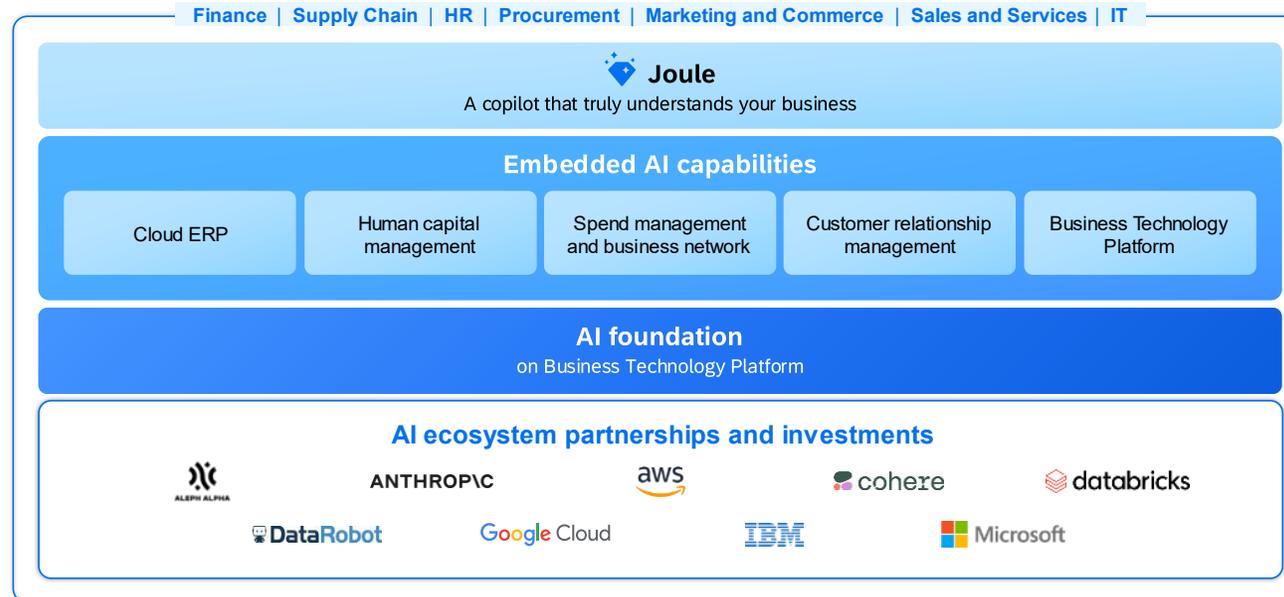


Empower

users to answer their business questions

SAP Business AI approach

Relevant. Reliable. Responsible.



Joule

A digital assistant that provides intelligent insights and fast business outcomes offered with seamless user experience across the entire portfolio.

Embedded AI capabilities

Business Processes

AI optimization based on unique business data and business process context.

Solution Areas

Business capabilities in every solution powered by AI to enable new business models.

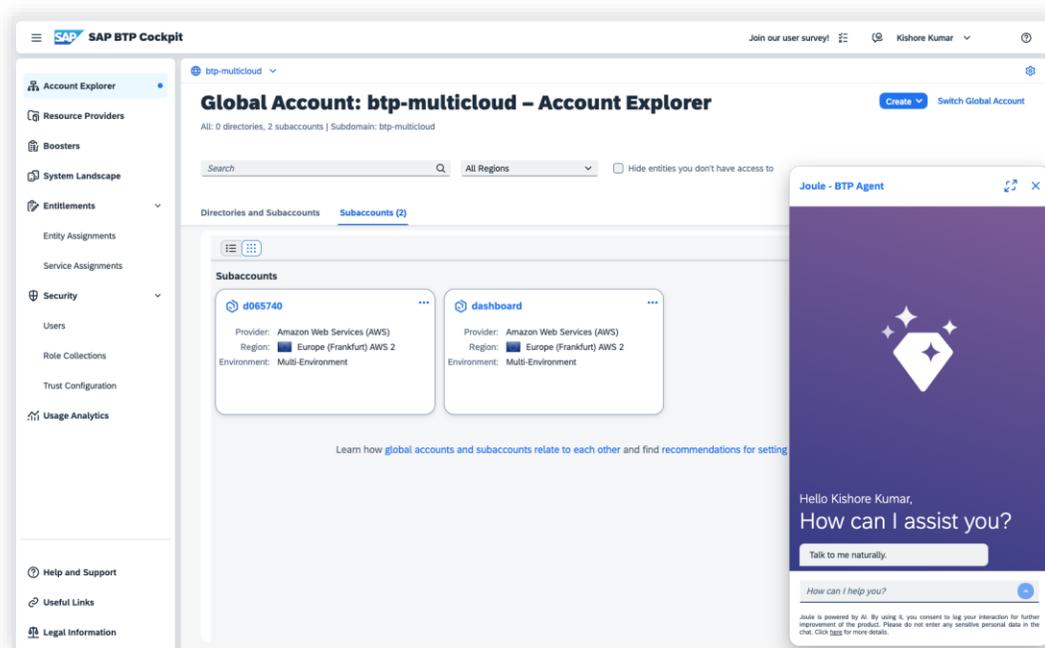
SAP BTP

AI infused in all components, from code development to analytics.

AI foundation on SAP BTP

SAP BTP as the enabler for the development of Generative AI-powered business applications across our ecosystem.

Artificial intelligence – SAP BTP Cockpit: An LLM based AI interface to SAP Business Technology Platform



> 50%
time reduction in SAP BTP Administration



Accessible
interact with SAP BTP from any other SAP Solutions



Empower
users to get faster value from SAP BTP with the help of AI

BTP Runtimes

SAP BTP – Runtime Strategy

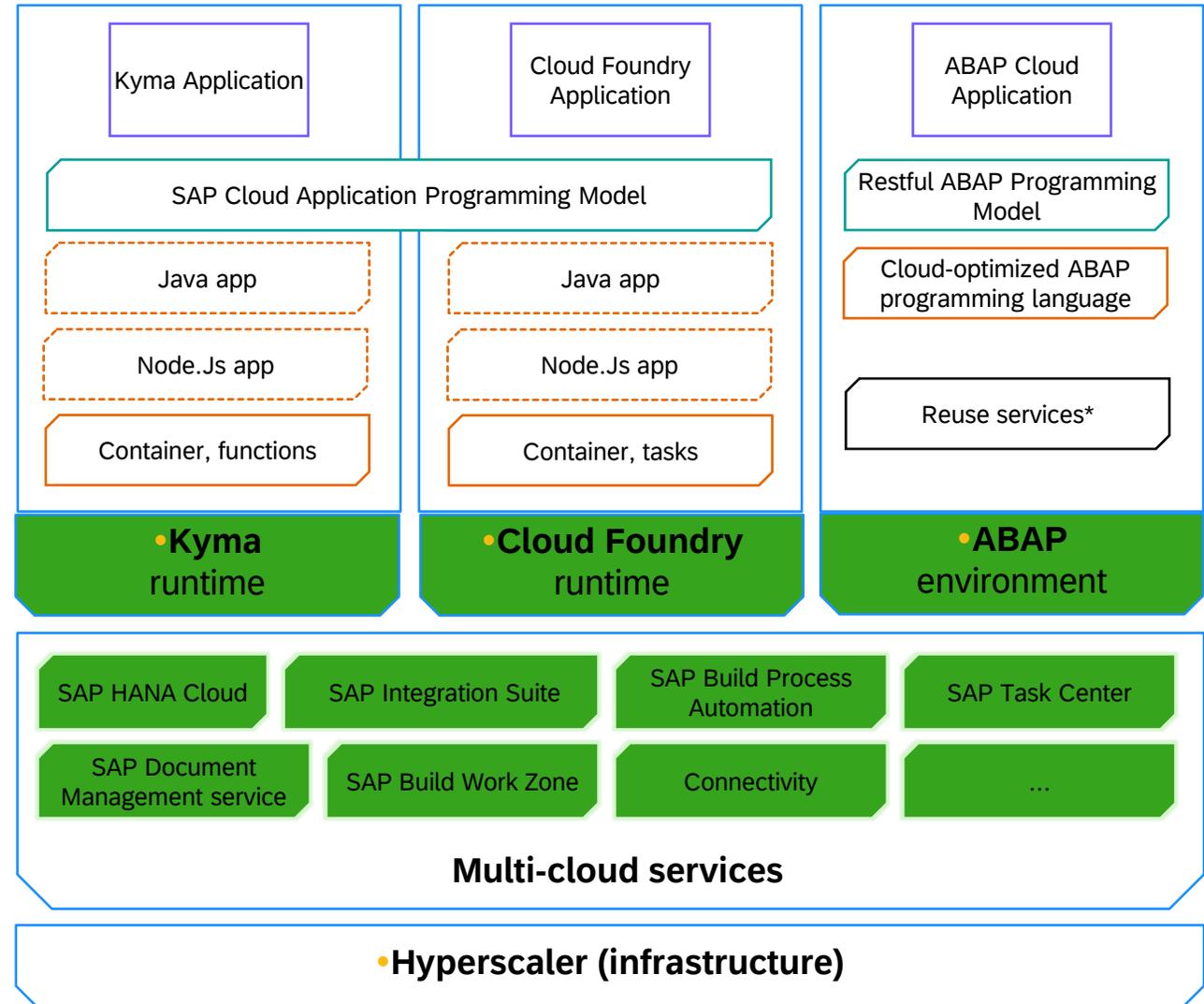
Unified runtime is not “another” environment to “replace” the existing BTP environments.

It is a strategy to streamline the experience on how to develop, build, deploy, and operate applications.



SAP BTP – Runtime strategy in a nutshell

- There are **three strategic runtimes of choice** supported on SAP BTP today:
 - ABAP environment
 - Cloud Foundry runtime
 - Kyma runtime
- The current **services** on SAP BTP can be consumed from the **strategic runtime environments** on SAP BTP.
- SAP is offering **aligned programming models** to abstract from services usage and runtimes where possible.
- **Buildpacks** are being used to ease user experience and portability of workloads.



Archetype following development guidance



Archetype with supported Buildpack



Archetype



Multi-cloud service

Runtime cross-consumption with SAP BTP

Services that are cross-consumable in Cloud Foundry and Kyma as of September 14, 2023*:

AI

- SAP AI Core
- Data attribute recommendation
- Document classification
- Document information extraction
- Business entity recognition
- SAP Translation Hub application

Application development and automation

- SAP Forms service by Adobe
- SAP Document Management service
- UI5 flexibility for key users

Data and analytics

- Object Store on SAP BTP
- SAP HANA Cloud (+instance)
- SAP HANA spatial services
- PostgreSQL, Hyperscaler Option (@AWS) (+instance)

Foundation and cross-services

- SAP Alert Notification service for SAP BTP
- SAP Audit Log service
- SAP Authorization and Trust Management service (+instance)
- SAP Cloud Transport Management service
- SAP Content Agent service
- SAP Continuous Integration and Delivery service
- SAP Credential Store service (+instance)
- SAP Data Privacy Integration service
- SAP Event Broker for cloud solutions from SAP (+instance)
- SAP Feature Flags service
- SAP HTML5 Application Repository services for SAP BTP
- SAP Job Scheduling service

- SAP Cloud Identity Services, Identity Authentication service
- SAP Cloud Identity Services, Identity Provisioning service
- SAP Malware Scanning service
- SAP Personal Data Manager service
- SAP Print service
- SAP Data Retention Manager service
- SAP Omnichannel Promotion Pricing solution
- SAP Service Manager service
- SAP Usage Data Management service for SAP BTP

Integration

- SAP Integration Suite (Cloud Integration, API Management)
- SAP Connectivity service
- SAP Destination service
- SAP Event Mesh capability
- SAP Master Data Integration service

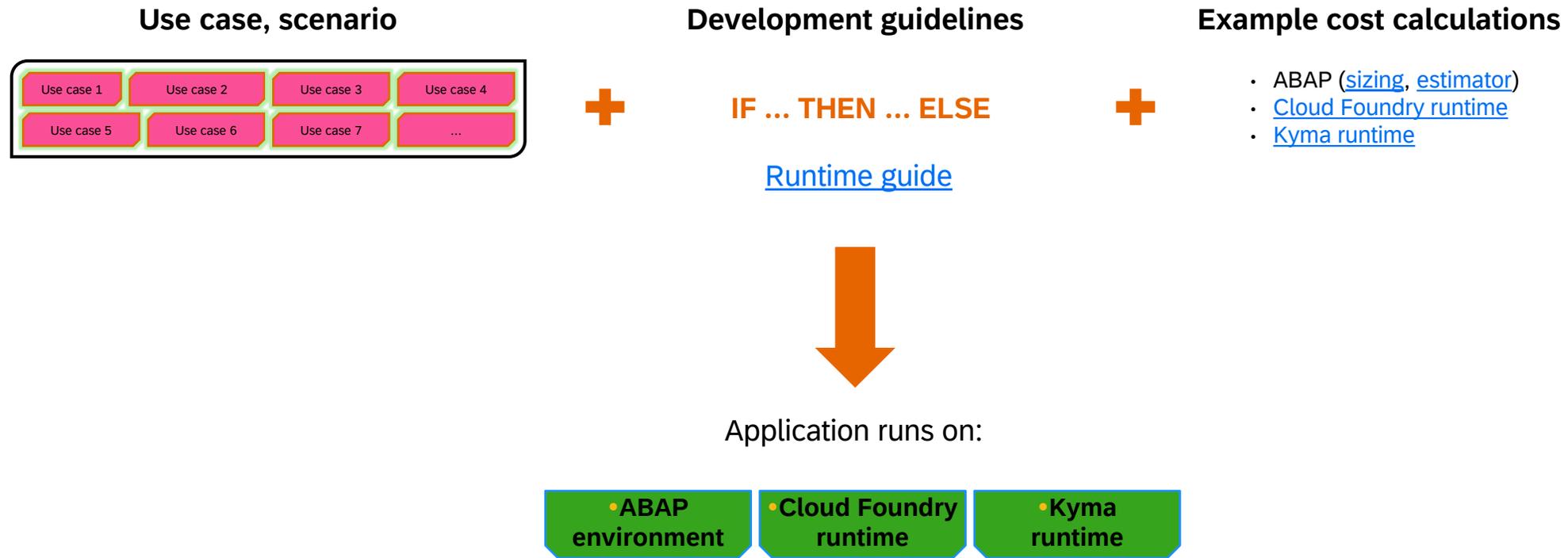
Services not considered for cross-consumability enablement:

- Services that are categorized as **applications** and don't offer any **APIs** exposed through **SAP Service Manager** (for example, SAP Business Application Studio)
- Services that **directly relate to a dedicated runtime** (for example, Application Autoscaler service)
- Services **exclusively** running on **SAP BTP, NEO environment** (for example, SAP ASE service)
- **Deprecated** services (for example, Service Ticket Intelligence business service)

*As listed in [SAP Discovery Center Service Catalog](#). Cross-consumable services are deployed and run on Cloud Foundry or on dedicated K8S clusters and can be provisioned and consumed from extensions and apps built on SAP BTP, Kyma runtime.

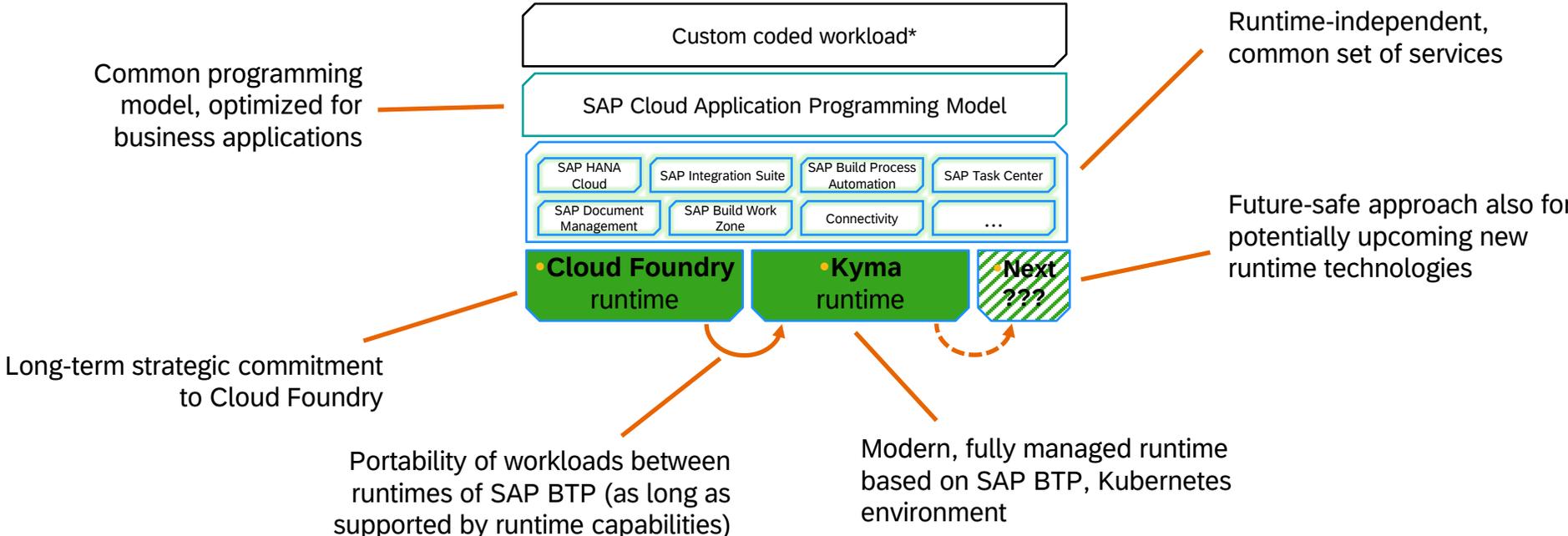
Runtime choice: Supporting your runtime decision

Decide on the right runtime based on your individual situation and driven by your business scenarios



Business continuity versus innovative technologies for cloud-native applications

Continuous, **stable operations** of cloud-native custom developed business solutions **while** allowing to **innovate based on latest runtime technology**



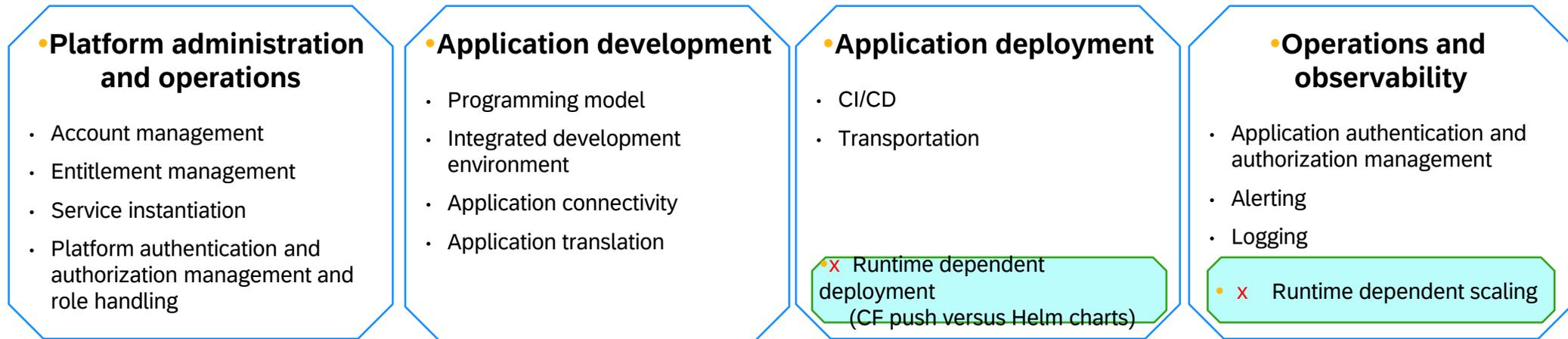
Long-term technology support + **Modern innovative technologies** + **Easy solution portability** = **Future-proof business application platform**

*As introduced in missions for [Cloud Foundry](#) and [Kyma](#) runtimes

Unified security, operations, and observability

SAP BTP offers **runtime-independent**, unified **concepts, tools, and approaches** for **administration, security, development, operations, and observability**

Unified user experience



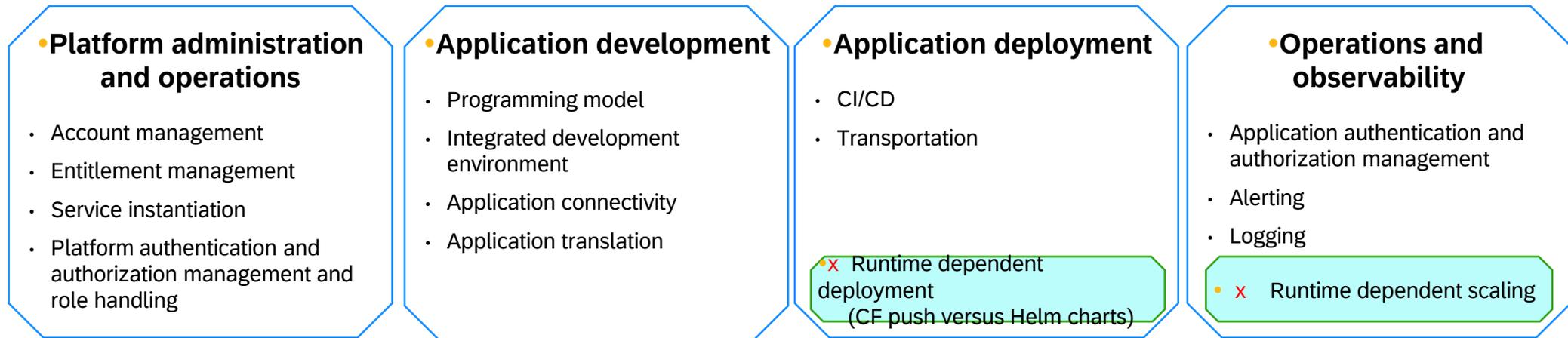
Unified automation

SAP BTP cockpit	SAP Cloud Application Programming Model	SAP Continuous Integration and Delivery	SAP Authorization and Trust Management service
SAP BTP – CLI	SAP Business Application Studio	SAP Cloud Transport Management	SAP Alert Notification service
SAP BTP – API	SAP Connectivity service and SAP Destination service	Project “Piper”	SAP Cloud Logging service
SAP Service Manager	SAP Event Broker for cloud solutions from SAP		SAP Audit Log service
SAP Cloud Identity Services	SAP Translation Hub		SAP Custom Domain
			SAP Feature Flags
			SAP Cloud Identity Services

Unified security, operations, and observability

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Unified user experience

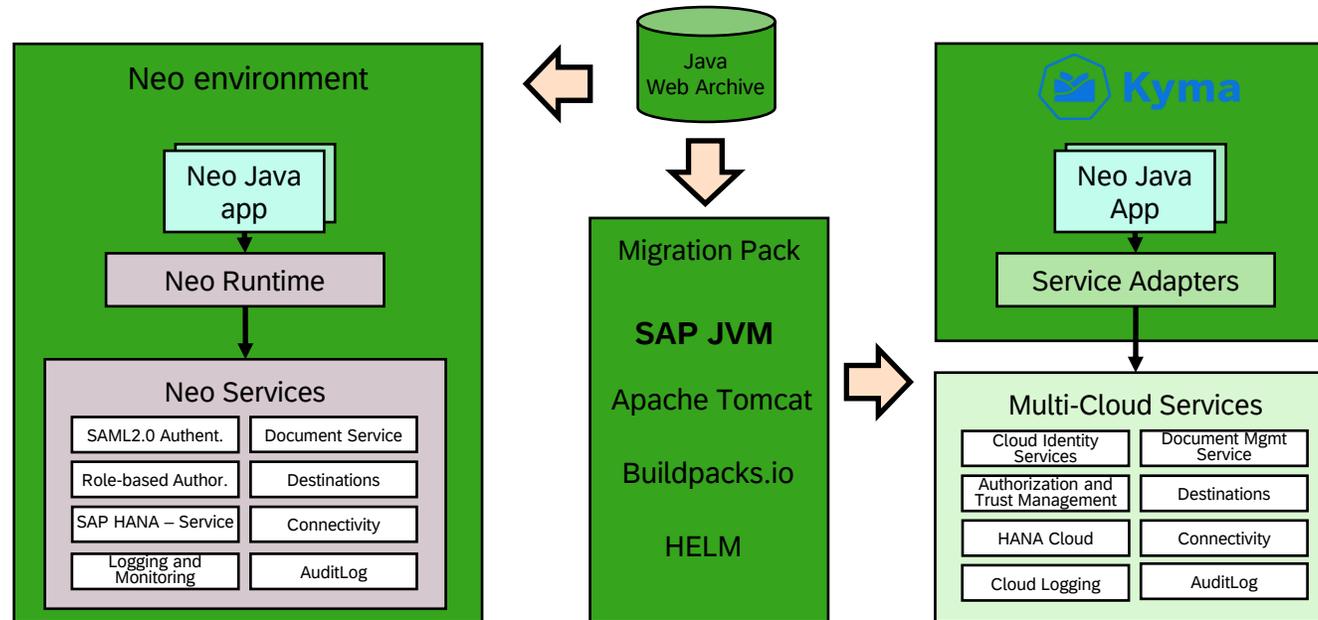


Unified automation



A Word on Neo: Migrating Java workloads from Neo environment to Kyma runtime

Migration package for Java on SAP BTP enables migration of Java applications from Neo environment to Kyma runtime and multi-cloud services without code modification



Available under
Test and
Evaluation
Agreement (TEA)*

- Provides a **cloud-native buildpack** to assemble JVM (SAP), Apache Tomcat, multi-cloud service adapter libraries and your app binaries to an OCI compliant container image
- Provides **migration assistant** tool to identify and translate Neo service usage to multi-cloud service subscriptions
- Provides a **Helm chart for deploying** your Neo Java app in a Kyma cluster

SAP Business AI

AI adoption is accelerating in the industry

Generative AI could add **US\$2.6 trillion to \$4.4 trillion** incremental value annually to the global economy

Existing productivity value from previous generation of AI and analytics

Widespread adoption, despite early days

1/3

Of companies globally are using generative AI regularly in at least one business function

40%

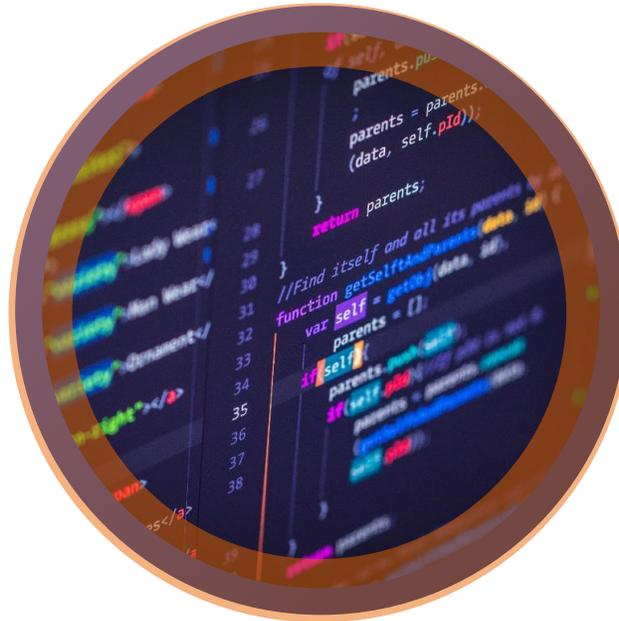
Of organizations will increase their investment in AI overall because of advances in generative AI

60%

Of organizations with AI adoption are using generative AI

The future with SAP Business AI

The most important business insights delivered with perfect clarity



Employee productivity augmented to deliver improved outcomes

Entirely new processes generated to transform business performance



SAP Business AI – Approach

Relevant | Reliable | Responsible



Joule

A copilot that truly understands your business

Embedded AI capabilities

Cloud ERP

Human capital management

Spend management and business network

Customer relationship management

Business technology platform

AI foundation

on SAP Business Technology Platform

AI ecosystem partnerships and investments



ANTHROPIC



cohere

databricks

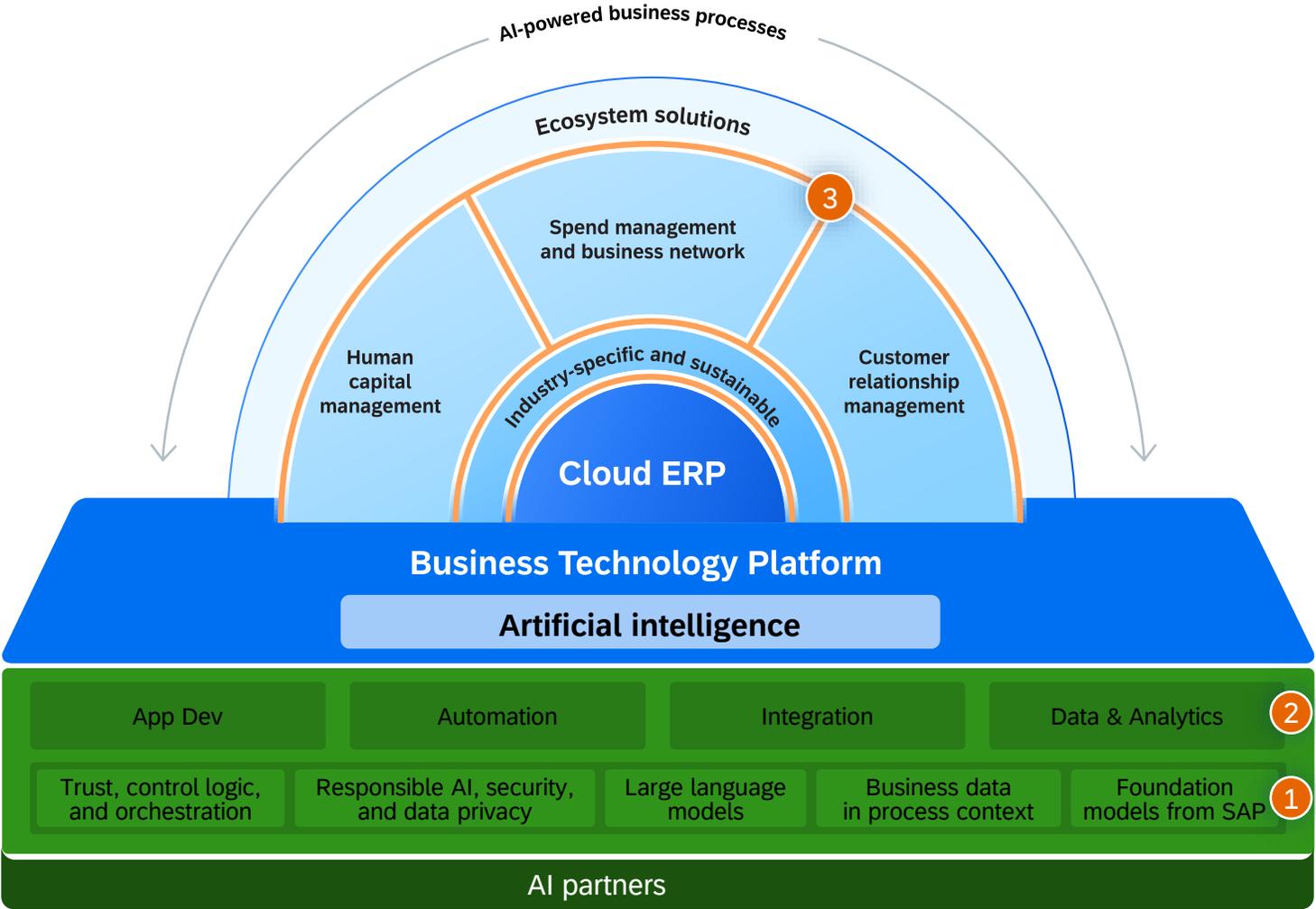
DataRobot

Google Cloud



Microsoft

Generative AI platform capabilities



Generative AI from SAP

Enabling SAP solutions and partner applications to leverage the power of generative AI

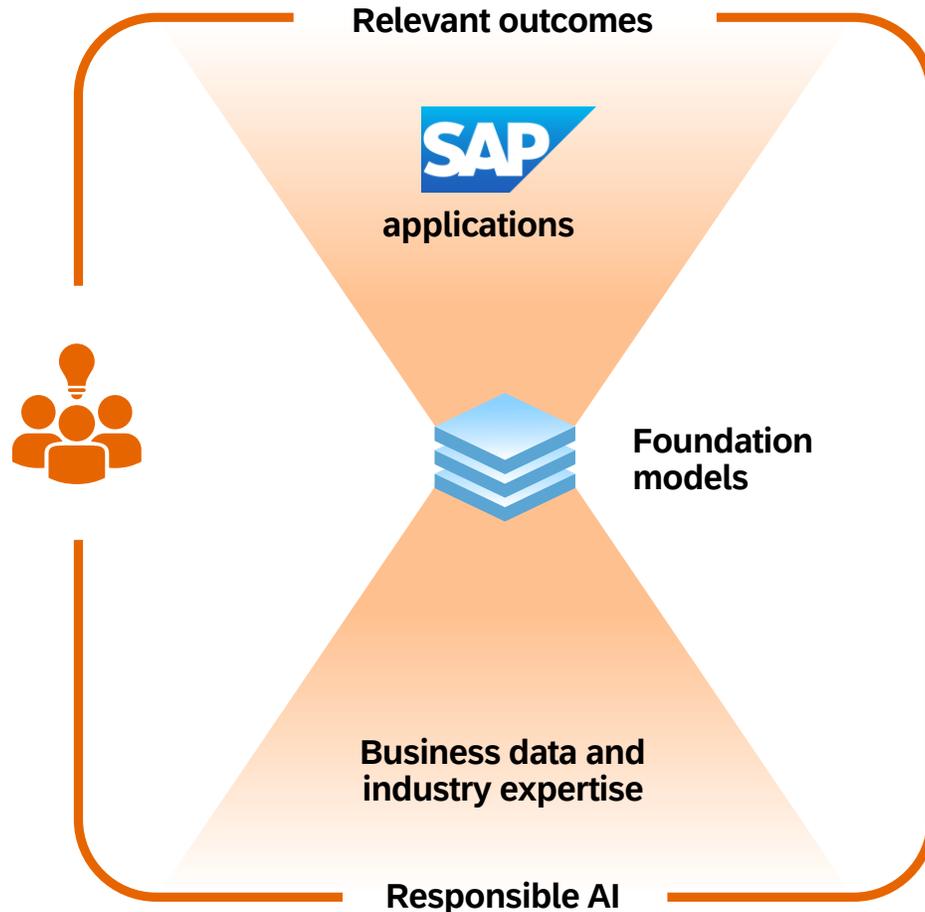
- 1 Provide trusted, compliant, and enterprise-ready **integration with generative AI partner models** and provide capabilities based on SAP data following the SAP AI Global Ethics guidelines
- 2 Provide code generation, automation, and extensibility based on generative AI
- 3 Infuse AI features and process innovations across all SAP solutions and partner applications based on generative AI services provided by SAP BTP

AI partner technologies

Integrate the open ecosystem of general purpose AI



SAP's approach for generative AI



- SAP combines the power of **generative AI with the context of business data and business processes** and applies fine-tuning and prompt engineering at scale. This allows SAP to turn otherwise generic results into ones that are tailored to your business. These results are built into the SAP applications that business users use every day.
- SAP **keeps humans in the loop responsibly** to review and approve generated information.
- SAP's use of **generative AI follows the same principles of its use of business AI**. The same rigorous development and responsible AI review processes are applied to both.

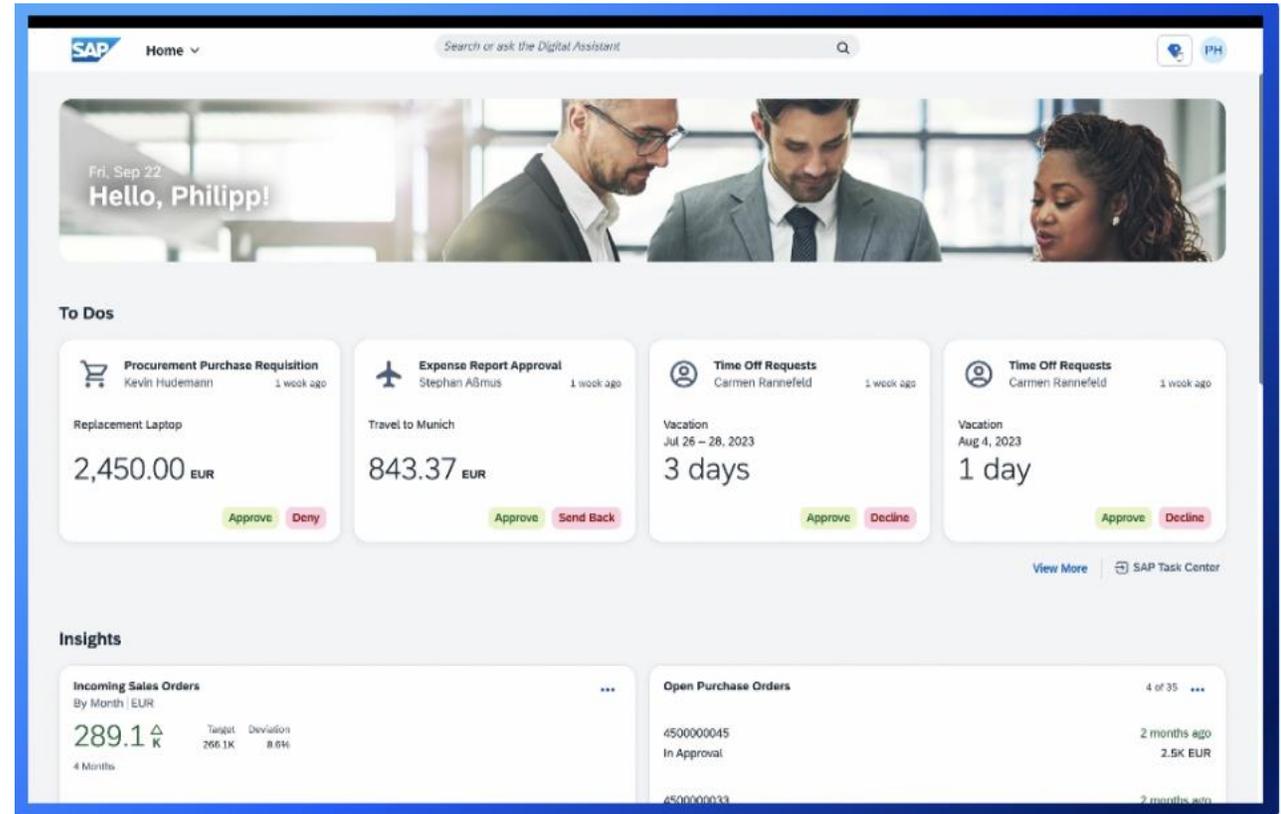
Joule

Work faster with an AI copilot that truly understands your business.

Benefit from smarter insights and quick answers on demand.

Achieve better outcomes when creating content, code, and more.

Maintain full control over decision-making and your data privacy.



Joule

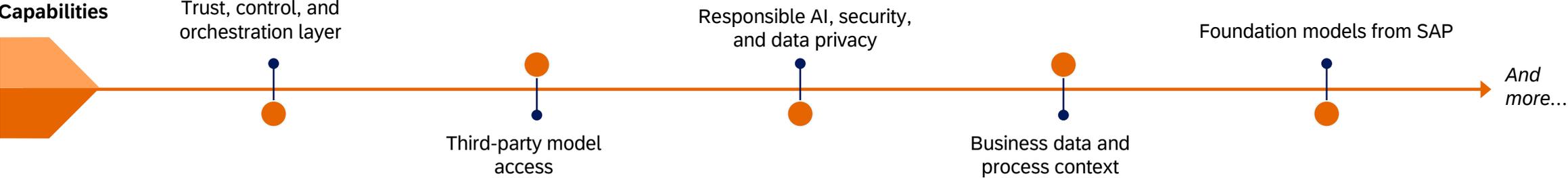
Note: Planned availability in SAP business applications at different times, starting with SuccessFactors and SAP Start in Q4 2023.

Generative AI foundation on SAP BTP

Explore, deploy, and control models with the flexibility to choose the best for the task.

Tailor results safely based on your data and minimize adverse effects.

Contextualize data and process information.



Get started with SAP Business AI



Speak with an SAP expert about accelerating your AI journey with the RISE with SAP solution and other solutions



Deep dive into the [AI road map](#)

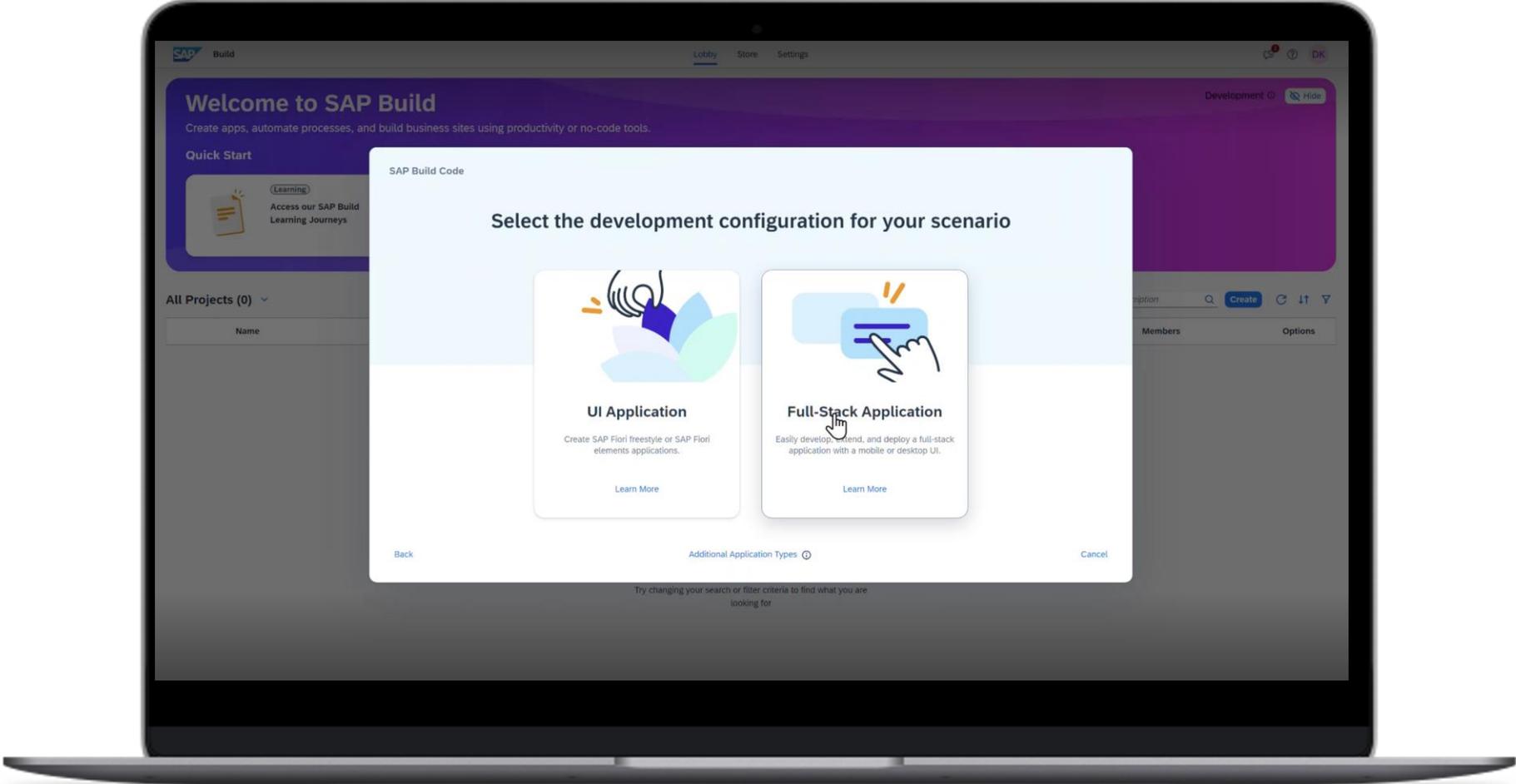


Explore more on sap.com/ai

SAP Build Code

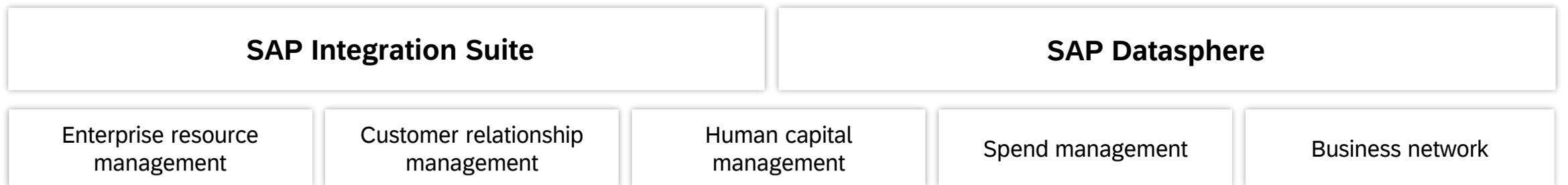
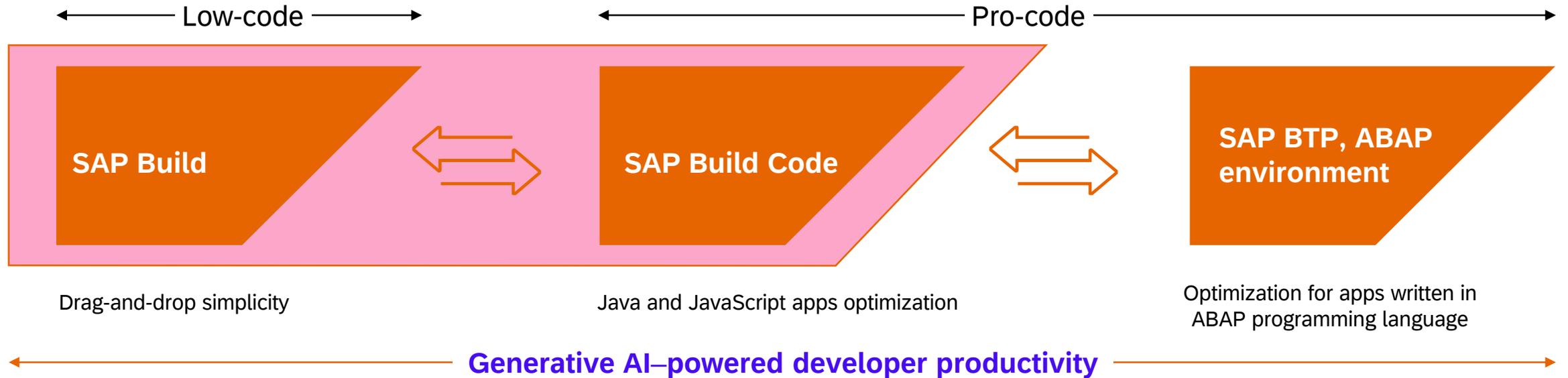
SAP Build Code

Generative AI-powered application development, optimized for Java and JavaScript developers



Application development and automation on SAP BTP

Integrated solutions enabled by generative AI



SAP Build Code

AI code generation with Joule copilot, optimized for Java and JavaScript application development

Build rapidly with AI code generation



Generative AI-powered app development

Turnkey environment for coding, testing, integrations, and application lifecycle management

Guided experiences and prebuilt templates to quickly build full-stack, back-end, and mobile apps

Gain tailored functionality for SAP solution development



Prebuilt integration with SAP and third-party solutions

Trusted, enhanced security for authentication, authorization, and data protection

Extensibility for SAP S/4HANA and other solutions

Enhance fusion development

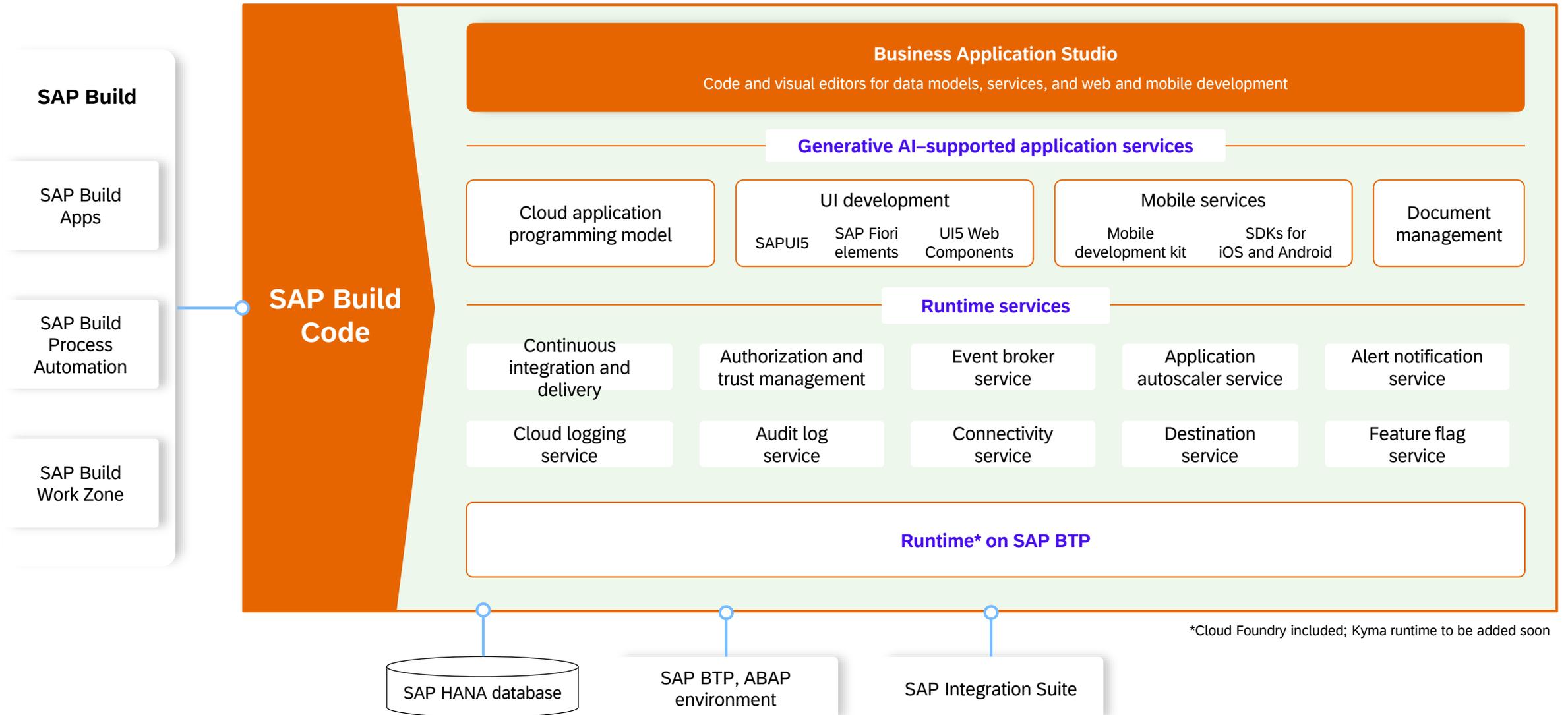


More-secure collaboration between professional and citizen developers

App composability across SAP Build and ABAP-developed solutions

Unified governance and simplified application lifecycle management

SAP Build Code: What you need to follow best practices of SAP



Simplified and guided development

Turnkey development environment with built-in runtime, design time, DevOps, and lifecycle management



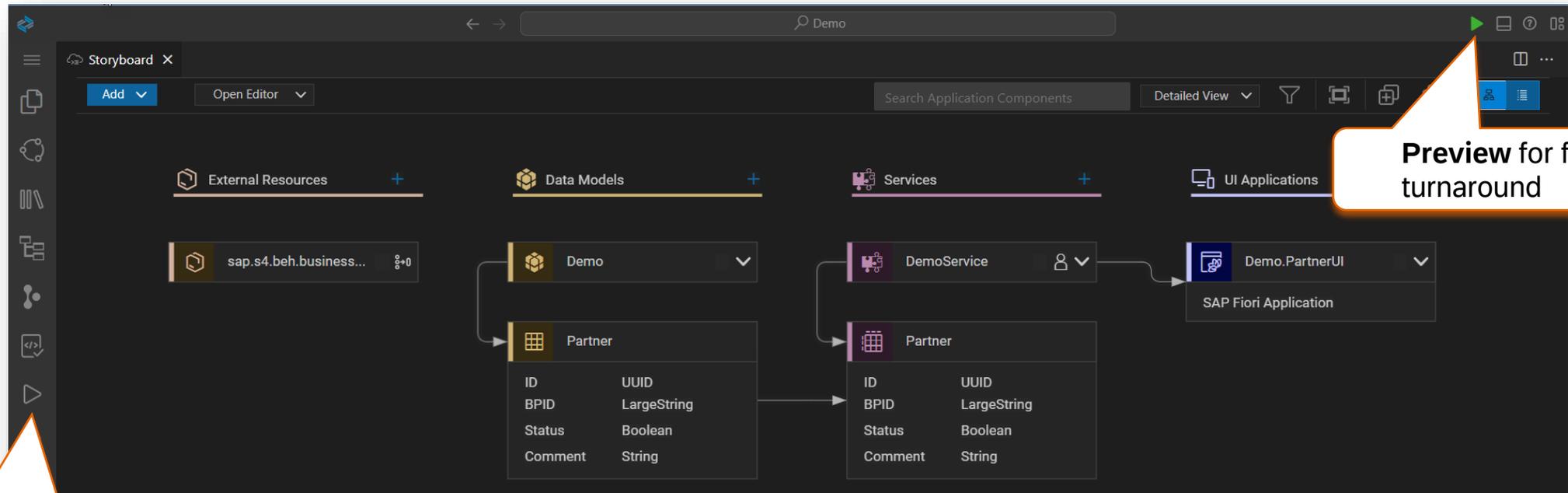
Guided development to quickly build SAP Fiori apps, mobile apps, and full-stack applications

Built-in guidance and best practices of SAP for developers to create enterprise-grade applications

Ability to leverage programming language of choice (Java, JavaScript) and use Visual Studio code if preferred

High-productivity environment for developers

Unified development experience for SAP applications and extensions



Preview for fast turnaround

One-click provisioning, preview of sample data or real back-end data, and deployment

Overview of all project assets

- Data models and services of SAP Cloud Application Programming Model
- SAP Fiori elements applications
- Mobile development kit apps
- External services like APIs for SAP S/4HANA

High-productivity environment for developers

Choice of UI application types for Web and mobile: SAP Fiori elements and mobile development kit

UI Application Type

What kind of application do you want to create? *

Template-Based, Responsive Application

Create a browser-based application with standard yet extensible floorplans, runs on desktop and mobile. It is derived from your data structures and metadata, automatically

[More Information](#)

Mobile-Centric, Freestyle Application

Create an application to run natively on mobile (Android & iOS) with device specific features such as biometric authentication and barcode scanning. It also runs on desktop browsers.

[More Information](#)

[Back](#) [Next](#)

• **SAP Fiori elements apps**
Responsive, work on all devices but optimized for desktop

• **MDK apps** Responsive, work on all devices but optimized for mobile

Page Editor - PartnerUI

Page Map

PartnerObjectPage

- Header
 - Actions
 - Header Sections
- Page Layout
- Sections
 - General Information
 - Form
 - Actions
 - Fields
 - BPID
 - Status
 - Comment
- Footer

Status
Value: Status Type: Boolean

Label Annotation
Define text to be displayed as a field label.
Status

Hidden Boolean Annotation
Define if this field should be hidden in the application UI. You the boolean property to serve as hiding condition in the Hide field below
 Element is always displayed.

Text Annotation
Choose string property describing field value. It will be display instead of the field value depending on the value of the Text A property.
None

Text Arrangement Annotation
Set text position relative to the field value. When set to none, positioning will be used as designed in SAP Fiori elements run

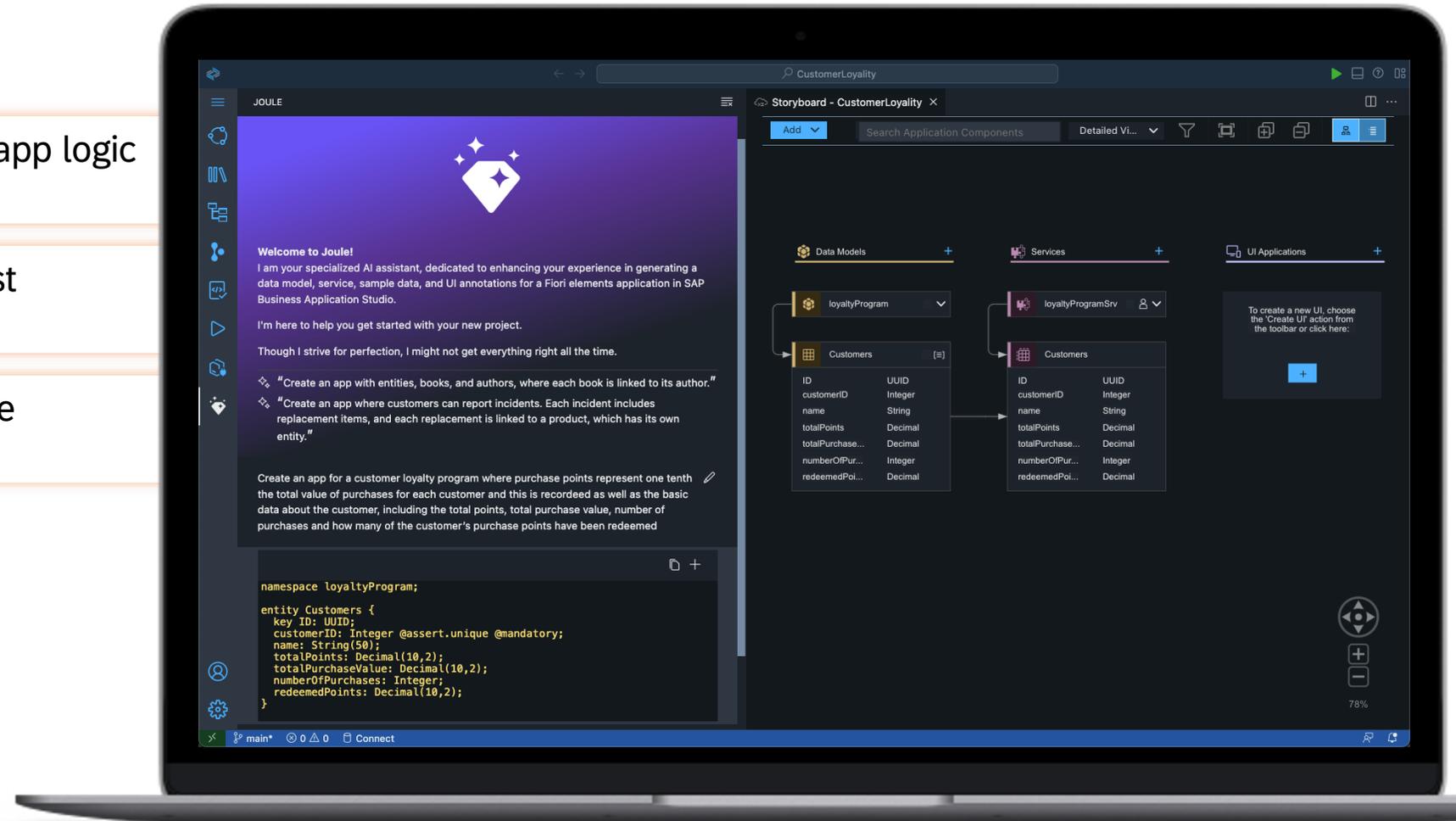
• **Page map for SAP Fiori elements apps**
No manual writing of annotations, lots of configs, for example, for creating value helps

Turbocharging application development with generative AI

AI assistant auto-generation for app logic and data models

Automated generative AI unit test coverage

Contextual application logic code generation based on prompts



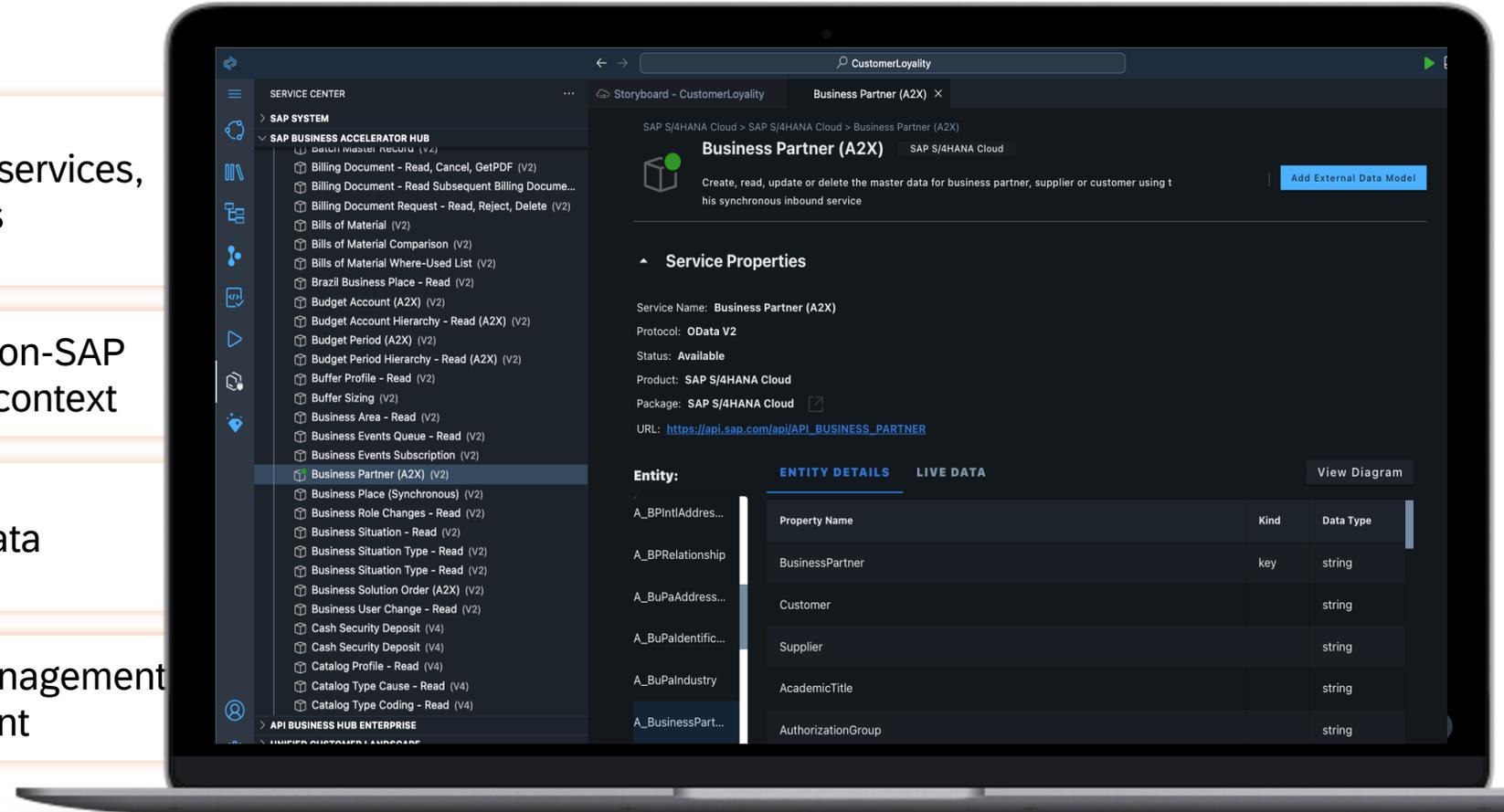
Safe and seamless: Mastering secure and trusted integrations

Discovery and consumption of APIs, prepackaged integrations, business services, and sample apps with SAP Business Accelerator Hub

Prebuilt integrations with SAP and non-SAP applications that maintain business context

Security provided by SAP BTP for authentication, authorization, and data protection

Unified IT governance, transport management and application lifecycle management



SAP Build – Lobby facilitates fusion development

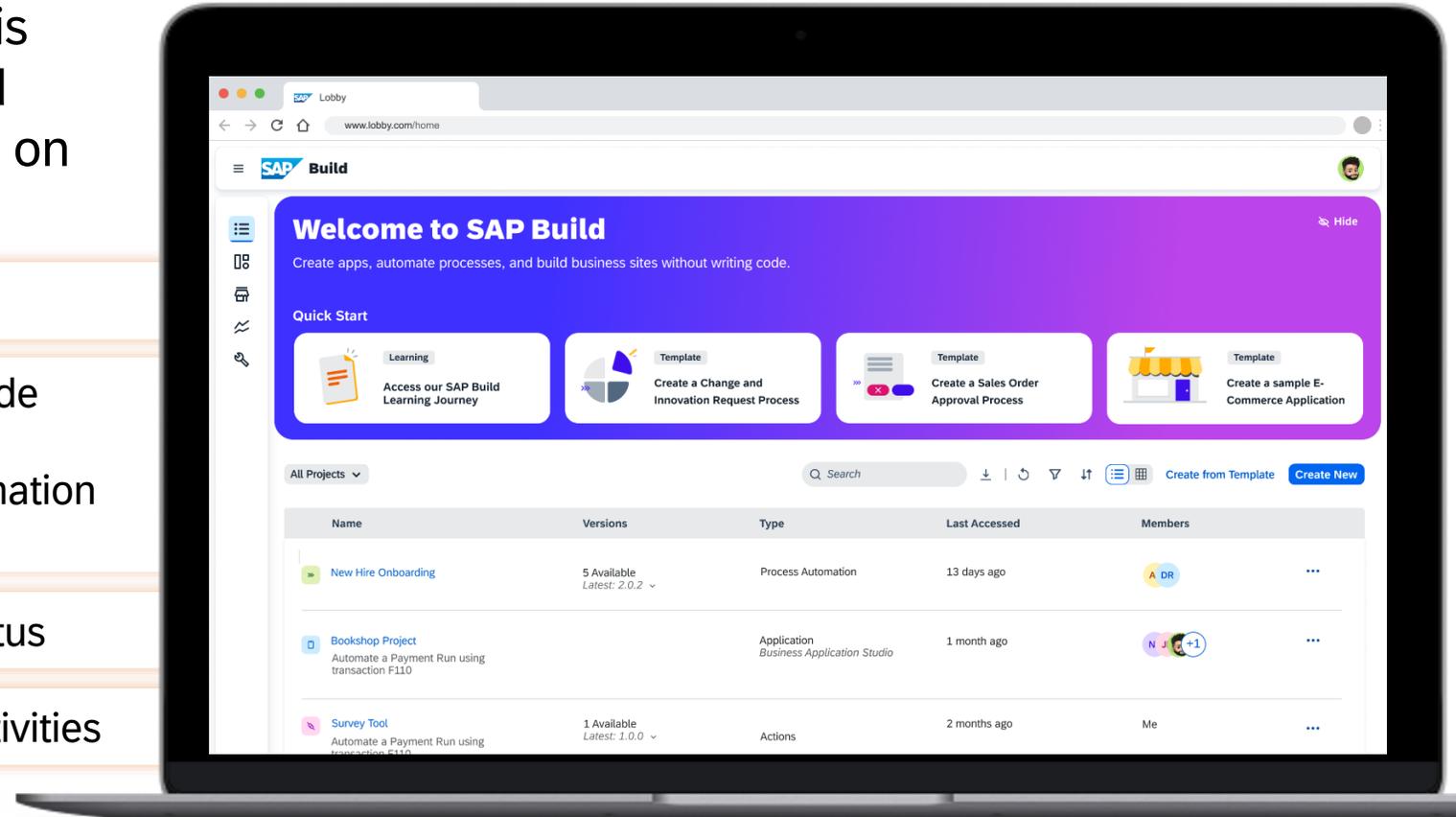
The lobby for SAP Build solutions is the **entry point for all citizen and professional developers** building on SAP BTP.

Use unified lobby for app composability

Consume components created with pro-code solutions in SAP Build Apps development environment, the SAP Build Process Automation solution, and SAP Build Work Zone

View and manage applications pipeline status

View and manage projects source-code activities



SAP Build Code

Key extension use cases for SAP software systems



Extend SAP solutions



Build SAP Fiori apps with
SAPUI5 and SAP Fiori elements



Build cross-platform
mobile apps



Develop native applications
on SAP HANA



Build multitenant SaaS
applications

SAPUI5 and SAP Build Code

SAP Fiori design system continues to evolve

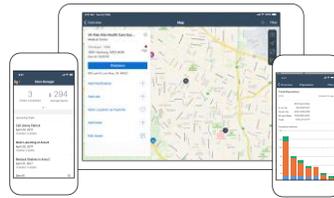
Casual users
Self-service apps



Desktop user
The new face of SAP S/4HANA



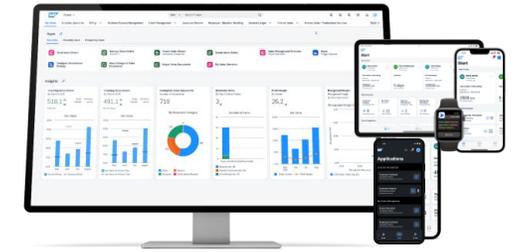
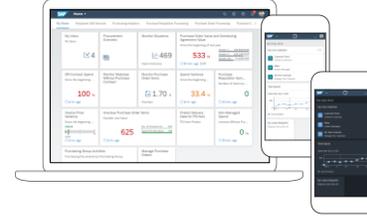
Native mobile
for iOS and Android



Conversational



Next steps of the evolution of SAP Fiori UX
SAP Fiori UX with Quartz theme SAP Fiori UX with Horizon theme



Consistent ----->
Intelligent ----->
Integrated ----->
Collaborative ----->

2013

SAP Fiori UX

2016

SAP Fiori UX 2.0

2019

SAP Fiori UX 3

2022+

SAP Fiori UX with the Horizon theme

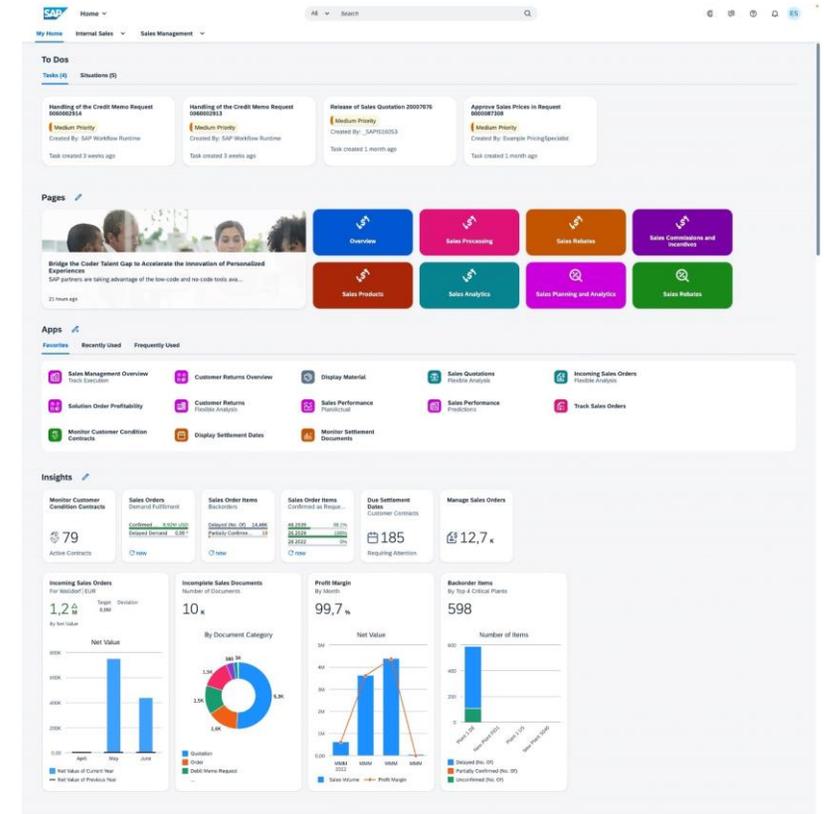


[Improvements Coming to the Horizon Visual Theme for SAP Fiori](#)

SAPUI5 for building modern Web applications

SAPUI5 is an HTML5 framework for creating cross-platform, enterprise-grade applications

- **Consistent UX:** SAP Fiori design system
- **Used anywhere:** responsive apps
- **Hundreds of enterprise UI elements** to build professional UIs
- **Accessibility, internationalization, security . . .** ready to use
- **Adaptable standard apps** without coding
- **Easy for any developer:** tools to build, test, and deploy
- **Innovations:** no effort to get innovations, upgrade-compatible



[SAPUI5 – Demo Kit](#)

[Video: What is SAPUI5?](#)



SAPUI5 is innovating with feedback from large-scale usage

2,150+

SAPUI5 apps with millions of users in SAP S/4HANA

18M+

unique users of SAPUI5 in SAP SuccessFactors

1,110+

SAP S/4HANA Cloud customers using SAPUI5 apps productively

SAPUI5 in

SAP Business Technology Platform
SAP Integrated Business Planning for Supply Chain
SAP Business ByDesign
SAP Build Work Zone, standard edition
SAP S/4HANA Cloud
SAP Fiori launchpad
SAP Analytics Cloud
SAP Business One
SAP Cloud ALM
SAP Work Zone
SAP S/4HANA
SAP for Me
SAP IT
...

14M+

Unique users of SAP Web Components in SAP SuccessFactors solutions

Web components

SAP Business Technology Platform
SAP S/4HANA
Procurement

2,000+

SAP BTP customers building SAP Fiori apps in SAP Business Application Studio

Design

Bringing the SAP Fiori design system

Partner

Enabling a thriving partner ecosystem

Open source

Growing developer community

UI5 Web Components

Using SAPUI5 capabilities in any HTML programming model

Native HTML

add

Hello

- Apples
- Oranges
- Bananas

```
<body class="sapUiBody">
  <h2>Native HTML</h2>

  <button>add</button><br>
  <input placeholder="Hello"></input>
  <ul>
    <li>Apples</li>
    <li>Oranges</li>
    <li>Bananas</li>
  </ul>
</body>
```

UI5 Web Components

+ add

Hello X

Apples

Oranges

Bananas

```
<body class="sapUiBody">
  <h2>UI5 Web Components</h2>

  <ui5-button>add</ui5-button><br>
  <ui5-input placeholder="Hello"></ui5-input>
  <ui5-ul>
    <ui5-li>Apples</ui5-li>
    <ui5-li>Oranges</ui5-li>
    <ui5-li>Bananas</ui5-li>
  </ui5-ul>
</body>
```



UI5 Web Components
[home page](#)

UI5 Web Components for any programming model

UI5 Web Components



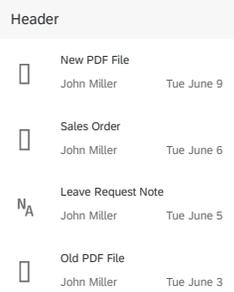
ui5-card



ui5-datepicker



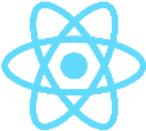
ui5-combobox



ui5-list



Programming models



React



Angular



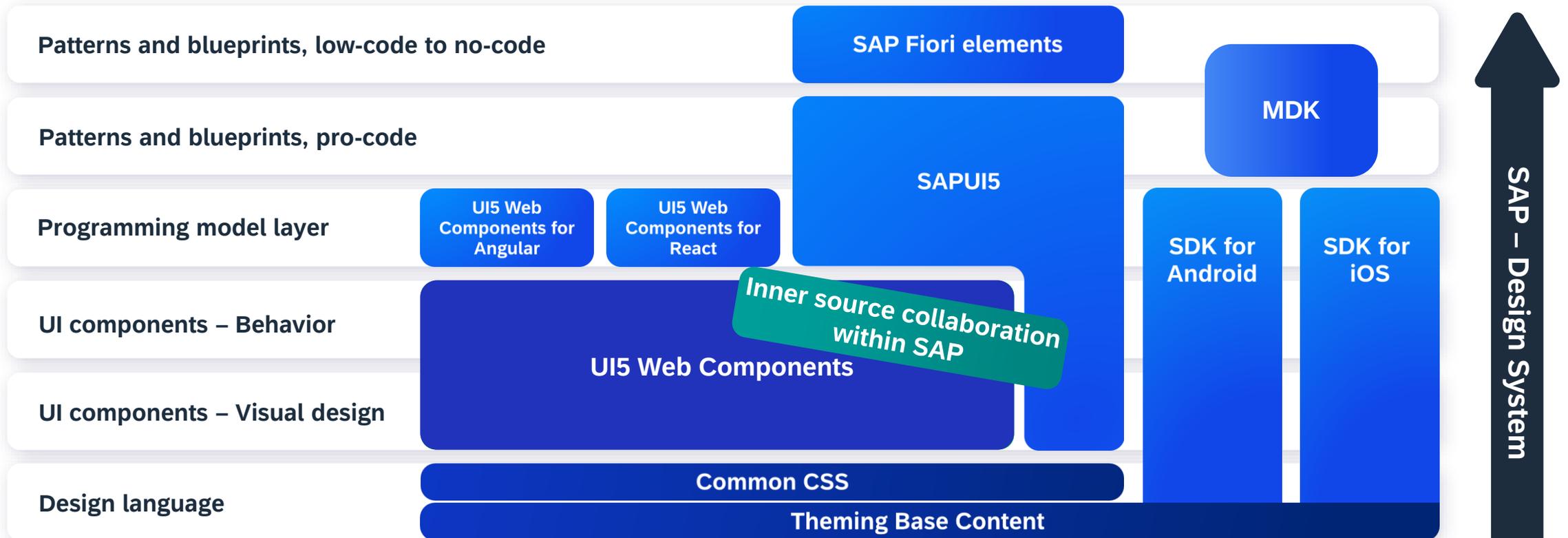
VueJS

UI5 Web Components are not a successor of SAPUI5, they are complementary.



UI5 Web Components [home page](#)

Strategic Web UI technologies



- Application development
- Framework development

SAPUI5

Integration cards expose application content in a consistent and unified way

UI integration with cards allows users to:

- Embed cards in different host environments, such as applications, dashboards, or HTML pages
- Use a variety of available card types
- Configure cards with a simple JSON configuration – No need to write code
- Create cards according to their needs, regardless of coding ability



[Card explorer](#): Learn, explore, and integrate cards



[UI5 Integration Cards in SAP Build Work Zone, advanced edition](#)

The screenshot displays the SAPUI5 Card Explorer interface. The main heading is "UI Integration with Cards". Below it, a sub-heading reads: "The new way for developers, key users, and end users to create and share business content in an easy, declarative, and consistent way." A prominent blue button labeled "Open Card Explorer" is visible. The interface features several floating cards: a "Travel Budget" card showing a bar chart with a target of 50k and a current value of 20.2k; a "Projected Monthly Revenue" card showing a value of 183.4 MM with a target of 150MM and a deviation of +37.6%; and a contact card for Julie Adams, Executive Assistant at Card Adventure Ltd., including mobile and phone numbers and an email address. A "Quick Links" sidebar is also visible on the right.

Declarative
Based on JSON schema. Design-time and runtime tooling support. Portable to any device and host environment. Rich feature set.

Consistent
SAP Fiori design language and customer theming. Accessible. All enterprise product standards included.

Easy To Consume
UI5, Custom Element and Web Component support. Included JSON-based data consumption. Configurable styling. Speech

SAP Fiori elements

Standard enterprise-ready floorplans increase developer productivity

Variant management

Search

Data lists

Filtering

Sorting

Actions

Personalization

Export to Microsoft Excel

Editing (including draft management)

Navigation

Overview page

Analytical list page

List report page

Object details

Object page

Standard

Manage Sales Orders - Version 2

Search In: "Apps"

Sales Order: Sold-to Party: Customer Reference: Document Date: Requested Delivery Date: Overall Status:

Sales Order Type: Sales Organization: Distribution Channel: Division:

Standard Order... Dom. Sales Or... Direct Sales (10) x Product Divisio...

Go Adapt Fioris (4)

Sales Orders (15.613)

Sales Order	Sold-to Party	Customer Reference	Requested Delivery Date	Overall Status	Net Value	Document ...
5022253	Schmitt Metal Stuttgart (USCU_M1)	0005022253-230920153742.702408	09/21/2023	Open	4.04 EUR	09/20/2023
374911	Tech Bike Corp-W (1000292)	20230920	09/22/2023	Open	261.340,00 USD	09/20/2023
374910	US Specialty Cycles 1 (USCU_S01)	US1	09/20/2023	Completed	565,00 USD	09/20/2023
374909	US Specialty Cycles 1 (USCU_S01)	US1	09/20/2023	Completed	565,00 USD	09/20/2023
374905	US Specialty Cycles 1 (USCU_S01)	US1				
374904	Inland Corp (1000290)	20230920				
374903	Domestic US Customer 1 (17100001)	MB 1				
374902	NK Bikes-S (1000293)	20230920				
374901	NK Bikes-S (1000293)	20230920				
374900	Inland Corp (1000290)	20230920				
374899	Tech Bike Corp-W (1000292)	20230920				
374897	Domestic US Customer 1 (17100001)	00				
374897	US Large Cycles 9 (USCU_L09)					
374896	Symphony Sports Inc (USCU-CUS25)	O2CMRP				
374661	US Specialty Cycles 1 (USCU_S01)	US01				

374900

Standard Order (OR)

Partners: Sold-to Party: Inland Corp; Ship-to Party: Inland Corp

Status: Overall Status: In Process; Overall Block Status: Not Blocked; Incompletion Status: Complete

Net Sales Volume (YTD): 45.972.341,00 USD; Net Value: 700,17 USD

General Information | Items | Prices | Billing Plan | Texts | Status and Blocks | Process Flow | Output Items

Basic Data

Order Data

Sold-to Party: Inland Corp (1000290); Document Date: 09/20/2023; Customer Group: Customer Group 01 (01); Order Reason: -; Requested Delivery Date: 09/22/2023

Ship-to Party Data

Ship-to Party: Inland Corp (1000290); Address: 200 Augusta Ave SE, ATLANTA GA 30315-3402, USA

Advanced Data

Terms and Conditions

Incoterms: Ex Works (EXW); Incoterms Version: No Version; Incoterms Location 2: -; Terms of Payment: As of End of Month (0004); Complete Delivery: No; Order Combination: No

Pricing and Billing

Pricing Date: 09/20/2023; Pricing Procedure: Materials (US) (Y17J01)

Organizational Data

Sales Organization: Dom. Sales Org US (1710); Distribution Channel: Direct Sales (10)

Administrative Data

Created By: SAP System Processing (SAP_SYSTEM); Created On: 09/20/2023, 12:00:02

Flexible programming model blends SAP Fiori elements and freestyle SAPUI5

Using OData V4, developers have a **continuum** of options instead of an either/or decision.

SAP Fiori elements

Metadata-driven development using annotations

Flexible programming model

Freestyle SAPUI5

JavaScript framework and UI library

Support for Typescript

Standard floorplans

Standard floorplans + custom artifacts*

Custom layout* + standard building blocks

Custom layout

Efficiency

Flexibility

*Leveraging standard building blocks and SAPUI5 controls and custom code

[Leverage the flexible programming model to extend your SAP Fiori elements apps for OData V4](#)

[Video series on flexible programming model for SAP Fiori elements](#)

A new library for smart controls: [sap.ui.mdc](#)

- Library for building metadata-driven controls
- Protocol-agnostic architecture for any data protocol, for instance, JSON-based formats such as GraphQL or [FHIR](#) for exchanging [electronic health records](#)
- Support for SAPUI5 flexibility
- Basis of SAP Fiori elements V4

•Open source



[Smart controls – Blog post](#)

Smart	Open	Adaptable
		
Predefined user experience through metadata-driven UI components.	Open for extension through implementable delegates and well-defined APIs for metadata in a unified format.	Adaptable UIs with SAPUI5 flexibility.
Support of the powerful UI5 development concepts and enterprise-ready qualities.	Free and open source with OpenUI5.	Integrated user and key user personalization and support for private, shared, and key user variants.

TypeScript = JavaScript + Types

Released for
productive use in UI5
1.116

Benefits

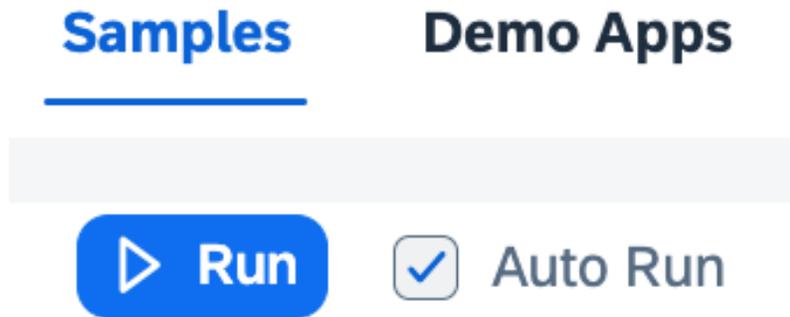
- Code completion
- Error messages while you code
- In-place API reference
- Easier refactoring and maintenance

Getting started

- [Tutorial: App Development in UI5 and TypeScript](#)
- [Blog post: Getting Started with TypeScript for UI5](#)
- [Showcase App](#)
- [TypeScript for UI5: “Yay, it’s official!” – and a round-up of recent changes](#)

```
var someNumber: number;  
  
var otherNumber = 1;  
  
function square(x: number) {  
    return x * x;  
}  
  
type Point = {  
    x: number;  
    y: number;  
};
```

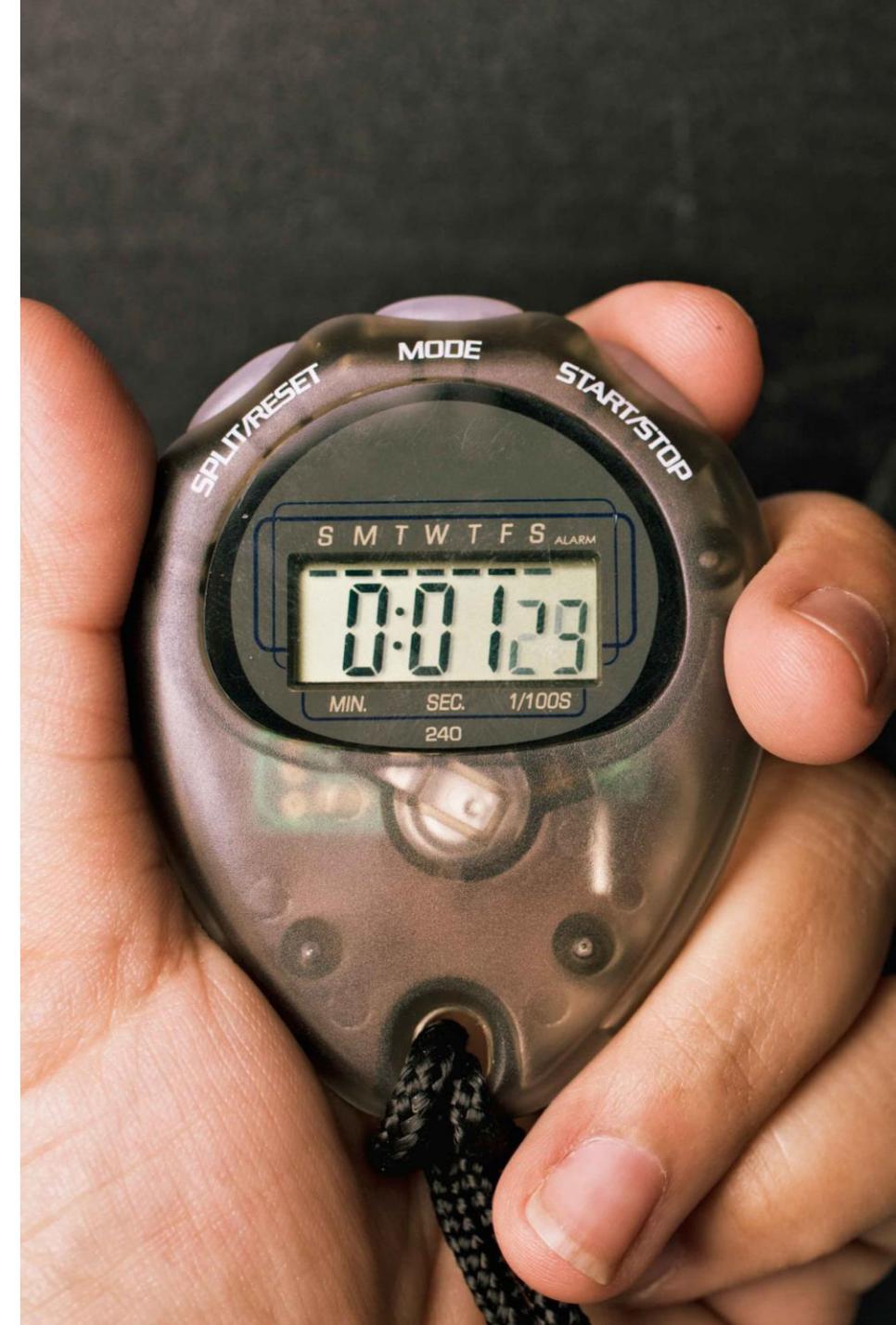
Developer productivity, end user performance



Lightweight bootstrap for improved performance

- Modular core of UI5 is split into modules, loading separately in an **asynchronous way** with the respective UI5 Tooling process support.
- Applications run with the minimum of resources, **loading only what is really needed**.
- Lightweight bootstrap is available with UI5 1.116 and investments are paying off with a drastically improved Google Lighthouse scores.

See [sample apps](#) mentioned in the [SAP Developer News](#).

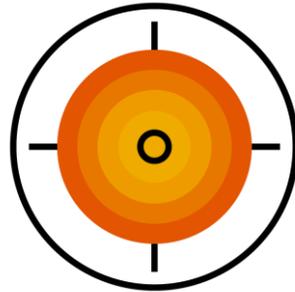


SAPUI5 flexibility

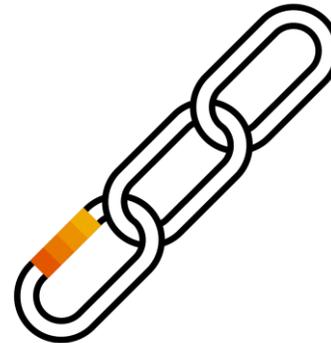
Facilitates a **cost-efficient UI change process** for extending apps



Provides **intuitive low-code/no-code tooling** tailored to the needs of target personas



Ensures **lifecycle-stable and modification-free UI changes** based on deltas



Provides a generic framework capability that allows **massive scales** automatically to all UI5 stakeholder



SAPUI5 flexibility: Personas adapting SAP apps

Developer



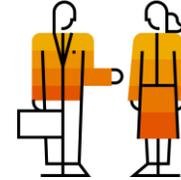
“I **develop** new or change existing apps **for everybody.**”

Key user



“As a **business expert**, I **adapt** apps for **my line of business.**”

User



“I **personalize** apps for **myself.**”



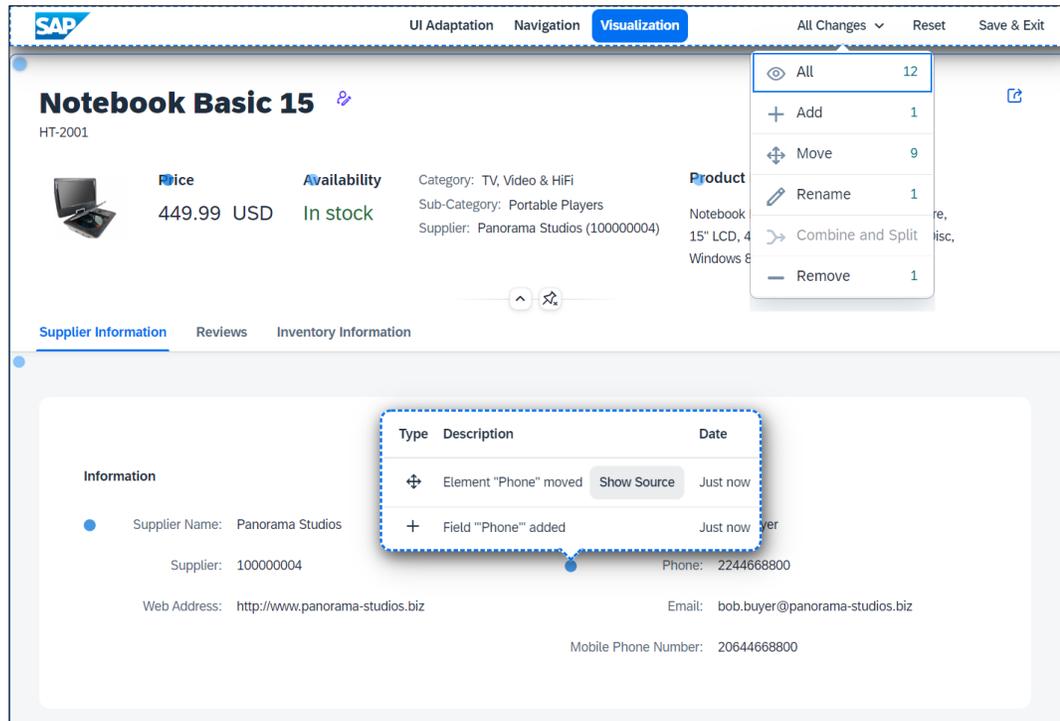
[SAPUI5 flexibility for key users – All you need to know](#)



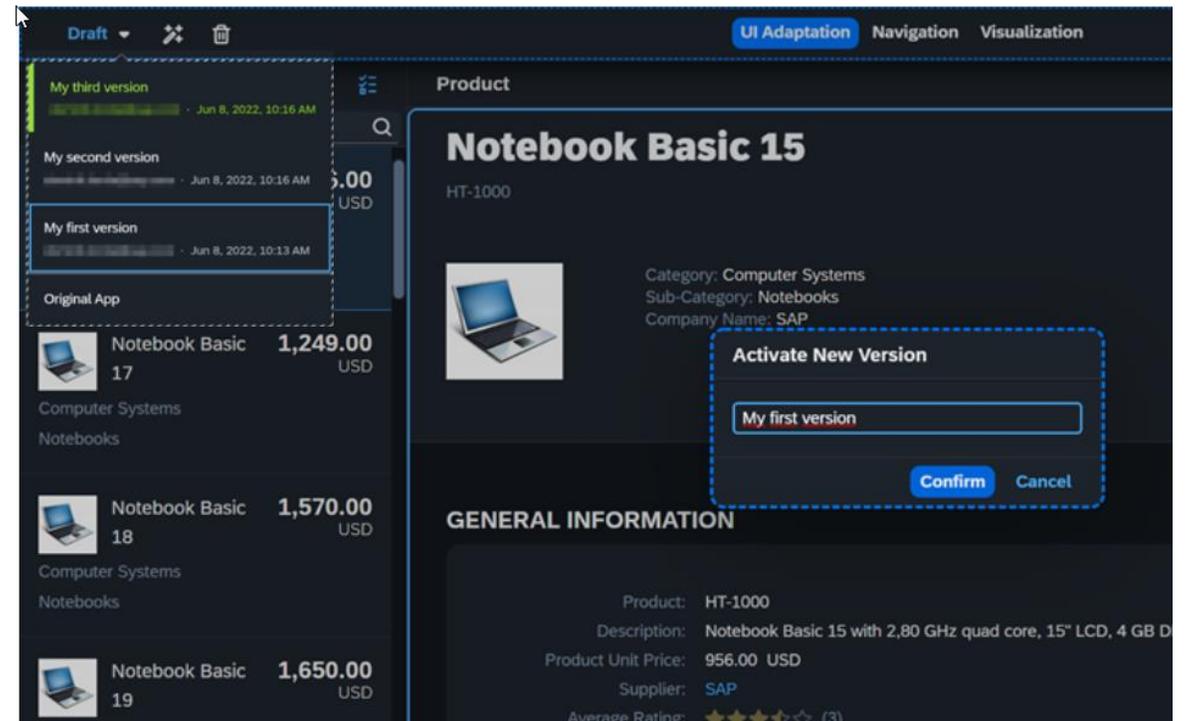
Try it yourself: <https://ui5.sap.com/> > Demo apps > SAPUI5 flexibility for key users – Demo apps

SAPUI5 flexibility: Changes and version history

Key users can **visualize** and manage their changes in an easy-to-understand way.



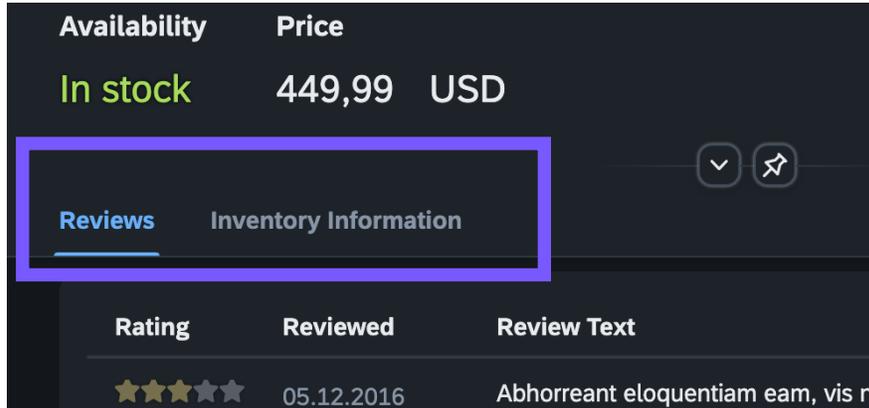
Key users work with **draft adaptations** to activate them once reviewed. A **version history** keeps track of how, when, and by whom the app was changed.



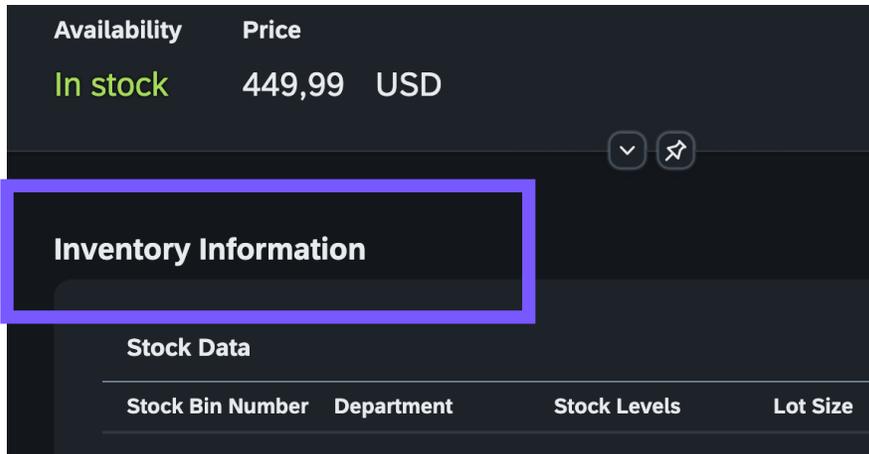
Learn more: [Easily manage your key user adaptations with SAPUI5 flexibility](#) and [Key user adaptation in SAP Build Work Zone, standard edition is available ready to run](#)

Adapting the UI for specific roles

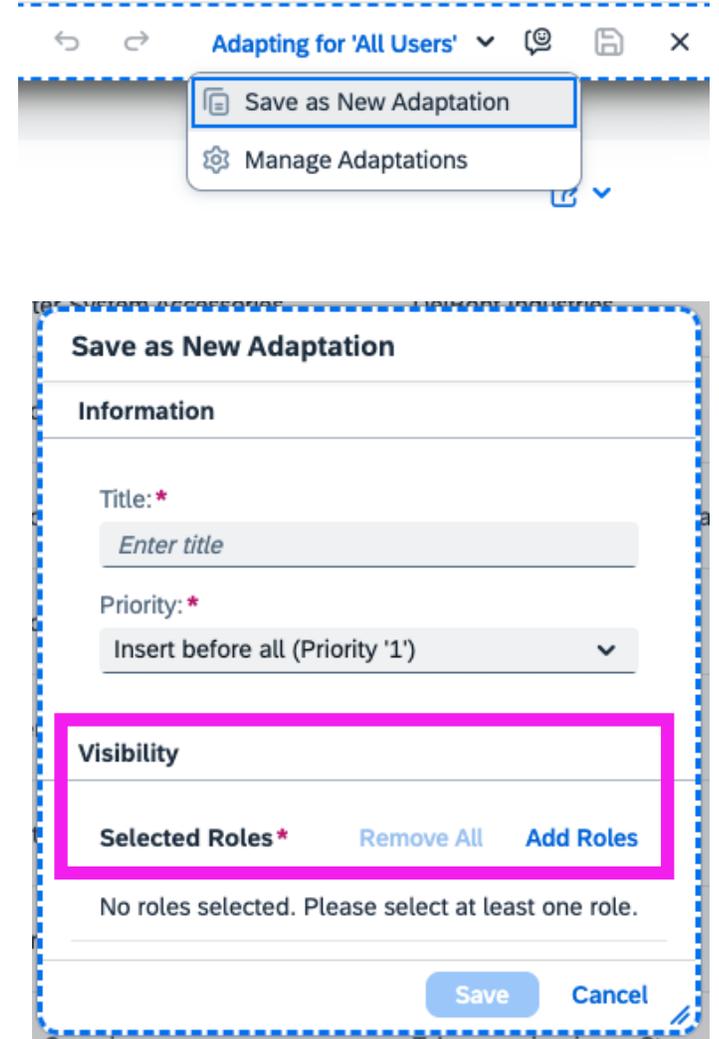
Sales
role



Inventory
role



[SAPUI5 Flexibility: Adapting UIs for Specific User Roles](#)



SAP Cloud Application Programming Model

What is SAP Cloud Application Programming Model?

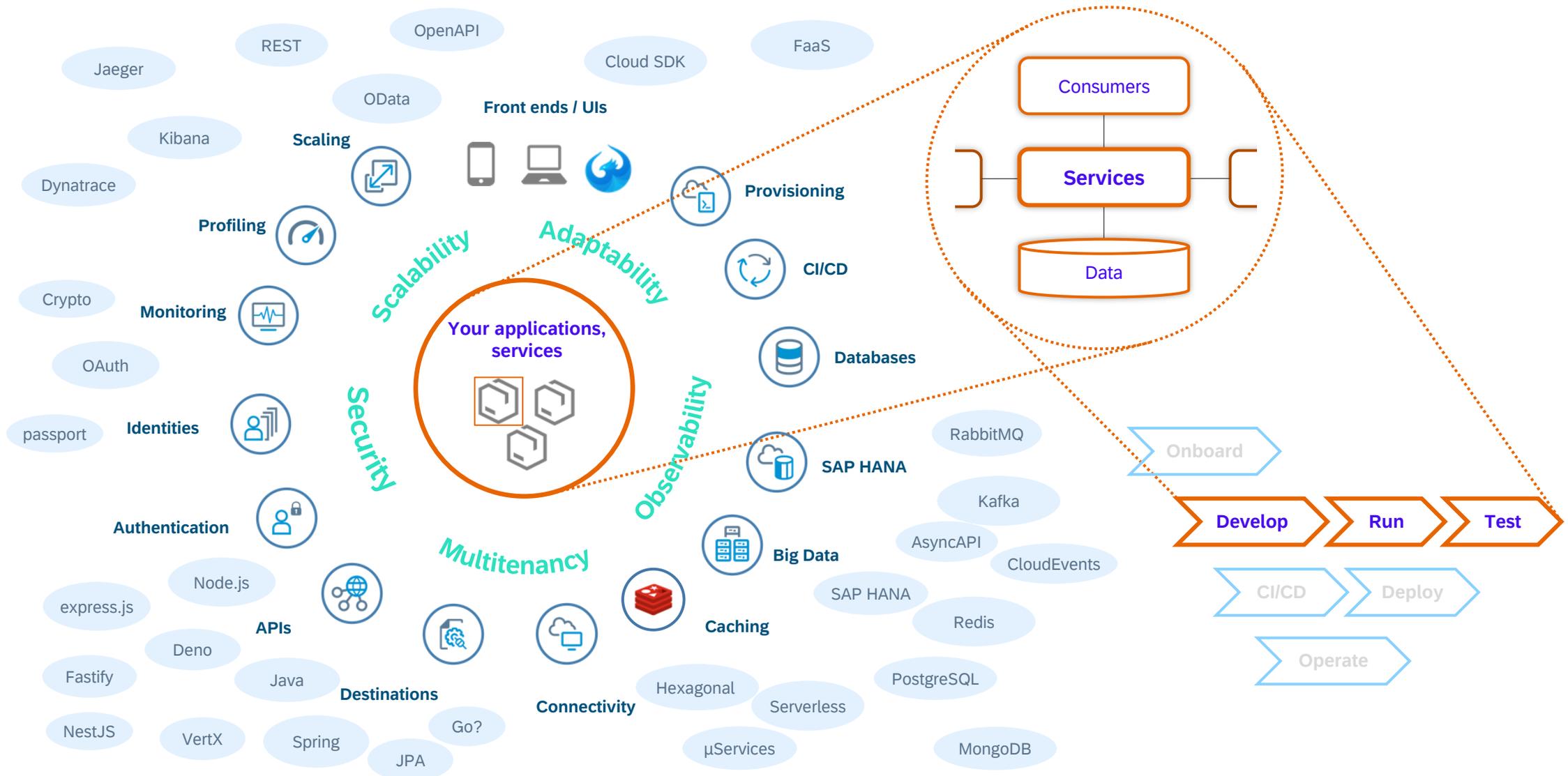


SAP Cloud Application Programming Model (CAP) is a framework of languages, libraries, and tools for building **enterprise-grade** services and applications.

It guides developers along a **golden path** of proven **best-practice** solutions to tedious recurring tasks, preconfigured and served by generic runtimes.

Projects benefit from a primary **focus on domain**, significantly **accelerated development** at **minimized costs**, and **safeguarded investments** in a world of rapidly changing technologies.

Why CAP? → Guidance and focus on domain → “What, not how”



Key concepts and value propositions

Jump-start and grow-as-you-go

Generic service providers

Capture intent (by CDS)

Intrinsic cloud qualities

Agnostic design



Accelerated development...

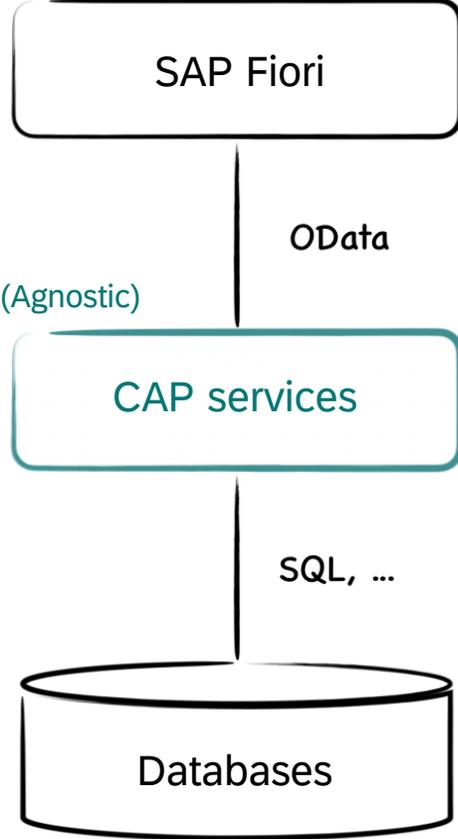
...at **minimized costs**

Focus on domain

Cloud scale by design

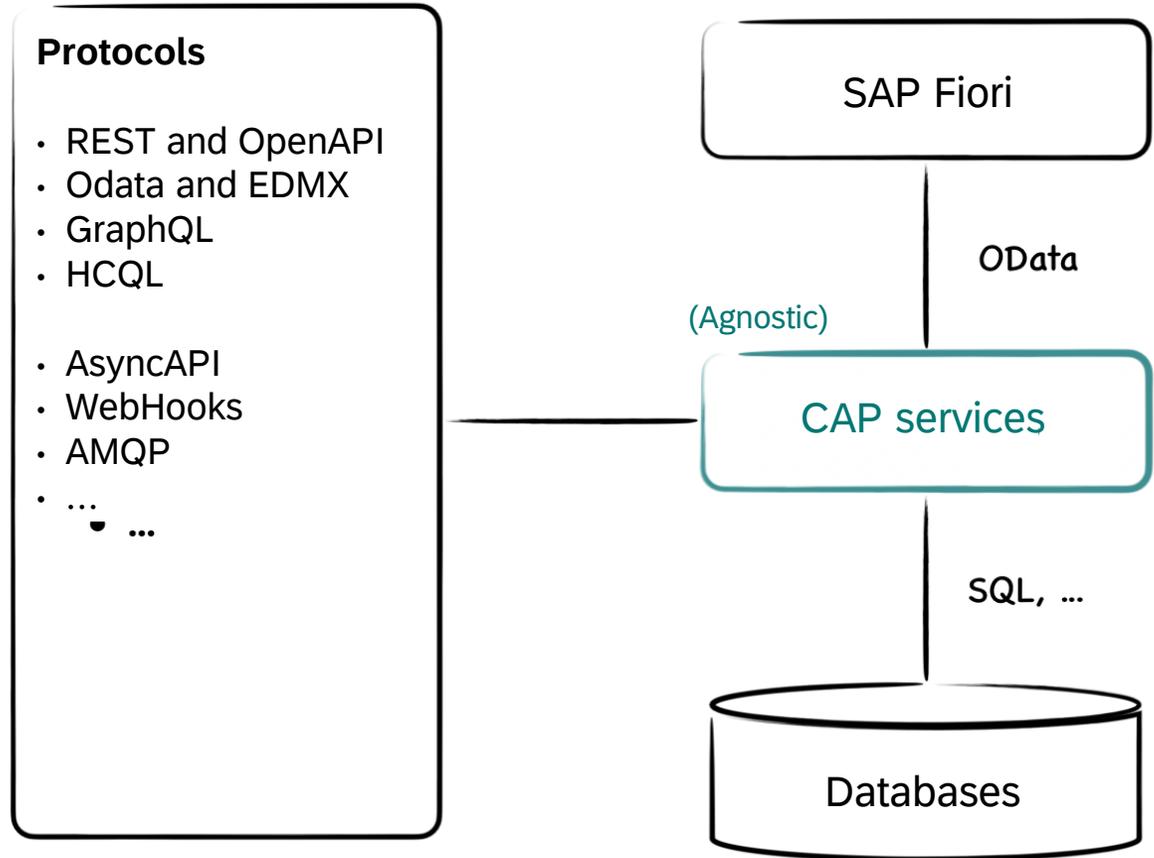
Evolution without disruption

CAP-level service interfaces = Generic providers continued...



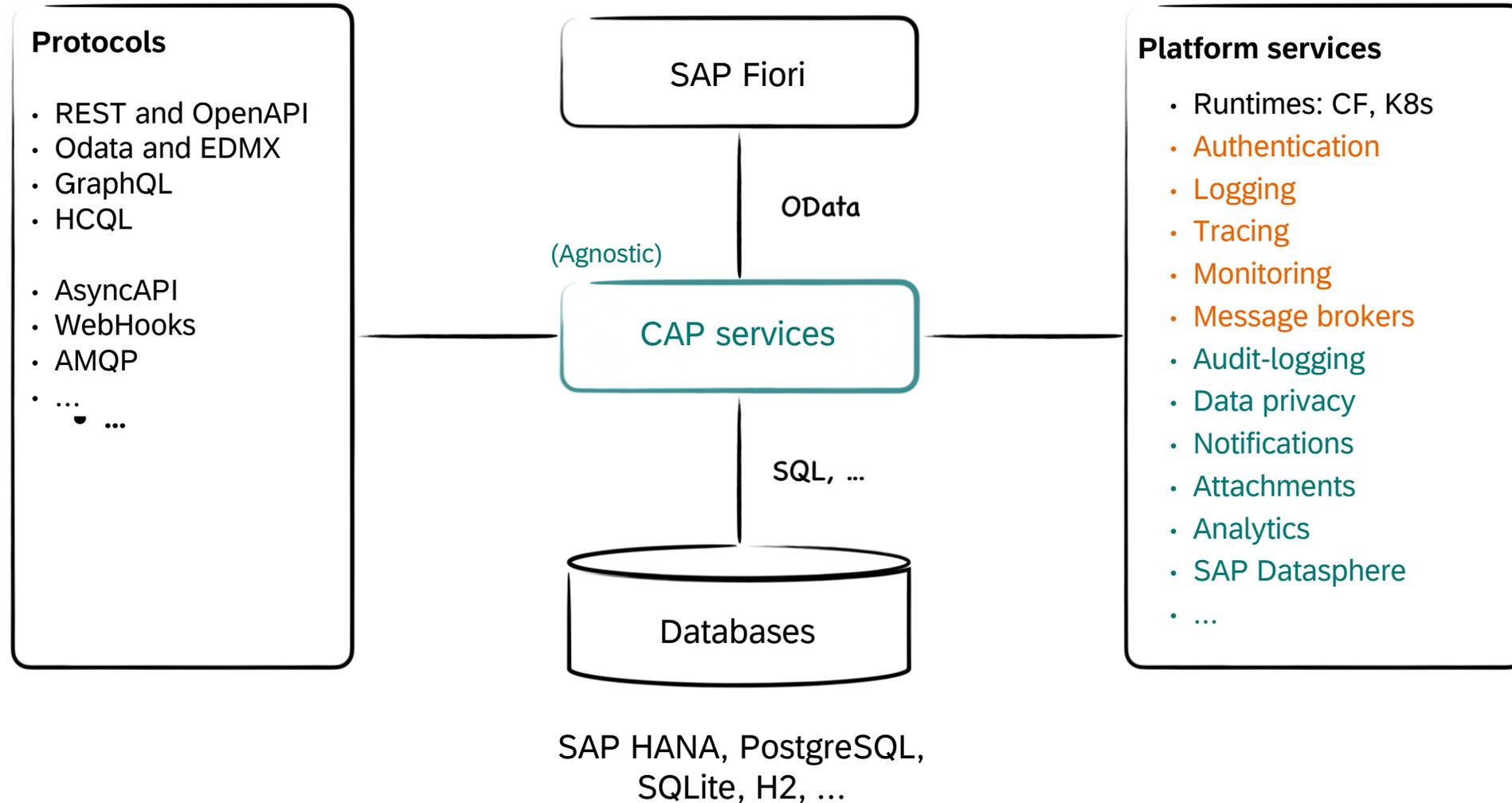
SAP HANA, PostgreSQL,
SQLite, H2, ...

CAP-level service interfaces = Generic providers continued...

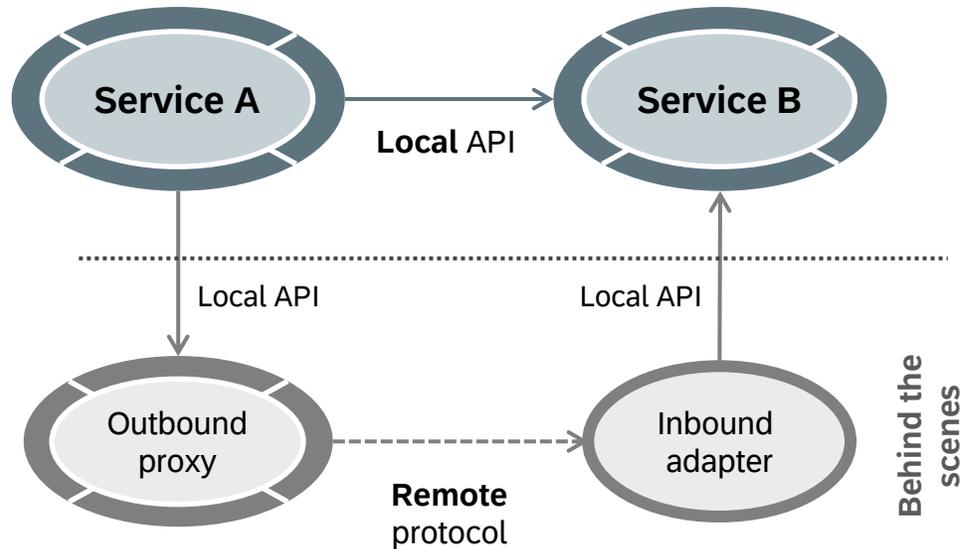


SAP HANA, PostgreSQL,
SQLite, H2, ...

CAP-level service interfaces = Generic providers continued...



CAP-level service integration

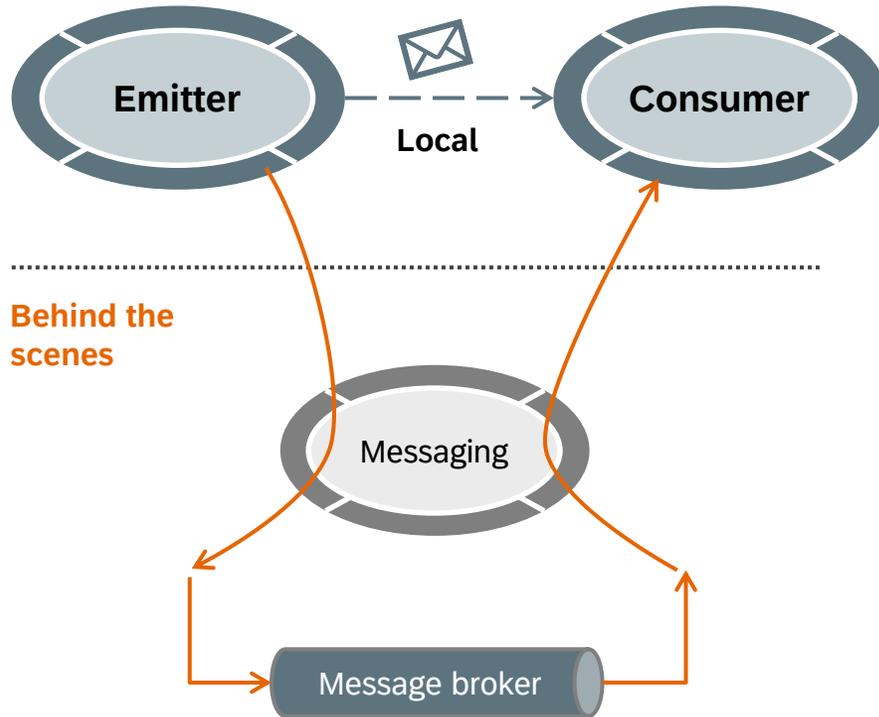


```
let ServiceB = await cds.connect.to('ServiceB')
let response = await ServiceB.send('Request')
```

```
cds.requires.ServiceB: rest
```

- Uniform, protocol-agnostic CAP service APIs
- Simple, protocol-agnostic custom code
- Late-cut microservices
- Custom handlers and providers
- Mocked service providers ootb
- Hexagonal architecture appearance

CAP-level messaging



Behind the scenes

Broker-agnostic code → File-based one at development;
Event mesh, event broker, Kafka in production

1) Declare events in core data services (CDS)

```
service Emitter {  
  event Some.Event { ... payload }  
}
```

2) Develop as if all local

```
await this.emit ('Some.Event', { ... })
```

```
let emi = await cds.connect.to ('Emitter')  
emi.on ('Some.Event', msg => console.log(msg))
```

3) Enable remote messaging

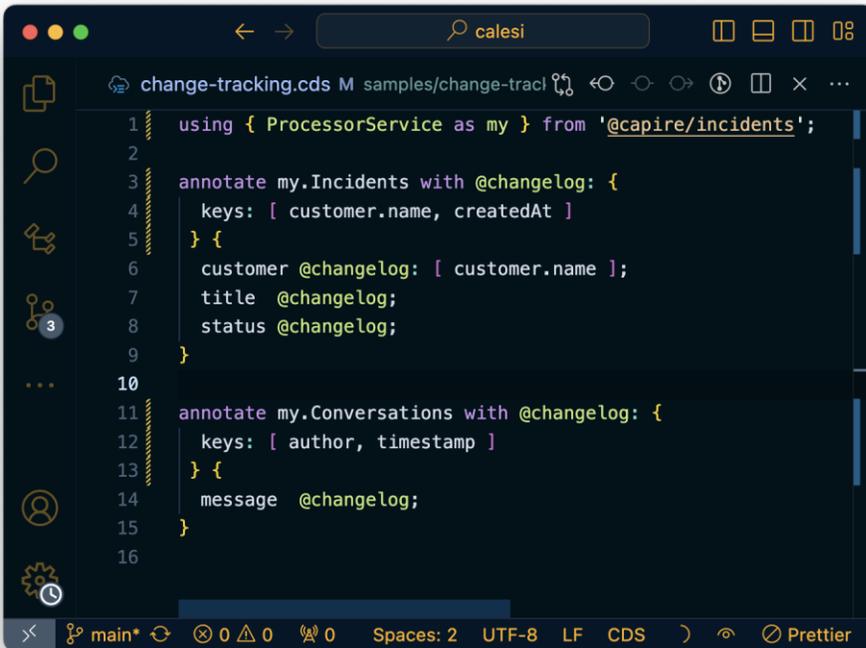
```
cds.requires.Emitter: remote
```

CAP-level change-tracking

1) Add the `@cap-js/change-tracking` plug-in

```
> npm add @cap-js/change-tracking
```

2) Add `@changelog` annotations to your model



```
1 using { ProcessorService as my } from '@capire/incidents';
2
3 annotate my.Incidents with @changelog: {
4   keys: [ customer.name, createdAt ]
5 } {
6   customer @changelog: [ customer.name ];
7   title @changelog;
8   status @changelog;
9 }
10
11 annotate my.Conversations with @changelog: {
12   keys: [ author, timestamp ]
13 } {
14   message @changelog;
15 }
16
```

3) Start your CAP server as usual

```
[change-tracking] cds watch
cds serve all --with-mocks --in-memory?
live reload enabled for browsers
```



⇒ Changes are tracked and displayed automatically.

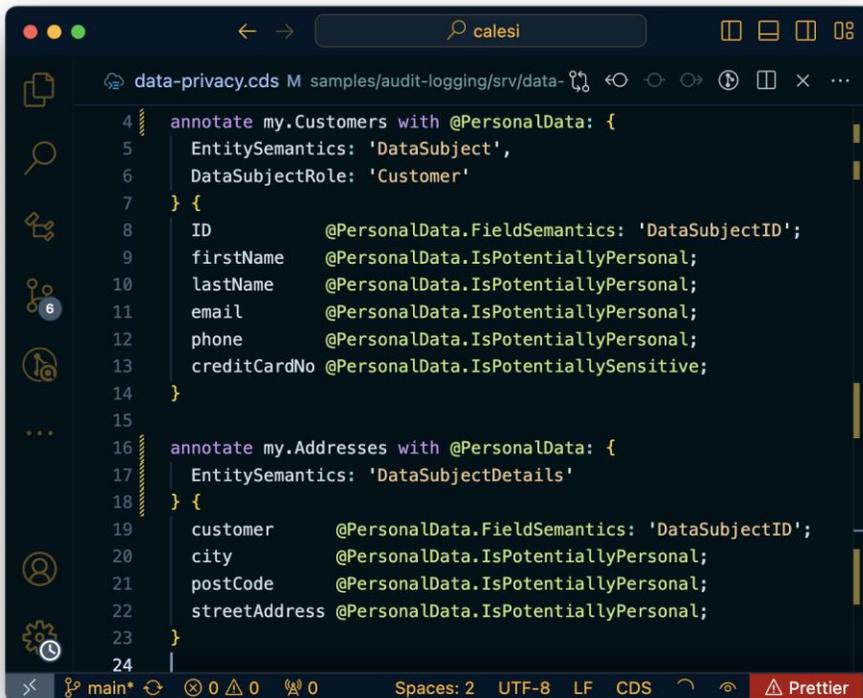
Change ...	On ↓	By	Field	New Value	Old Value
Update	5 Oct 2023, 13:03:02	alice	Title	Solar panel broken X	Solar panel broken
Update	5 Oct 2023, 13:03:02	alice	Status	A	I

CAP-level audit-logging

1) Add the `@cap-js/audit-logging` plug-in

```
> npm add @cap-js/audit-logging
```

2) Add `@PersonalData` annotations to your model



```
4  annotate my.Customers with @PersonalData: {
5      EntitySemantics: 'DataSubject',
6      DataSubjectRole: 'Customer'
7  } {
8      ID          @PersonalData.FieldSemantics: 'DataSubjectID';
9      firstName   @PersonalData.IsPotentiallyPersonal;
10     lastName    @PersonalData.IsPotentiallyPersonal;
11     email       @PersonalData.IsPotentiallyPersonal;
12     phone       @PersonalData.IsPotentiallyPersonal;
13     creditCardNo @PersonalData.IsPotentiallySensitive;
14 }
15
16  annotate my.Addresses with @PersonalData: {
17      EntitySemantics: 'DataSubjectDetails'
18  } {
19      customer    @PersonalData.FieldSemantics: 'DataSubjectID';
20      city        @PersonalData.IsPotentiallyPersonal;
21      postCode    @PersonalData.IsPotentiallyPersonal;
22      streetAddress @PersonalData.IsPotentiallyPersonal;
23  }
24
```

3) Start your cap server as usual

```
[change-tracking] cds watch
cds serve all --with-mocks --in-memory?
live reload enabled for browsers
```

⇒ Audit logs are written automatically.

```
[audit-log] - SensitiveDataRead: {
  data_subject: {
    id: { ID: 'feb04eac-f84f-4232-bd4f-80a178f24a17' },
    role: 'Customer',
    type: 'ProcessorService.Customers'
  },
  object: {
    type: 'ProcessorService.Customers',
    id: { ID: 'feb04eac-f84f-4232-bd4f-80a178f24a17' }
  },
  attributes: [ { name: 'creditCardNo' } ],
  uuid: '93c95ea5-d2b4-444c-8528-b3c22823f8cd',
  tenant: 't1',
  user: 'alice',
  time: 2023-10-05T11:12:22.124Z
}
```

CAP-level notifications

1) Add the CAP plug-in package

```
> npm add @cap-js/notifications
```

2) Add notification templates

3) Programmatically send notifications
(through uniform CAP service APIs)

```
let alert = await cds.connect.to('alert-srv')  
alert.emit('Some Message', { ... })
```

3) Start your CAP server as usual

```
[change-tracking] cds watch  
  
cds serve all --with-mocks --in-memory?  
live reload enabled for browsers
```

⇒ Audit logs are written automatically.

```
[audit-log] - SensitiveDataRead: {  
  data_subject: {  
    id: { ID: 'feb04eac-f84f-4232-bd4f-80a178f24a17' },  
    role: 'Customer',  
    type: 'ProcessorService.Customers'  
  },  
  object: {  
    type: 'ProcessorService.Customers',  
    id: { ID: 'feb04eac-f84f-4232-bd4f-80a178f24a17' }  
  },  
  attributes: [ { name: 'creditCardNo' } ],  
  uuid: '93c95ea5-d2b4-444c-8528-b3c22823f8cd',  
  tenant: 't1',  
  user: 'alice',  
  time: 2023-10-05T11:12:22.124Z  
}
```

CAP-level attachments

- 1) Add the CAP plug-in package

```
> npm add @cap-js/attachments
```

- 2) Use predefined types in core data services

```
entity Incidents { ...; photos : Attachments; }
```

- 3) Add respective UI controls

```
... TODO ...
```

- 3) Start your CAP server as usual

```
[change-tracking] cds watch  
cds serve all --with-mocks --in-memory?  
live reload enabled for browsers
```



⇒ All upload, download and read requests are handled behind the scenes.

CAP-level service integration – Summary

Before with low-level interfaces

- **More than 1,000** lines of code, caring for:
 - Streaming upload requests
 - HTTP-level remote calls
 - Virus checking
 - Preventing DoS attacks
 - Principle propagation
 - Resilience
 - Deployment
 - ...
- **Approximately 3–6 months** effort
- ... **repeatedly** in each project

With CAP-level interfaces

1. **Install CAP plug-in** → Plug and play
2. **Add integration content**
 - a) **Declaratively** in core data services through annotations or predefined types like that:
 - b) **Programmatically** through CAP runtime's agnostic service APIs

```
entity Incidents { ...; photos : Attachments; }
```

```
let alert = await cds.connect.to('alert-srv')  
alert.emit('Some Message', { ... })
```

⇒ **Few lines of code** (domain logic)

⇒ **Few minutes** for common cases

With **local mocks** → Fast turnarounds

The **CAP-level service interfaces** blueprint

Objectives

- **Minimized TCD and TCO** → Accelerated development at minimized costs
- **Evolution without disruption** → Safeguarded investments

Approach

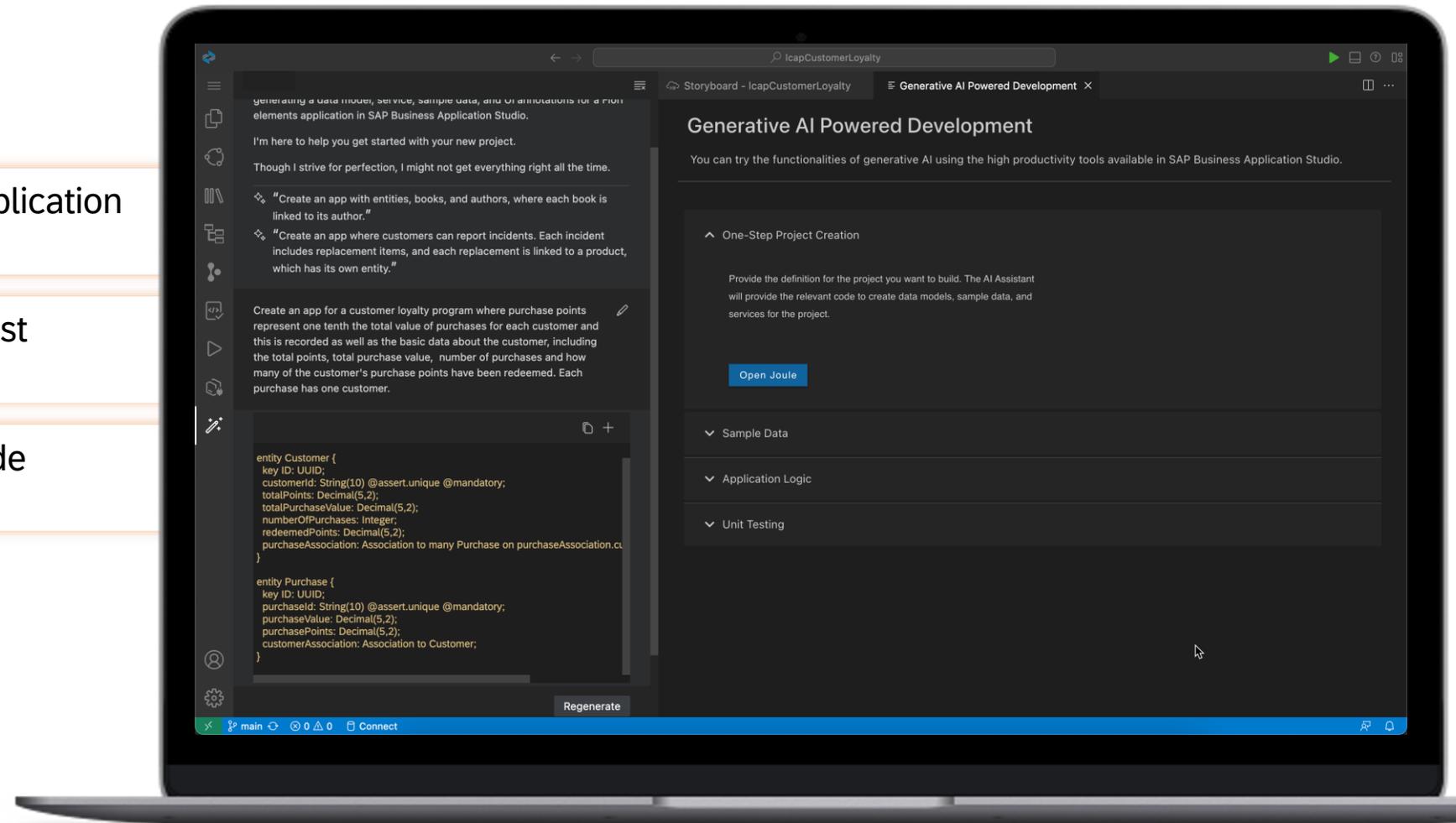
- **“CAP first”** → Principle of one instead of common denominator
- Co-owned by **service teams of SAP BTP** and CAP teams
- **Open source** packages whenever possible
- CAP documentation and samples

Turbocharging application development with generative AI

AI assistant to autogenerate application logic and data models

Automated generative AI unit test coverage

Contextual application logic code generation based on prompts

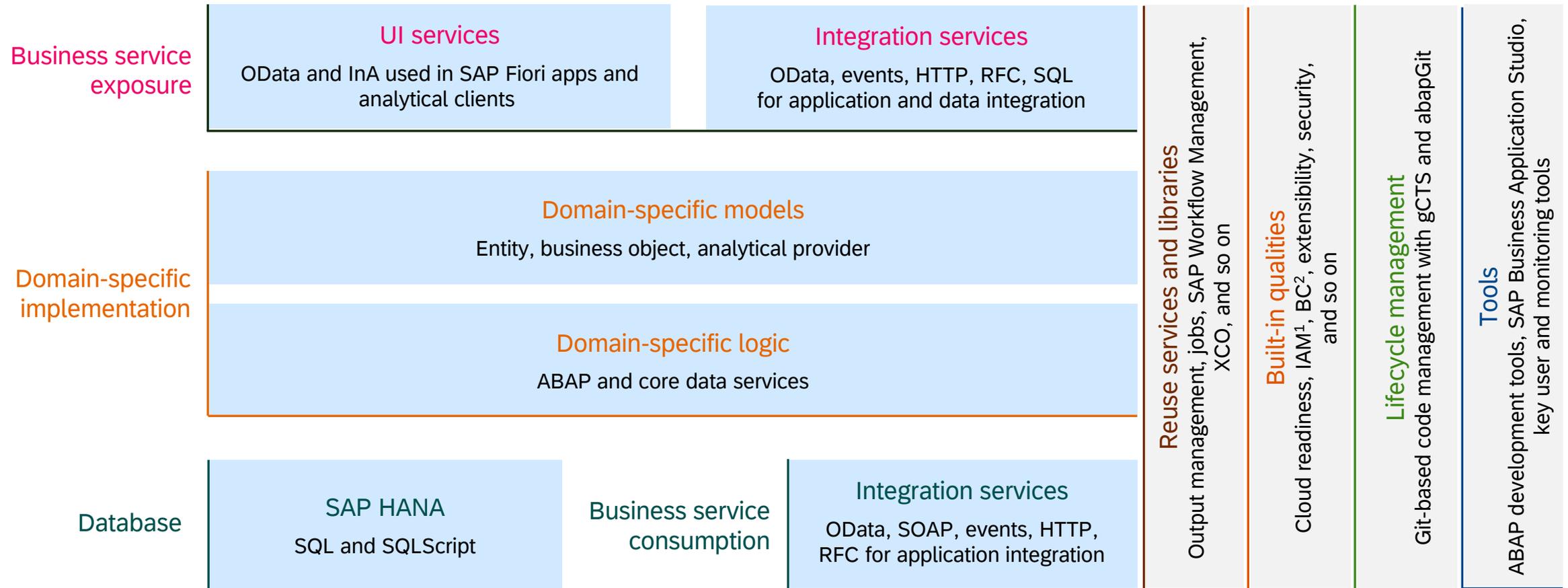


ABAP Cloud

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: Map



¹ Identity and access management

² Business configuration

SAP BTP, ABAP environment – Usage scenarios

Common sweet spot

Loosely coupled, side-by-side extensions and applications
Multitenancy SaaS solutions

Characteristics of typical usage scenarios

Decoupled extension with own lifecycle
Custom applications for a separate user group (no ERP users)
Custom application workload that runs separated from ERP
Solutions integrating with several ERP systems and cloud services (*hub scenario*)
SaaS applications provided by partners

System hibernation

SAP BTP ABAP Environment – Manage System Hibernation

13 23 3,005 Edit

Update on August 28th, 2023:

- System hibernation is now available 😊
- Free tier systems will be stopped each night automatically by SAP operations and need to be started manually by the free tier customer before the next usage.

System hibernation for SAP BTP ABAP Environment (aka Steampunk) is available since August 28th, 2023. This blog post explains how this feature works and what are the required prerequisites. To benefit from the intended cost savings, we recommend to plan a potential usage and to fulfill the prerequisites.

What is the purpose of system hibernation?

Before the introduction of system hibernation, there was no option to suspend or to stop a Steampunk system if it is not used. The deletion of the system is only an option, if the stored data in the SAP HANA Cloud instance is not needed anymore. As a consequence, there was no option to reduce the costs for temporarily unused systems. The new feature will allow to stop and (re-)start the system without the deletion of the corresponding SAP HANA Cloud instance. This might be helpful, for example:

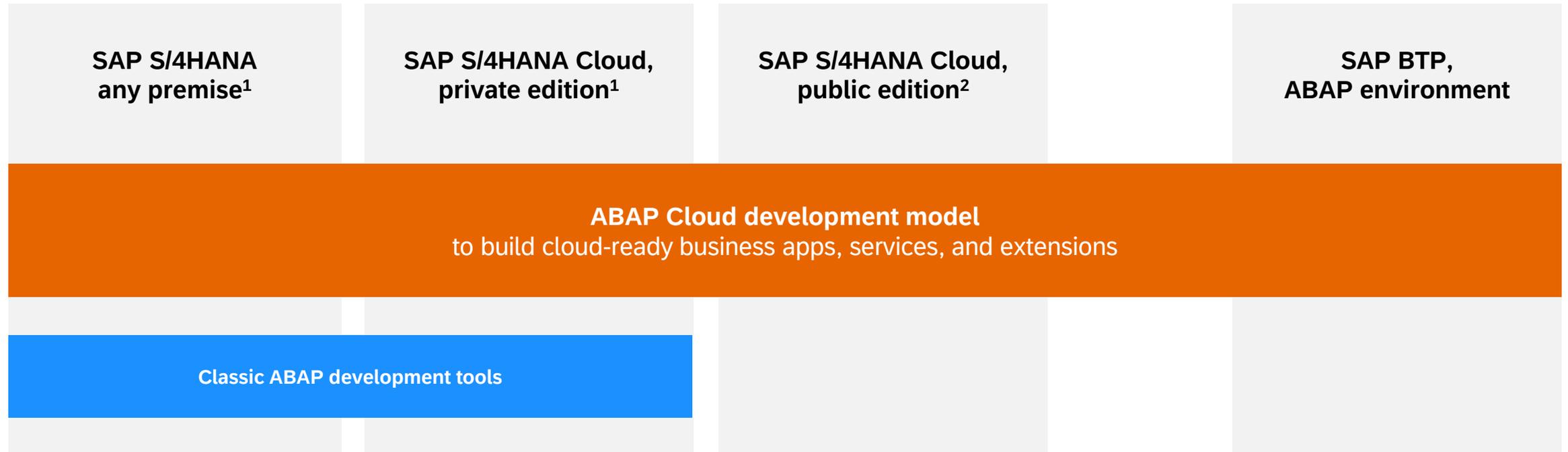
- To stop development systems outside of working hours and during the weekend
- To stop correction systems (for the productive codeline) outside of correction activities
- To stop test systems outside of test activities
- To stop custom code analysis system when analysis is done
- To stop production systems before go-live

Available since August 28

Total costs for a stopped
minimal system

less than 5%

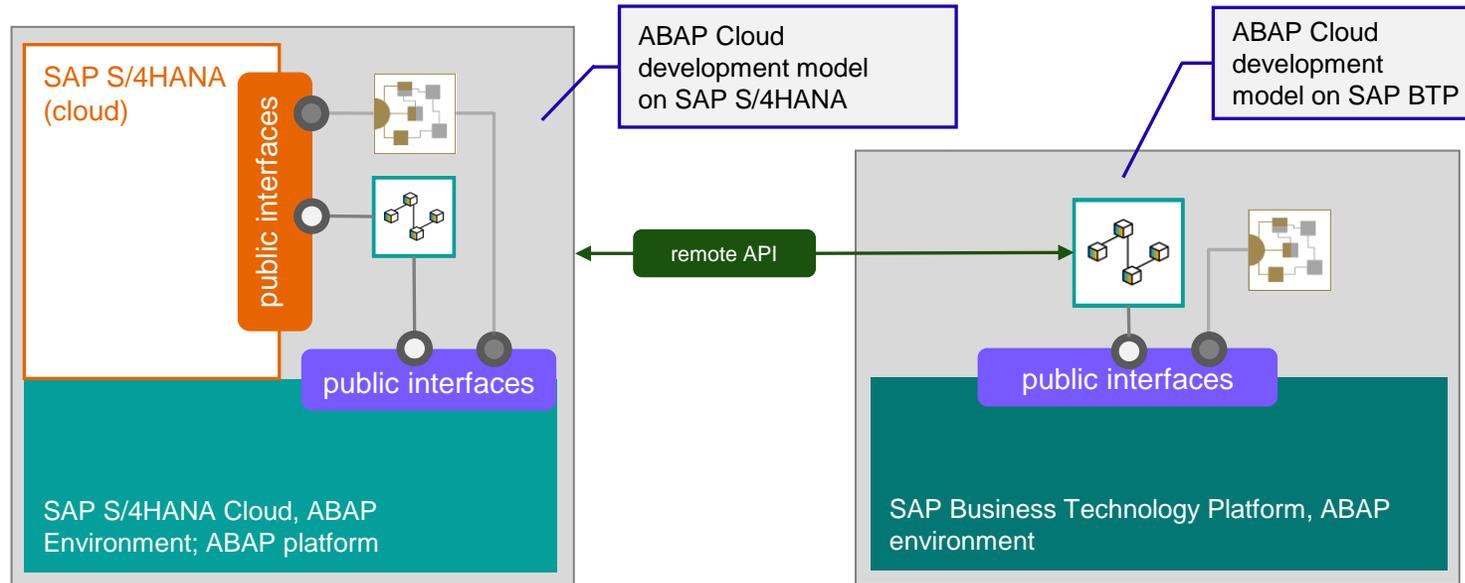
ABAP Cloud – One development model for SAP S/4HANA and SAP BTP



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

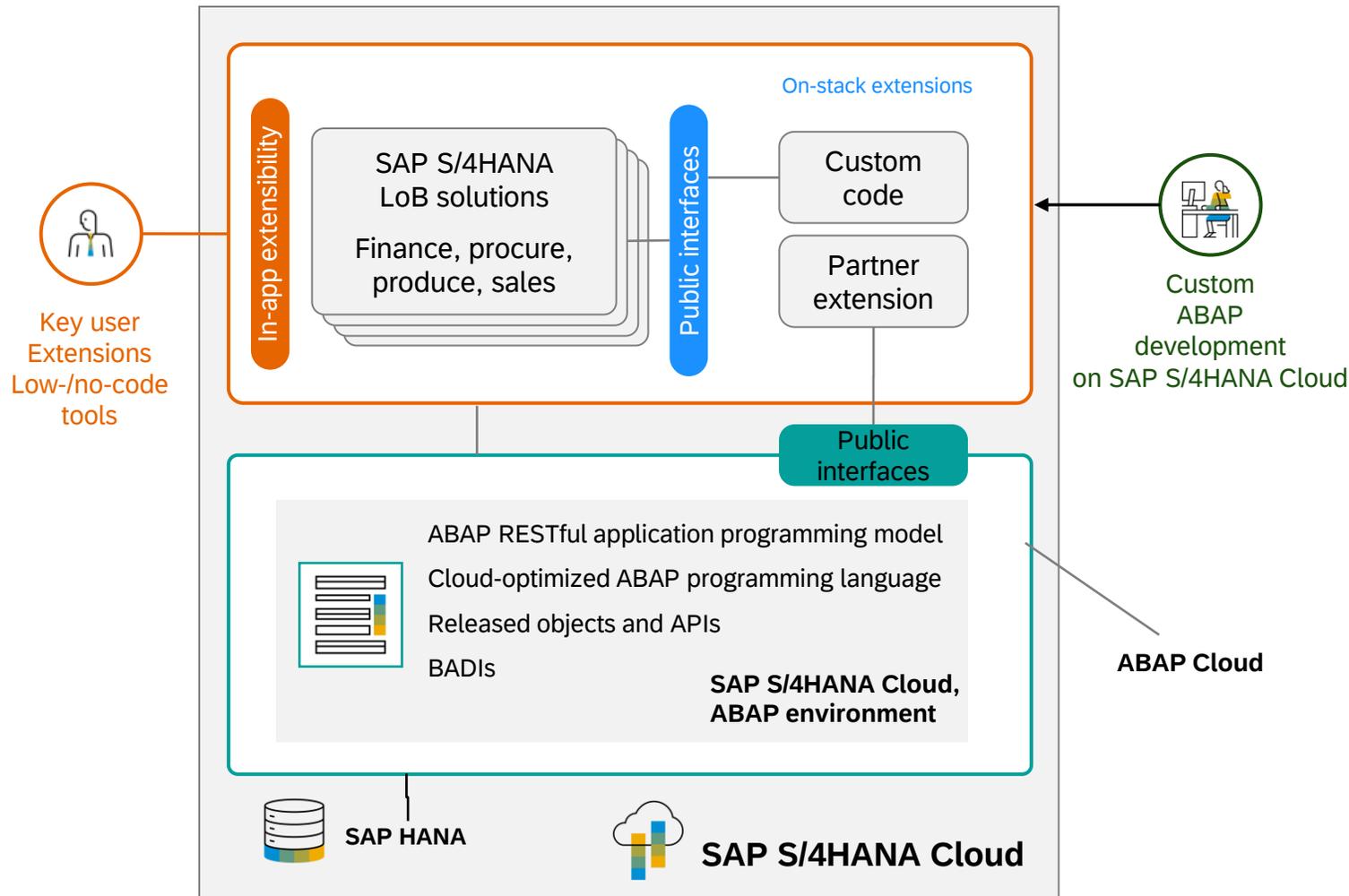
ABAP Cloud on SAP BTP and on SAP S/4HANA



ABAP Cloud

- Public SAP APIs and extension points
- Cloud-optimized ABAP programming language
- ABAP development tools
- ABAP RESTful application programming model

Key facts of SAP S/4HANA Cloud, ABAP environment



Enable custom ABAP development directly on SAP S/4HANA Cloud

Modern ABAP development

SAP, customers, and partners use same development model

High developer productivity

ABAP RESTful application programming model

Development of apps and services optimized for SAP HANA

Eclipse-based ABAP development tools

SAP Fiori UX for UI development

Proven lifecycle management

Rules of the game

Clear separation between SAP solutions and extensions

Only stable and reliable public interfaces and released objects from both ABAP platform and SAP S/4HANA Cloud LoB solutions can be used

No modifications

ABAP Cloud – IDE and API examples for on-stack developer extensibility

Custom ABAP development on SAP S/4HANA Cloud

ABAP development tools in Eclipse
Cloud-optimized ABAP programming language
Proven transport management for ABAP

Access to public SAP APIs ONLY – otherwise, syntax error!

No access to old Web Dynpro development
environment APIs
No direct select on the MARA table from SAP
software

Local APIs from SAP S/4HANA

SELECT products from
SAP S/4HANA tables using the public I_Product
CDS view

```
1 CLASS zcl_using_public_apis DEFINITION
2 PUBLIC
3 FINAL
4 CREATE PUBLIC .
5
6 PUBLIC SECTION.
7
8 INTERFACES if_oo_adt_classrun .
9 PROTECTED SECTION.
10 PRIVATE SECTION.
11 ENDClass.
12
13
14 CLASS zcl_using_public_apis IMPLEMENTATION.
15
16
17 METHOD if_oo_adt_classrun~main.
18
19 SELECT FROM I_CountryText FIELDS CountryName
20 WHERE Language = @sy-langu ORDER BY CountryName INTO TABLE @DATA(lt_countryname).
21 LOOP AT lt_countryname REFERENCE INTO DATA(cref) .
22 out->write( cref->CountryName ).
23 ENLOOP.
24
25 CALL FUNCTION 'POPUP_TO_CONFIRM'.
26 SELECT FROM mara FIELDS COUNT( * ) INTO @DATA(lv_mara_count).
27
28 SELECT FROM I_Product FIELDS ProductExternalID
29 ORDER BY ProductExternalID INTO TABLE @DATA(lt_externalid).
30
31 LOOP AT lt_externalid REFERENCE INTO DATA(xref) .
32 out->write( xref->ProductExternalID ).
33 ENLOOP.
34
35 ENDMETHOD.
36
37 ENDClass. |
```

Description	Resource	Location	Type
2 errors, 0 warnings, 0 others			
Errors (2 items)			
The use of Function Module POPUP_TO_CONFIRM is not permitted.	zcl_using_public_apis.aclass	line 25	ABAP Activation Problem
Use of Table MARA is not permitted. See object documentation for replacement.	zcl_using_public_apis.aclass	line 26	ABAP Activation Problem

Cloud ABAP development – The developer perspective

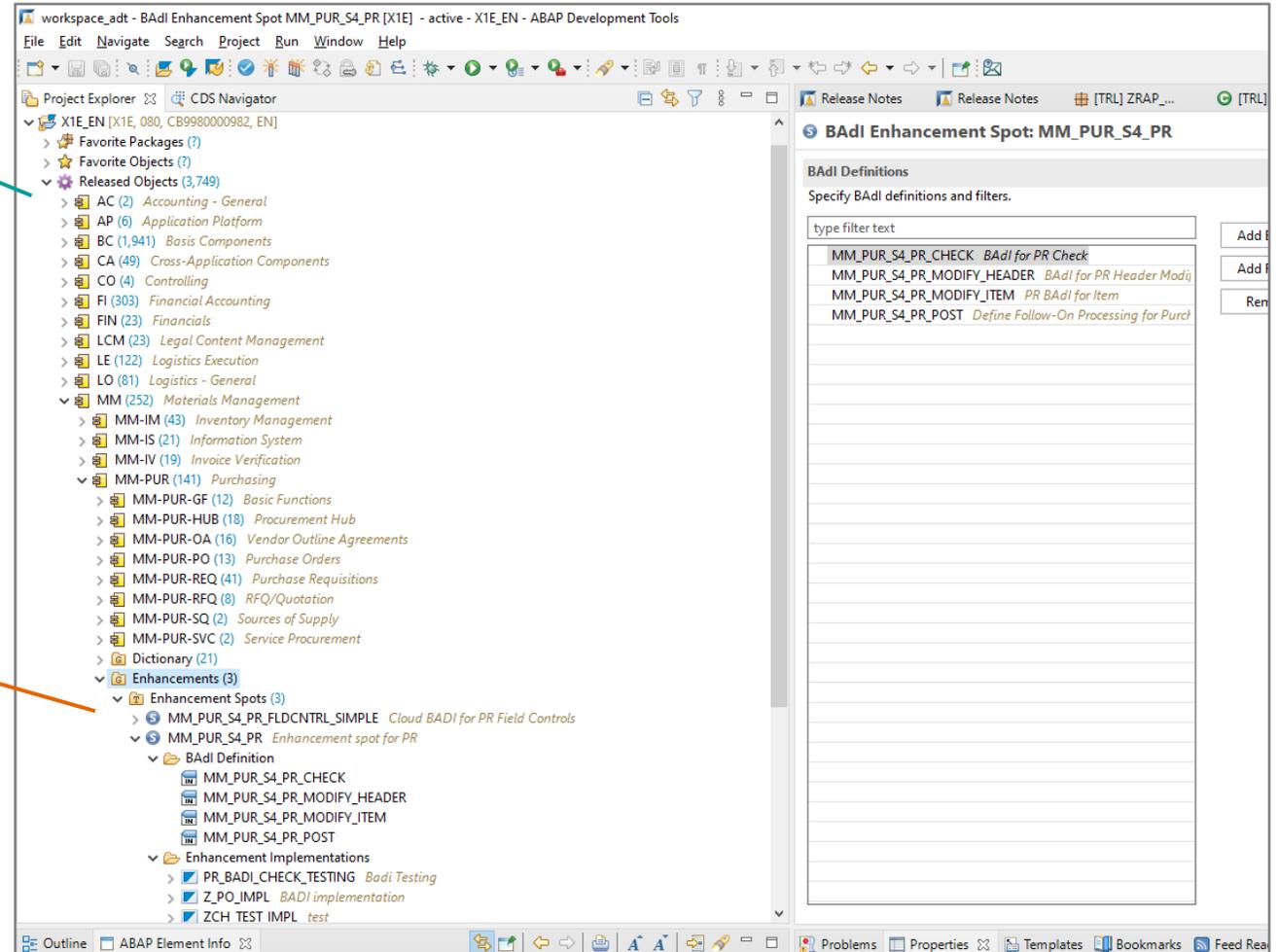
Public APIs,
released objects

Clean core

Modification-free extension
development

Feature-rich tool support

Search and identification of public API
by browsing the application component
tree



Invoking ABAP RESTful application programming model facades over EML

Entity
Manipulation
Language
(EML)

Released
facade

```
73  
74 METHOD create_pr.  
75  
76 IF keys IS NOT INITIAL.  
77  
78 READ ENTITIES OF Orders IN LOCAL MODE  
79 ENTITY Orders  
80 ALL FIELDS  
81 WITH CORRESPONDING #( keys )  
82 RESULT DATA(lt_order_result)  
83 FAILED DATA(lt_failed)  
84 REPORTED DATA(lt_reported).  
85  
86  
87 MODIFY ENTITIES OF i_purchaserequisitiontp  
88 ENTITY purchaserequisition  
89  
90 CREATE FIELDS ( purchaserequisitiontype )  
91 WITH VALUE #( ( %cid = 'My%CID_1'  
92 purchaserequisitiontype = 'NB' ) )  
93  
94  
95 CREATE BY \_purchaserequisitionitem  
96 FIELDS ( plant  
97 purchaserequisitionitemtext  
98 accountassignmentcategory  
99 requestedquantity  
100 baseunit  
101 purchaserequisitionprice  
102 purreqnitcurrency  
103 materialgroup  
104 purchasinggroup  
105 purchasingorganization  
106 )  
107 WITH VALUE #( ( %cid_ref = 'My%CID_1'  
108 %target = VALUE #( ( %cid = 'My%ItemCID_1'  
109 plant = '1010'  
110 purchaserequisitionitemtext = lt_order_result[ 1 ]-Ordereditem  
111 accountassignmentcategory = 'U'  
112 requestedquantity = '8.00'  
113 baseunit = 'EA'  
114 purchaserequisitionprice = '10.00'  
115 purreqnitcurrency = 'EUR'  
116 materialgroup = lt_order_result[ 1 ]-Materialgroup  
117 purchasinggroup = '001'  
118 purchasingorganization = '1010'  
119 ) ) )  
120 ) ) )  
121 )  
122 )  
123 )  
124 )  
125 )
```

Facades

Modification-free access to
functionality of stable core

Released and stable APIs

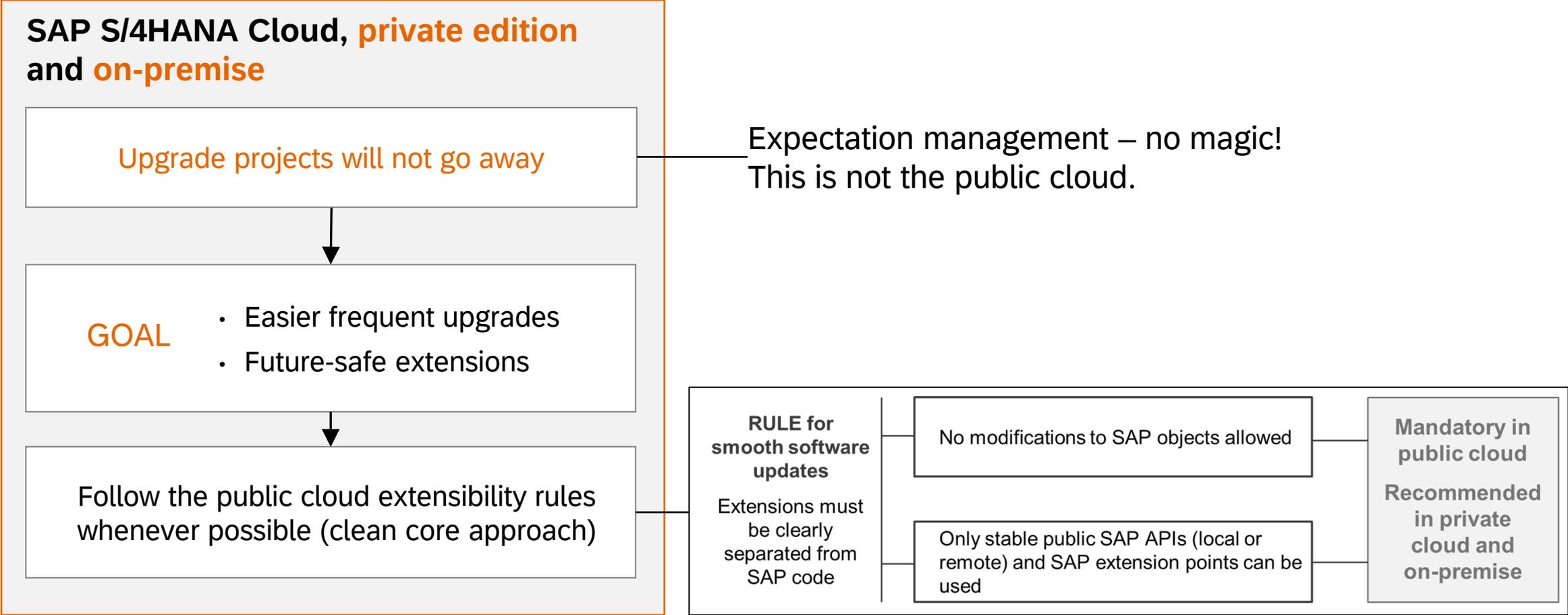
Local (nonremote) access

Based on core data services for
ABAP

[Documentation](#) of developer
extensibility + ABAP

[Documentation](#) of ABAP RESTful
application programming model
and its extensibility

Clean core rules for extensions to support smoother SAP software updates

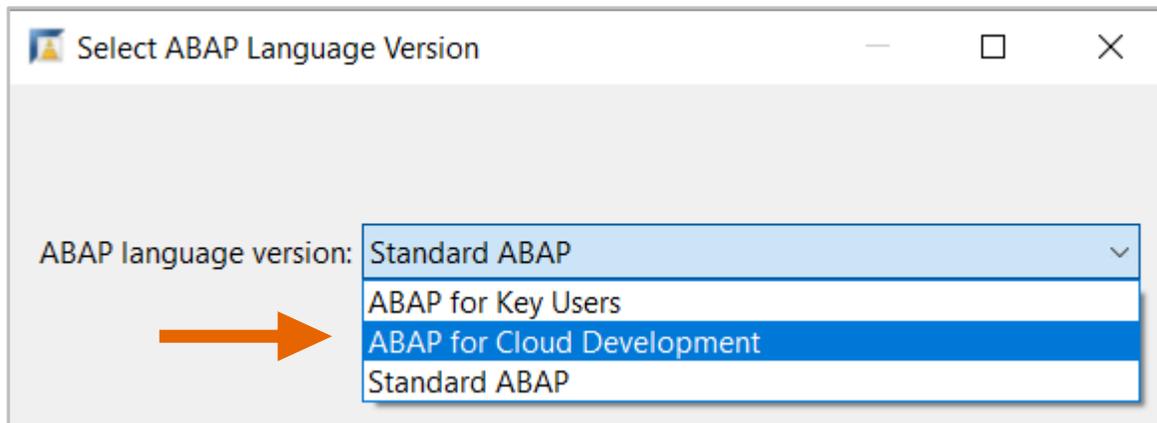


SAP S/4HANA, private cloud and on-premise editions

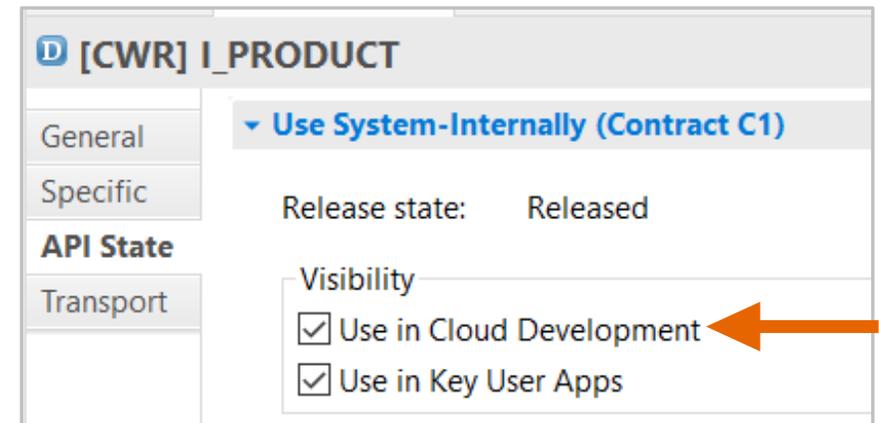
ABAP cloud development model – ABAP programming language version and public SAP APIs

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

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

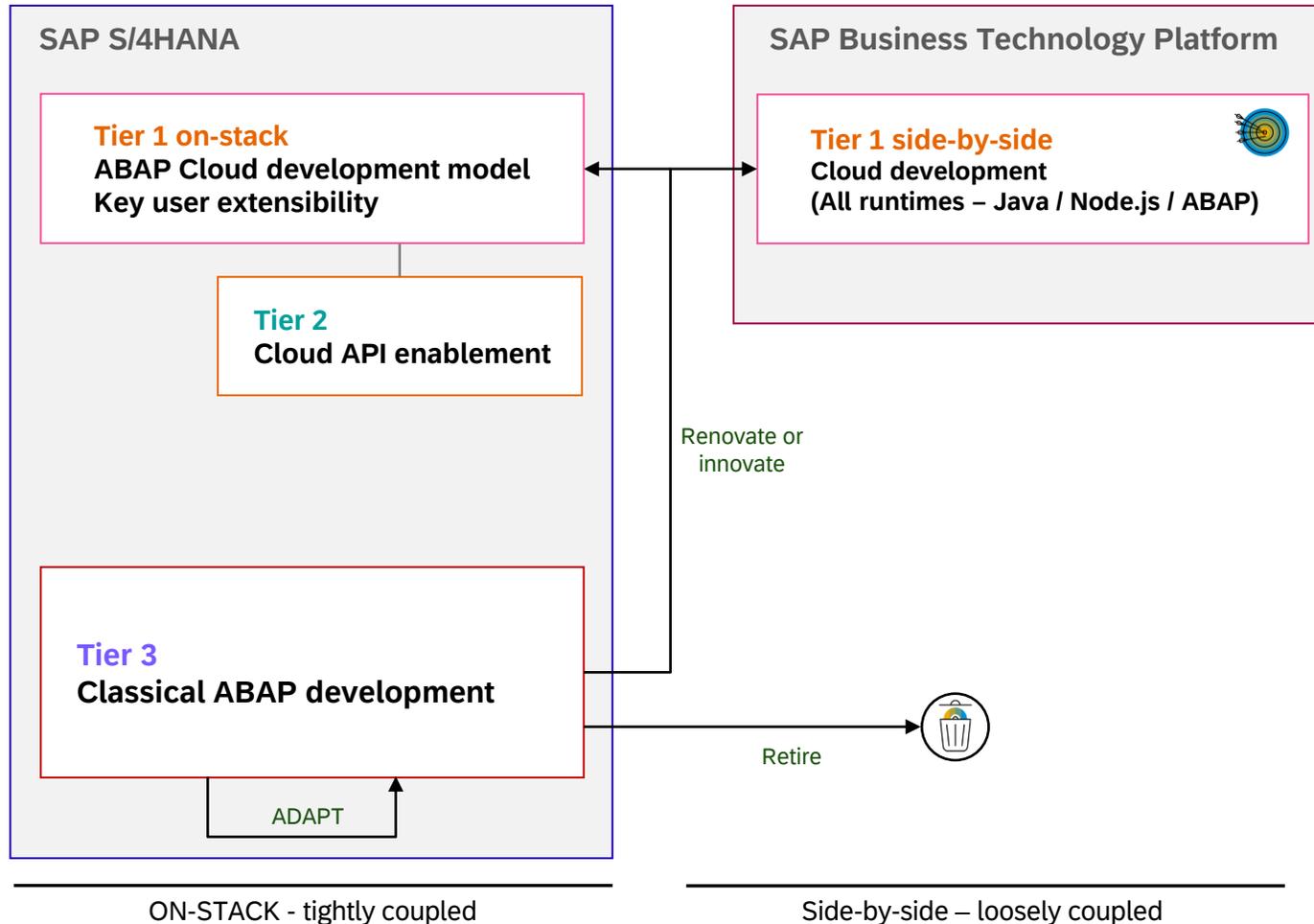


Switch from classic extensibility for ABAP (standard ABAP) to ABAP Cloud (ABAP for cloud development).



SAP released the CDS view for the *ABAP Cloud development model*.

Three-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:

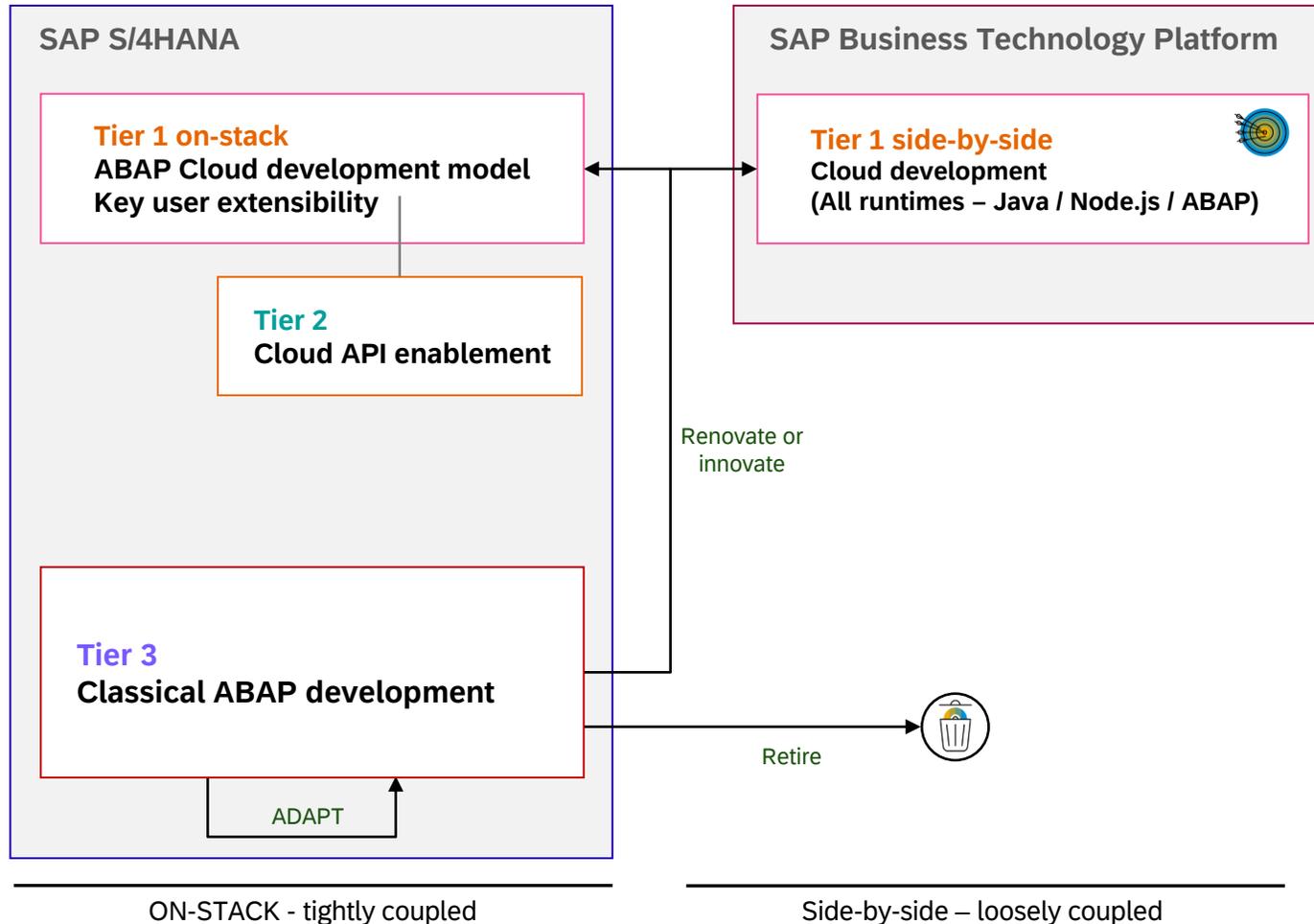
- Develop custom wrapper objects for not released SAP objects to be used in tier 1
- Retire wrapper once a released SAP API is available

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

Guidance to avoid and reduce the content in tier 3

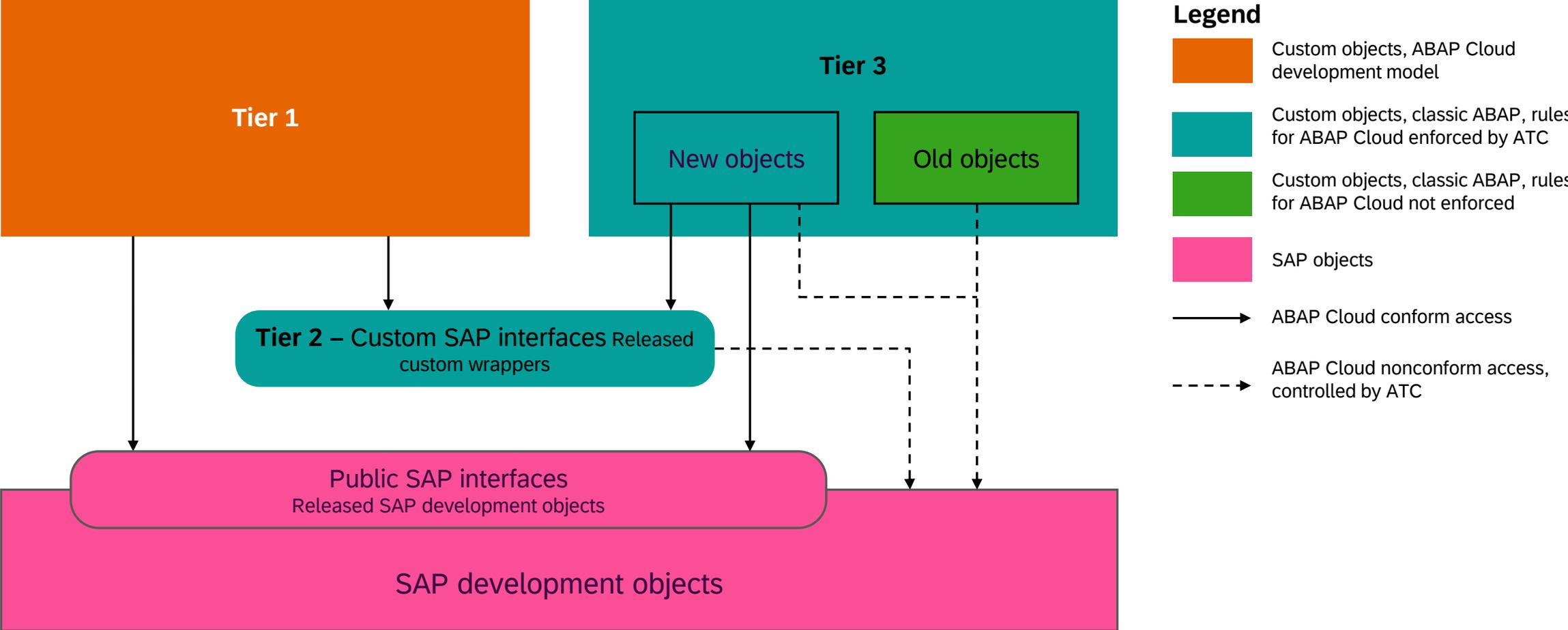
Three-tier extensibility model for SAP S/4HANA, private cloud and on-premise



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)
- ✓ Enablement of 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

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



Thank you

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