



# Extending SAP Applications with **SAP Business Technology Platform (BTP)**

Arne Speck, SAP  
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Public

# Agenda

What are “extensions”?

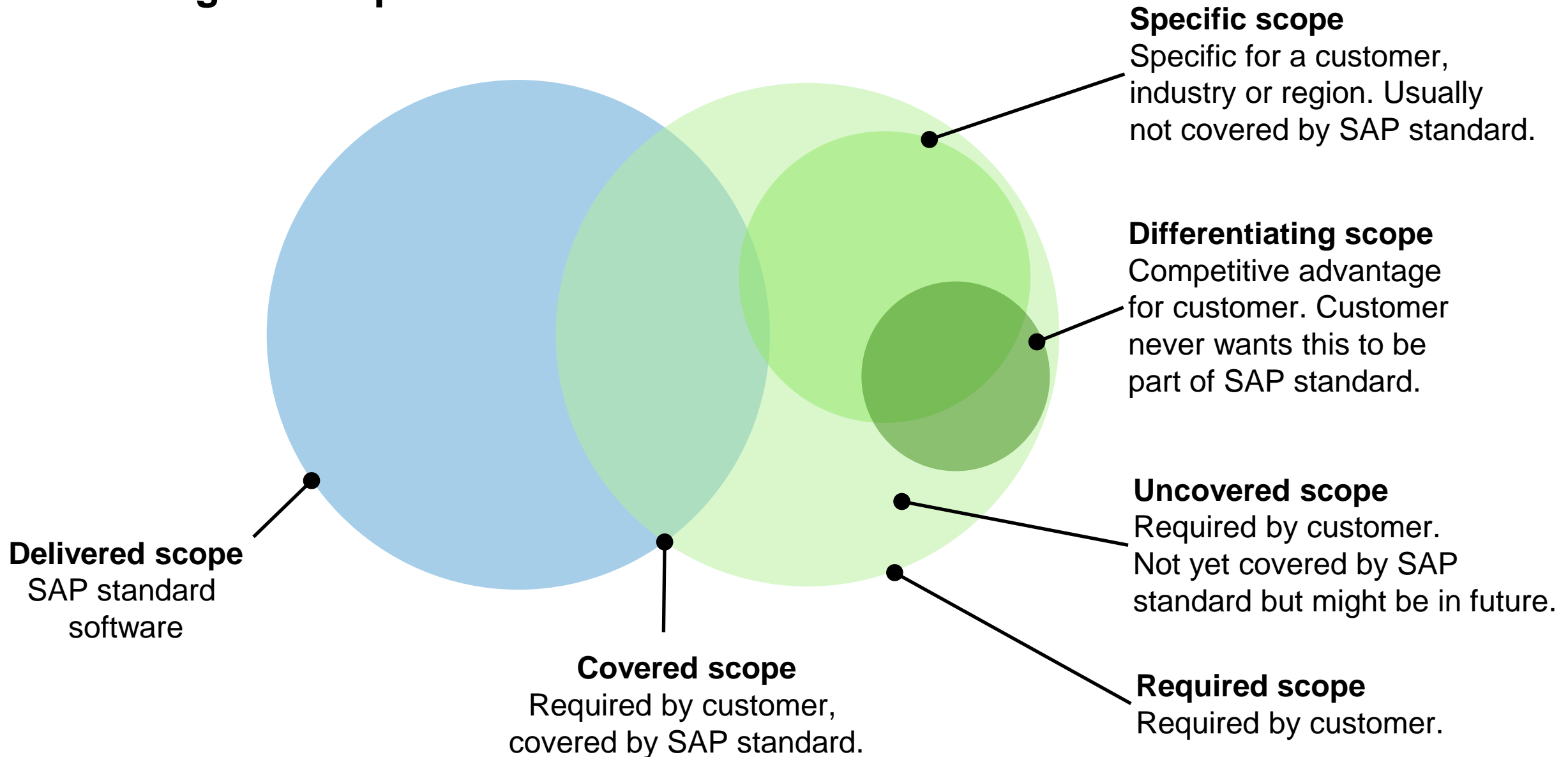
BTP Recap

How does SAP BTP support you in developing extensions?

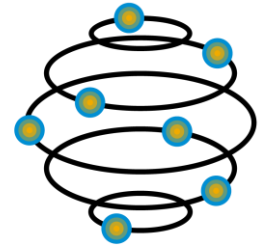
- BTP for Coders
- BTP Tooling for Coders and Citizen Developers
- A quick Look into DevOps
- The “right” Way...

Summary

# Extending the scope of standard software



## (C)lean Core Concept - Keeping the Core Clean



- Leverage SAP standard processes where possible by adhering to **Fit-to-Standard**.
- Apply a **zero-modification policy** from the project's first day.
- Eliminate enhancements that are redundant to standard code and functionality, as well as “**clones**” of standard code.
- Use **released APIs** as stable contracts of communication between systems that cannot be changed without notice (governed by **deprecation policies**).
- **Decouple** extensions for upgrade stability, extensions should not break an upgrade and upgrades should not break an extension.
- Leverage the full potential of **extension options** (In-App, Side-by-Side or Hybrid Extensions) which fits best to your needs.
- Build extensions in a way does **not prevent a move to a real cloud environment**, e.g. by moving from SAP S/4HANA on-Premise to SAP S/4HANA Cloud.
- Employ the capabilities and services offered by SAP Business Technology Platform.

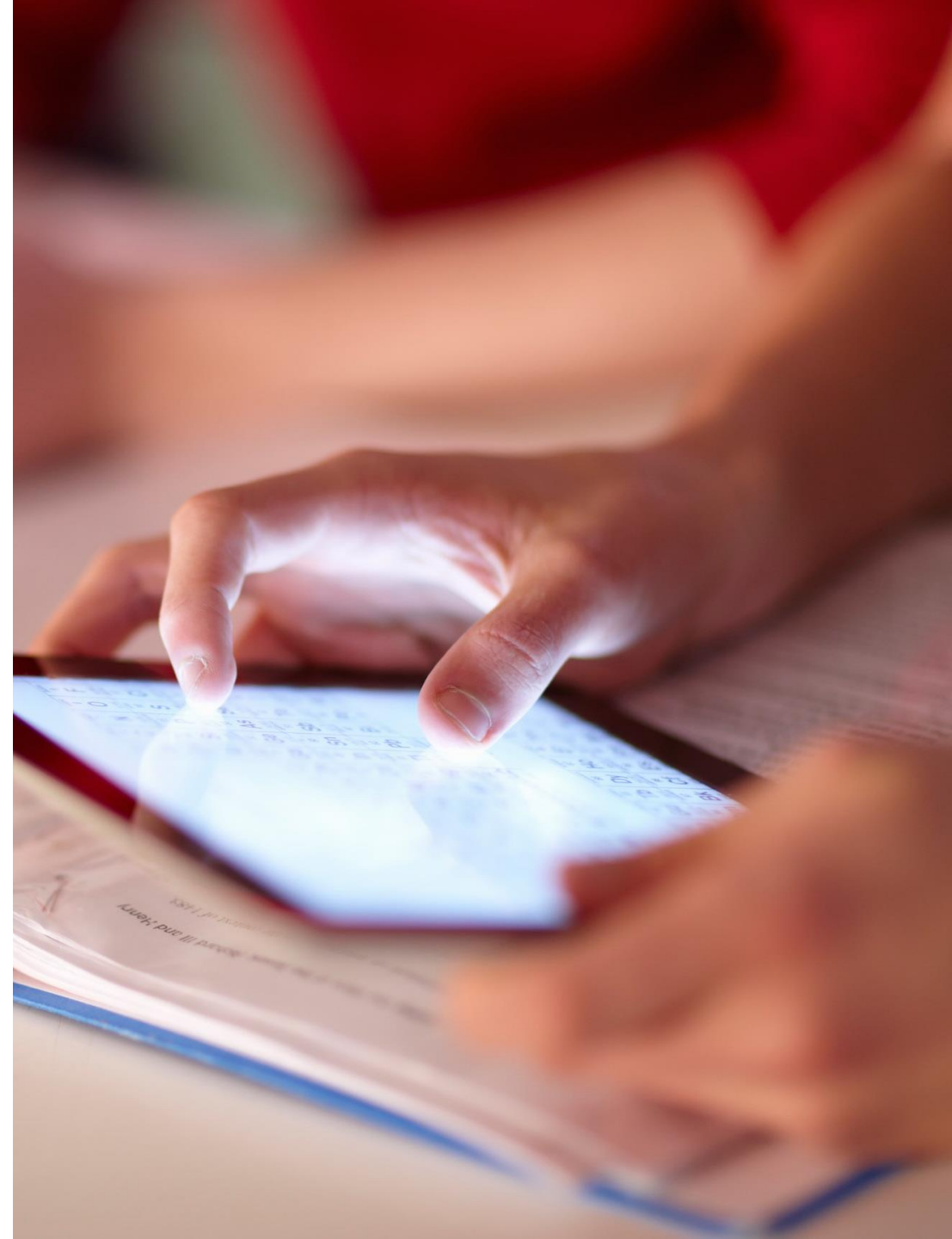
# Advantages of side-by-side extensibility

## Business

- Extend reach to new user groups
- Extend scope with custom solutions
- Complement data and business services from different back-ends
- Business agility by reduced time-to-market
- Build reusable business capabilities

## Technology

- More developers are enabled
- Digital core remains focused
- Innovative by leveraging new technology services in the cloud



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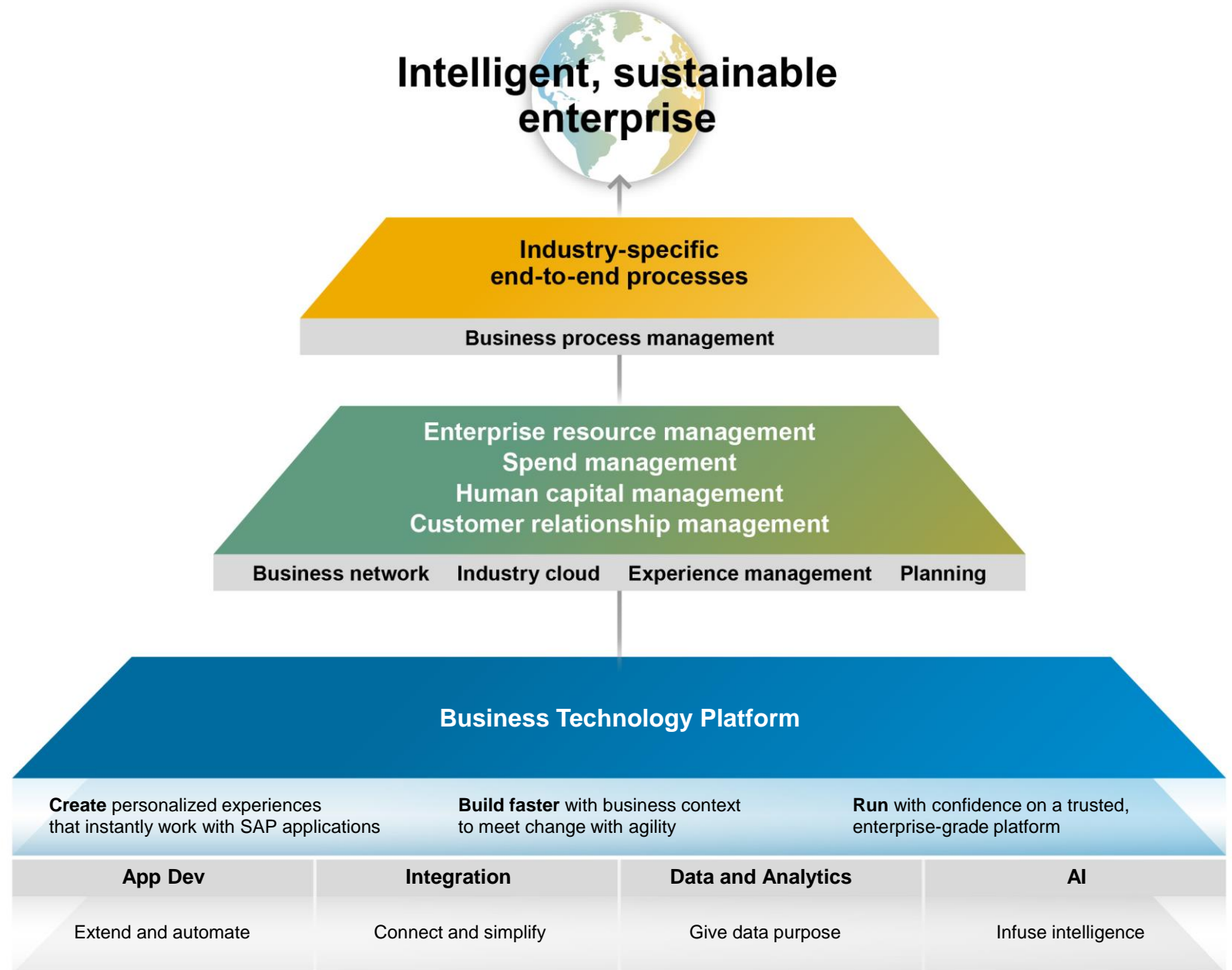
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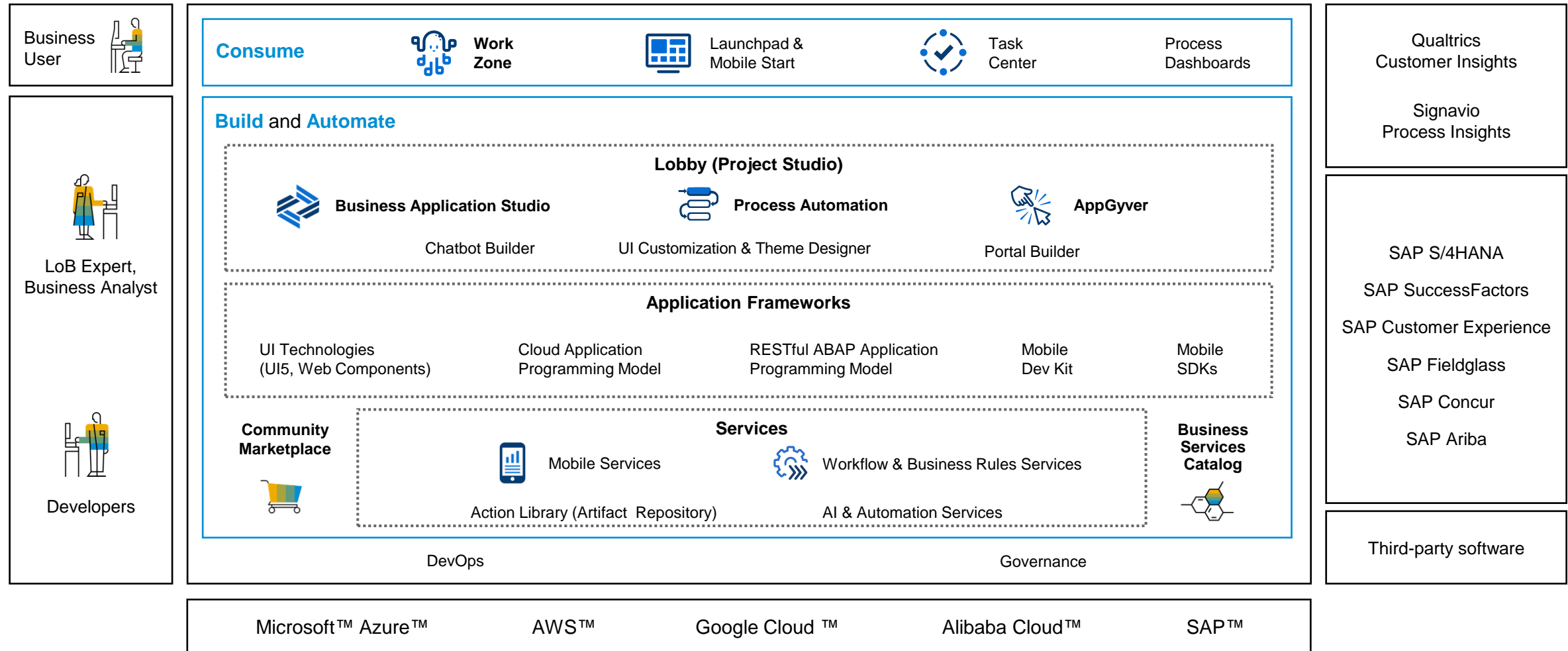
# SAP BTP is the foundation of the Intelligent Sustainable Enterprise



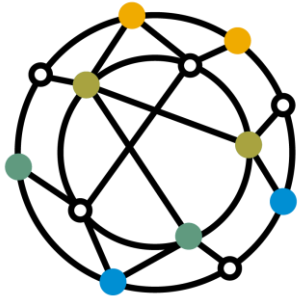


# Application Development

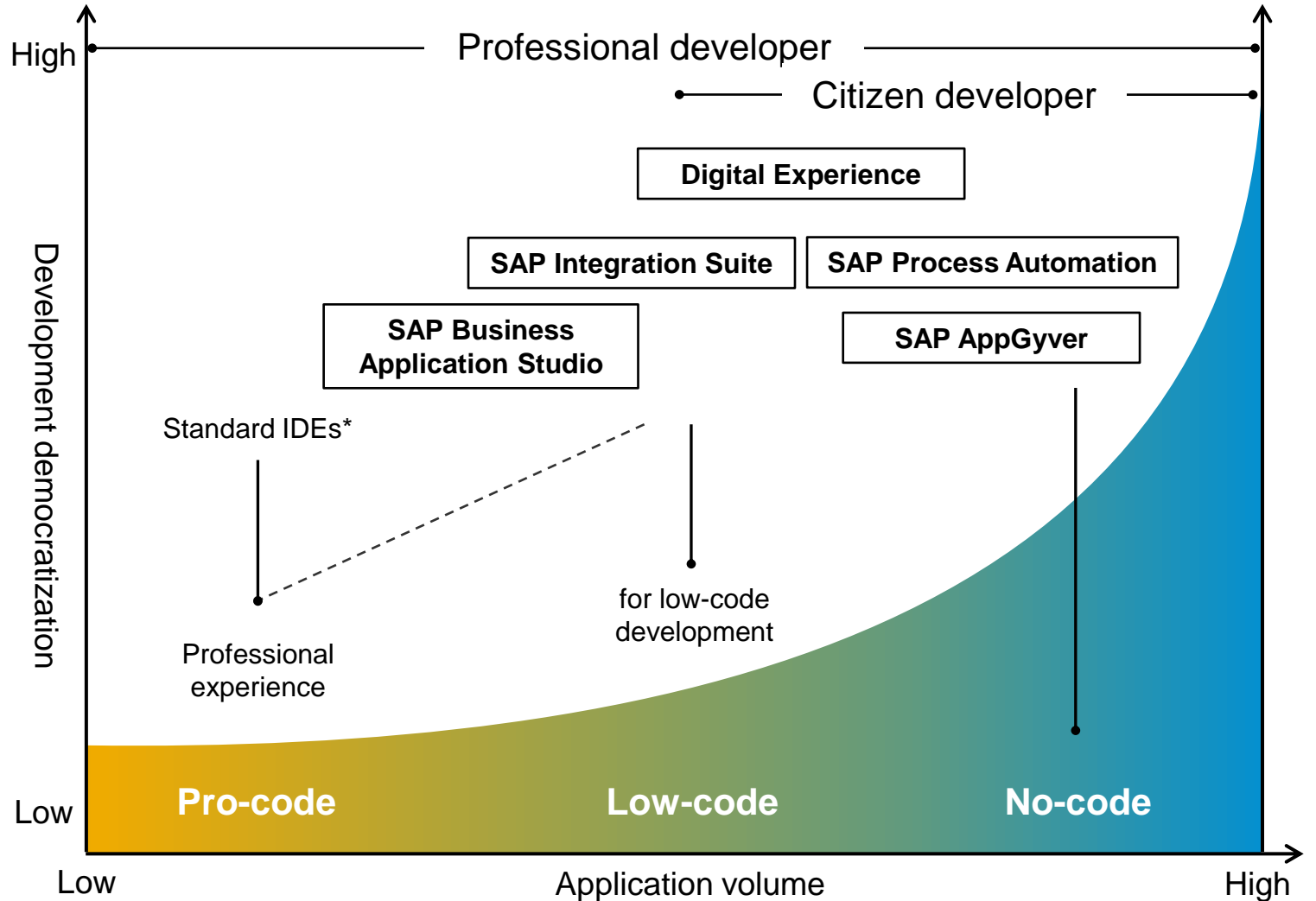
## Application Development, Process Automation and Digital Experience Services







Create a **unified developer experience** that allows every developer to build apps fast, no matter the skill level



\* For example, VS code + extensions

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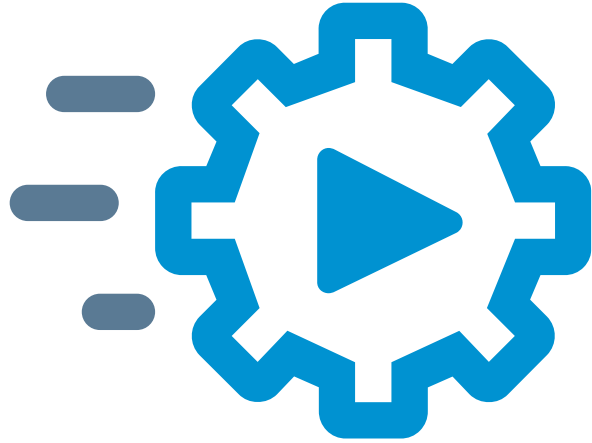
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## Runtime choices on SAP BTP



**Cloud Foundry**

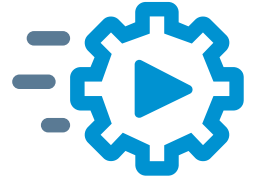


**Kyma**



**ABAP**

# SAP BTP Cloud Foundry Runtime



The SAP BTP, Cloud Foundry Runtime lets you develop polyglot cloud-native applications and run them on the SAP BTP Cloud Foundry environment.

## Benefits

- **Develop polyglot applications:** Build on open standards with SAP Java, Node.js, and Python buildpacks or bring your own language with community buildpacks for PHP, Ruby, Go.
- **Manage the lifecycle of applications:** Start, stop, scale, and configure distributed cloud applications using standard Cloud Foundry tools, our web-based administration user interface for SAP BTP, and dev-ops capabilities.
- **Optimize development and operations:** Use the rich set of SAP BTP services including messaging, persistence, and many other capabilities.
- **Use the application programming model:** Use programming languages, libraries, and APIs tailored for full-stack application development.

## Key capabilities

- Build scalable multitenancy applications (SaaS) securely and highly available
- Simplified developer experience for business application development
- Large choice of programming languages
- Intuitive “code-to-container” packaging and deployment, managed by the platform
- Platform-managed application security patching and updates
- Automatic application routing, load balancing, health checks, and multilevel self-healing
- Support for CAP – an opinionated business app development framework
- No infrastructure vendor lock-in
- Build scalable multitenancy business applications (SaaS)
- Out-of-the-box consumption of SAP and hyperscaler services
- Built on industry standards and open technology



CLOUDFOUNDRY

# SAP BTP Kyma Runtime - more than just a “pure” managed Kubernetes runtime



- Ready-to-use Kubernetes runtime including
  - API Gateway
  - Eventing
  - Service Mesh
  - Serverless engine
  - Monitoring and Logging
- Integrated into SAP BTP - which means
  - Consumption of many SAP services
  - Connectivity to SAP cloud solutions
- not just pure compute power, but a complete setup including
  - Loadbalancer
  - Bandwidth
  - IP Addresses



based on  
Kubernetes

## Event-based

- Trigger extensions by business event
- Used for asynchronous processes

## Serverless functions

- Make use of built-in serverless engine
- Build pure function-based extensions

## API-based

- Publish APIs to call extensions
- Used for synchronous cases and UI-extensions

## Microservices

- Deploy containerized extensions
- Use any programming language

# Cloud Foundry and Kyma runtime - Comparison

## Cloud Foundry

*«Here is my source code*

*Run it on the cloud for me*

*I do not care how»*

## Kybernetes/Kyma

*«Here's my code*

*I'll tell you exactly how you should  
run it on the cloud for me*

*And don't you dare make any  
assumptions on the deployment  
without my written consent»*

vs.

## Simplicity

With in-built opinions to  
shield app developer from  
complexities of IaaS, etc.

## Empowerment

With greater control to  
shape deployments and  
utilize infrastructure, etc.

[“Cloud Foundry and Kubernetes – Where do they differ? How do they fit together?”](#) Sanjay Patil, Posted on October 19, 2018

# SAP ABAP Environment



The ABAP environment is a platform as a service that allows you to **extend existing ABAP-based applications and develop ABAP cloud apps** decoupled from the digital core. You can leverage your ABAP know-how in the cloud and reuse existing ABAP assets by writing your source code with ABAP Development Tools for Eclipse.

The ABAP environment enables you to **expose**:

- OData services
- HTTP services
- SQL services
- RFC function modules

With your ABAP applications, you can **consume**:

- HTTP services (HTTP client)
- OData services (service consumption model)
- Remote Function Calls (RFC)
- On-premise systems via Cloud Connector
- SOAP-based Web services

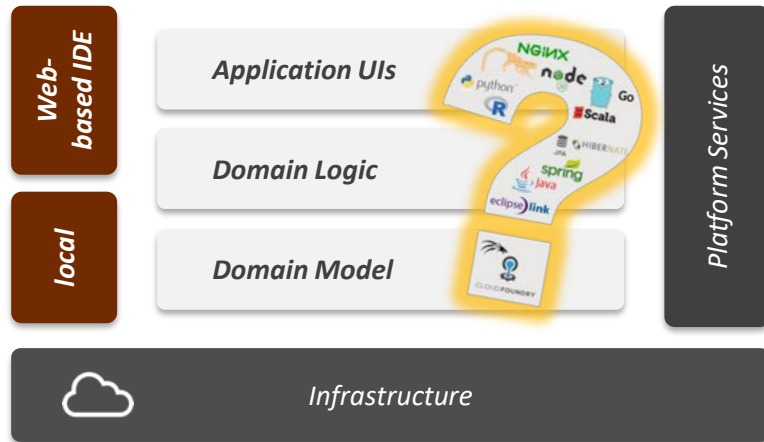
The ABAP environment is **based on the latest ABAP platform cloud release** that is also **used for SAP S/4HANA Cloud**. It **leverages** the innovations provided by **SAP HANA Cloud**.

The software stack contains standard technology components that are familiar from the standalone Application Server ABAP.



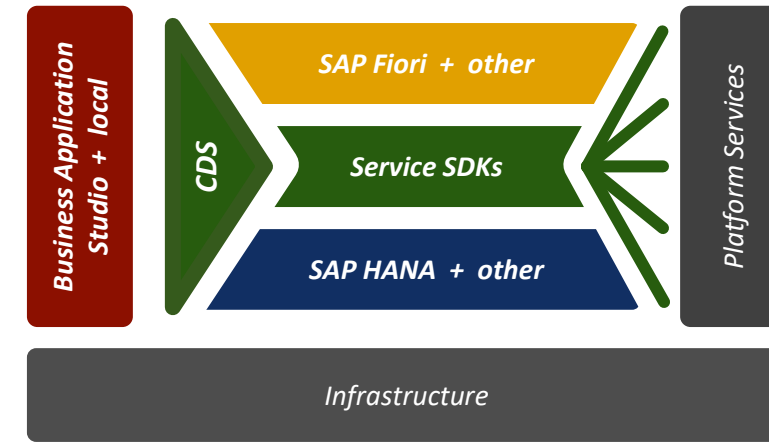
# Application Programming Models - What we provide

complementing cloud-native platform...



- High variety of open standards and SAP technologies
- How to combine between the technologies and solutions?
- Rather technical focus → *no quick start*
- Each project has to address *platform integration* and *enterprise qualities* individually
- High rates of boilerplate coding  
→ *slow time to market & hard to fix/evolve*

with business domain focus



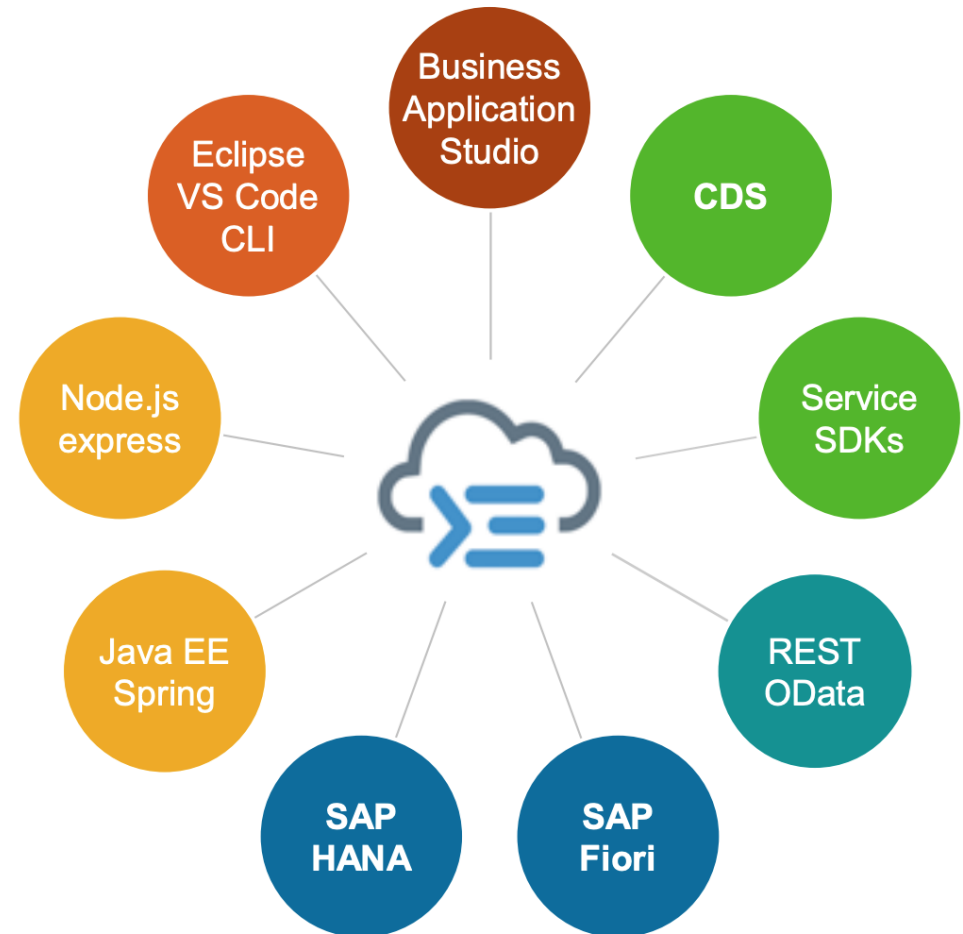
- Clear guidance to seamlessly integrated best practices...
- Common patterns & reuse models → *interoperability*
- Conceptual modeling → *re-focus on business domains*
- Capturing intent → *what not how; single points to fix*
- Automating tedious tasks → *multi-tenancy, extensibility, authorization, audit logging, data privacy, localization, platform integration, ...*

# SAP Cloud Application Programming Model (CAP)

*The SAP Cloud Application Programming Model is an **opinionated**, yet **open** framework of tools, languages, and libraries to efficiently build enterprise-grade services and applications.*

*It guides developers along a 'golden path' of proven **best practices**, while minimizing boilerplate so they can **focus on their domain** problems at hand.*

*The framework features a mix of broadly adopted **open-source** and **SAP** tools and technologies.*



# SAP Cloud SDK

“The SAP Cloud SDK is a versatile set of libraries and tools for developers to build cloud-native applications on the SAP Business Technology Platform (SAP BTP). The goal is to simplify the life of developers working in the SAP ecosystem.”

Available for [Java](#) and [JavaScript / TypeScript](#), providing the following benefits and capabilities:

- A set of pre-generated type-safe client libraries for various SAP published OData and REST services for convenient consumption and bullet-proof developer experience.
- Robust connectivity abstractions for SAP Business Technology Platform for convenient management of destinations, authentication, multitenancy, CSRF, e-tags, and more.
- A tailor-made type-safe client code generator for OData services that seamlessly integrate with other SAP Cloud SDK value-adds.
- A type-safe client code generator for REST services that wraps the open-source generator with custom code templates to make it deeply integrated with other SAP Cloud SDK features.
- An easy-to-use CLI with code scaffolding capabilities.
- A [pre-configured CI/CD pipeline](#) to set you on the best DevOps practices from the get-go.
- Modular design and high-level of extensibility
- Advanced cloud-native development patterns like resilience, caching, inherent multitenancy, etc.
- Support in [Business Application Studio](#)
- First-class documentation and [support](#)

The SAP Cloud SDK is well-integrated with SAP products and services like:

- [Cloud Application Programming model \(CAP\)](#)
- [SAP S/4HANA Cloud and On-premise](#)
- [SAP API Business Hub](#)
- [SAP SuccessFactors](#)
- [SAP Sales Cloud](#)
- [SAP Fieldglass](#)
- [SAP Concur](#)
- [SAP Ariba](#)



# ABAP RESTFul Application Programming Model (RAP) – The ABAP Story

Providing a  
programming  
model ...

... as a strategic long-term solution for ABAP development

... for the efficient development of

SAP Fiori apps and Web APIs,  
**from scratch** or **by integrating legacy code**,  
in the **cloud** and **on-premise**

... offering an end-to-end development experience with

High development **efficiency**

**Standardized** development flow

**Best practices and** development guides

**Focus on business logic**, rather than technical aspects

Native **testability**, **documentability**, and **supportability**

**Code pushdown** to SAP HANA

Comfortable support for **stateless** and **stateful** environments

... supporting the product qualities

User experience: SAP Fiori and SAP HANA

Cloud: scalability

Out-of-the-box extensibility and verticalization

Flexibility: Break-outs for non-standardized implementations

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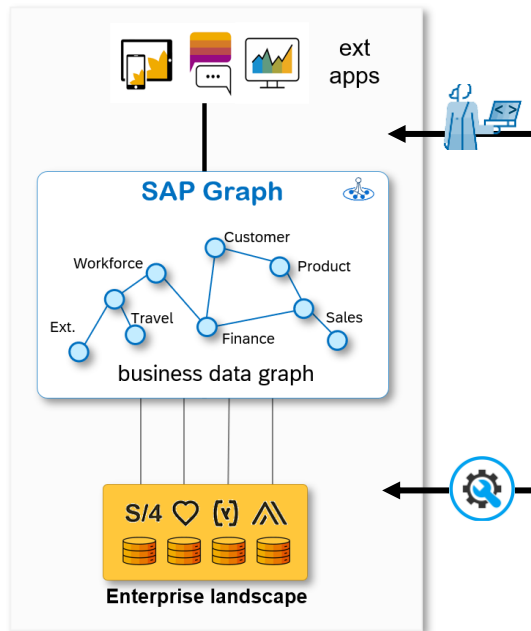
Summary

# SAP Graph

One connection to your business data



SAP Graph is a **new, unified SAP API** to access all business data as a single, semantically connected, **business data graph**. Easily and securely, provide your app developers with selective access to your enterprise data, via a single, easy-to-use API.



## App developer benefits

- Enjoy one easy-to-use API\* with powerful data graph queries
- *Focus on the data* you need, regardless of landscape complexity
- Experience one connected and consistent system data model
- Use **out-of-the-box** graph with 4,500+ SAP entities, 3,500+ connections
- Be instantly more productive, and deploy landscape-agnostic reusable apps

- Also suited to LC/NC developers and use cases

## Enterprise IT benefits

- *Carefully control* which data is securely and selectively exposed to different apps
- Avoid unnecessary ETLs and replications for specific use-cases
- Simple hand-over: just one BDG URL & creds
- Create your own extended data models and **enterprise graph**

- Also suited to outsourced / partner developer relations

Attribute	Description	Example
ID %	Qualified identifier	"1", "1001"
createdAt	Date and time the entity was created.	"2020-01-01T10:00:00"
changedAt	Date and time the entity was changed last.	"2020-01-01T10:00:00"
displayName	A unique identifier that represents the business partner.	"1001"
name	The formatted textual representation of the business partner.	"1001"
language	The language used to communicate with the	"en"

out-of-the-box connected data

Name	Status	Graph Model Version	Last Modified	URL	Model Extension
v1	Available	1.0.0	4/9/2022	https://oic30.graph.sapgraph1	SalesItem
v2	Available	1.0.2	4/12/2022	https://oic30.graph.sapgraph2	

Name	Description	Last Modified	Custom Entities
SalesItem	Adds the SalesItem Custom Virtual Entity	4/9/2022	(1) My custom SalesItem

create your enterprise graph



# SAP Business Application Studio: Professional & Low-Code Developer Tooling

Scale your Development and Build Smarter Enterprise Apps.



- Professional development environment **for code-based development + Low-code development environment** in a single solution, tailored for efficient development of business applications for the Intelligent Enterprise
- Easy path **from low-code visual tools to professional** development tools



- **Modern and intuitive** web user interface
- **Simplified, faster setup** of the development environment
- **Tight integration** with SAP services, technologies, and systems



- Based on **industry best of breed IDE and tools**, providing full, tool independent, developer flexibility
- Develop **enterprise ready applications, out of the box**, utilizing SAP services and best practices



- Used daily by **thousands of SAP customers as well as by SAP internal development teams**
- Operated across all different **SAP multi cloud environments**



# SAP Mobile Services

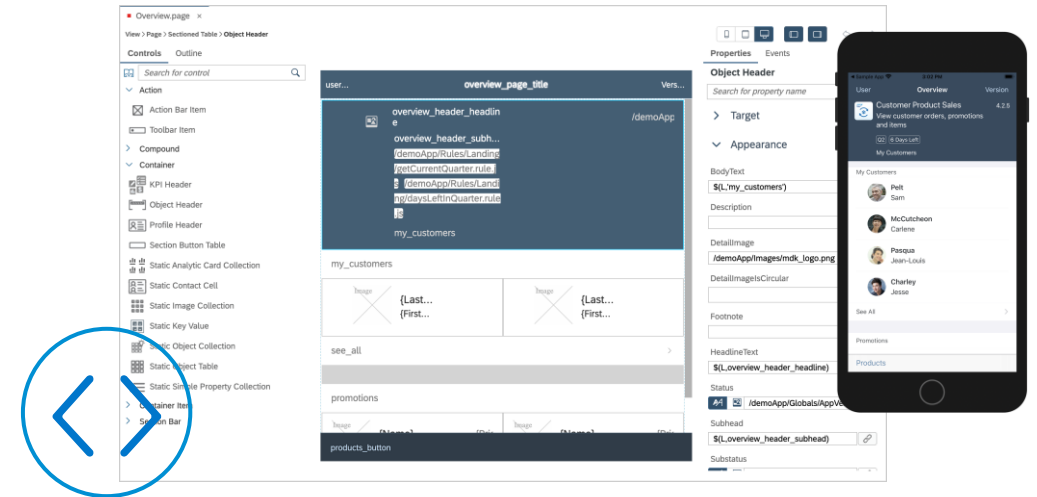
Build, run, and scale mobile enterprise applications



SAP Mobile Services helps you satisfy enterprise requirements so that you can focus on creating business value. [SAP is leader in the mobile enterprise space](#), because we allow customer to build apps in near to no time.

## Build

- From Low/No Code to Pro Code SAP offers SDKs to accelerate the development of mobile enterprise apps.
- No compromises on the enterprise readiness and enterprise security.
- SAP Mobile Development Kit enables developers to build and customize native mobile applications in a highly productive, metadata-driven model.
- SAP BTP SDK for Android and iOS enable developers to leverage the full powers of the platform.

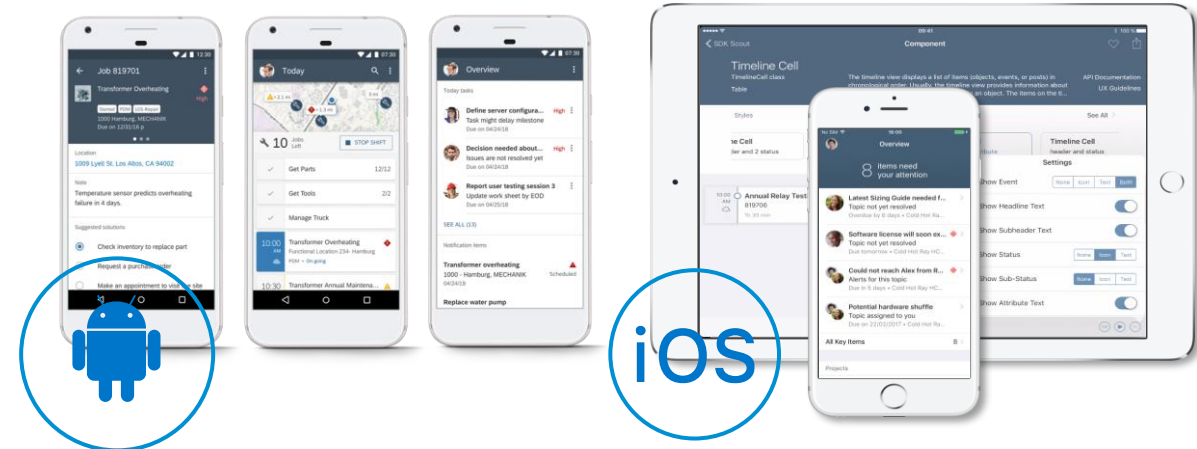


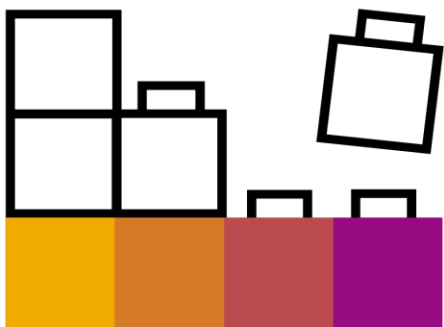
## Run

- SAP Mobile Services enables administrators to keep the deployed mobile solutions up and running with deep insights.

## Scale

- SAP Mobile Services supports flexible growth horizontally and vertically.





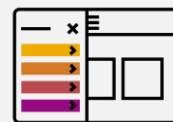
# SAP AppGyver

## The No-Code Approach

Increase development efficiency while eliminating coding effort. Build full-stack apps intuitively for Web, iOS and Android.



- Simplified creation of UI's with **drag-and-drop functionality**
- Integration with external data using **predefined integrations** and custom connectors
- Ability to create any logic with **flow functions**



- Support for over **400 built-in formula functions**
- **Vast enablement opportunities and community** support to help no-coders get started to rapidly create and distribute sophisticated enterprise apps



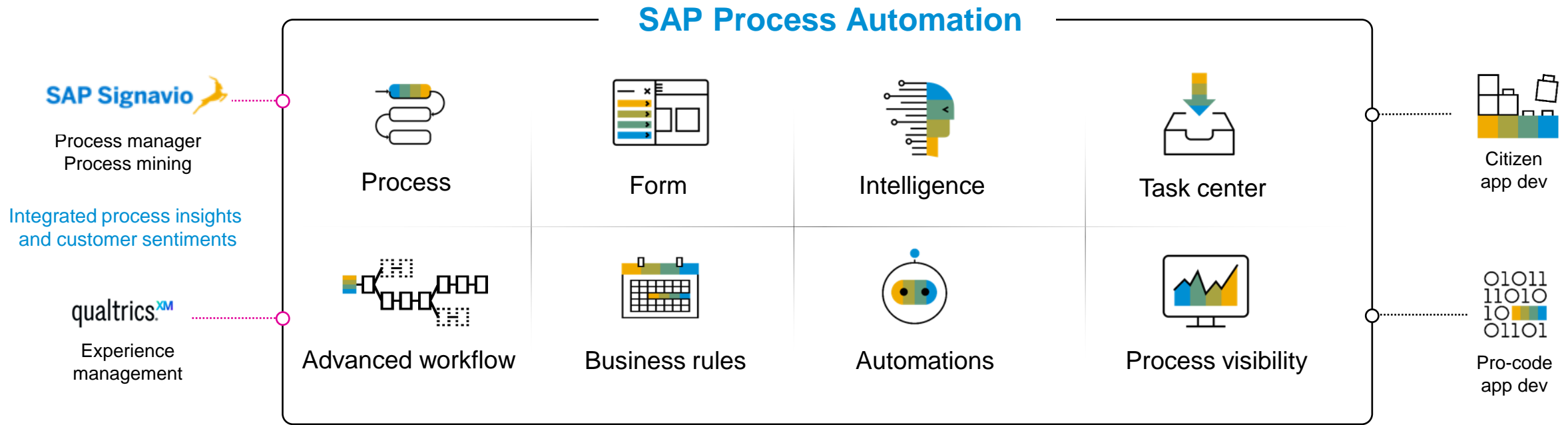
- **Visual cloud functions** empower users to assemble full-stack apps with data models and business logic, without writing code
- Easily **compose APIs** with the same no-code paradigm used for the front-end



- Trusted by Fortune 500 companies and **more than 300,000 users**

# SAP Process Automation – No-Code based Process Automation

Capabilities: citizen automation for line-of-business builders



- New **citizen automation user experience** (process builder, forms builder)
- All **advanced workflow management** capabilities available (rules, process visibility, process flexibility, AI)
- Embedded **RPA capabilities** to readily combine bot automations with workflows
- Content and **reusable artifacts** (such as bots, workflow components, process steps, actions)
- **Unified launchpad and task center** for citizen developer applications and automations

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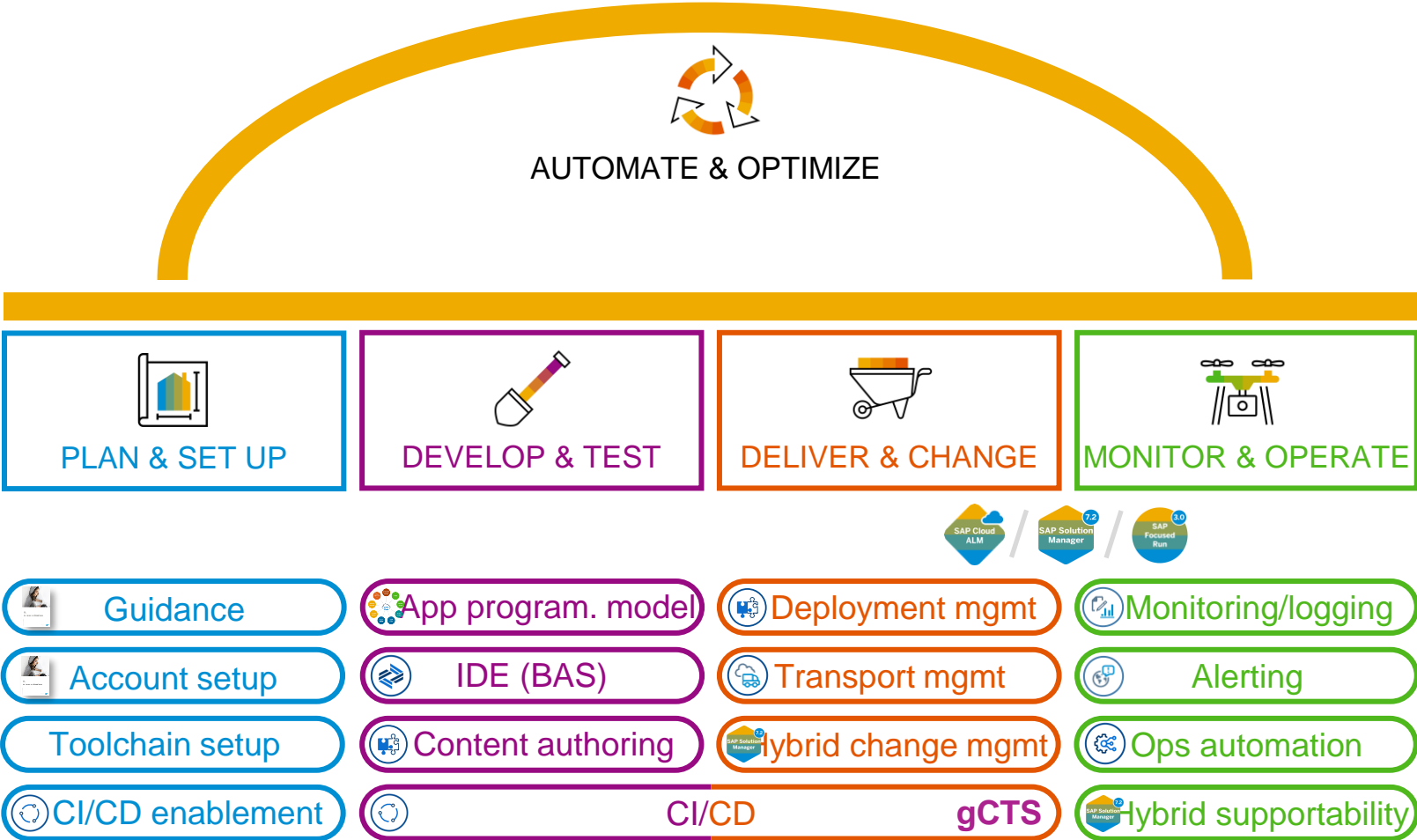
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# DevOps with SAP

DEV

OPS



# Set up **CI/CD** efficiently for SAP environments

CI/CD enablement



## SAP Continuous Integration and Delivery

**who** For SAP customers and partners with ABAP background transitioning into the cloud

**what** The service provides a golden path for partner and customer development with SAP-specific scenarios

**where** Regional coverage (EU, US, APJ), Azure + AWS available, Trial + Free Tier

**how** Offered as SAP cloud BTP service – no own infrastructure required, running pipeline in minutes, support provided by SAP



## Simplicity

for typical SAP business application developers



## Project “Piper”

**who** For experienced customers, comes with full flexibility, requires know-how and CI/CD stack

**what** Enablement, learnings and open source CI/CD library for custom CI/CD pipelines, covering many SAP-specific scenarios

**where** Customers/partners must bring their own CI/CD stack, widely used also SAP-internally

**how** CI/CD expertise required, you build pipeline on separate infrastructure – running pipeline in hours/days, no direct support by SAP



## Flexibility

to automate complex and customer-specific development scenarios

# Deliver your cloud changes toward production

Transport mgmt

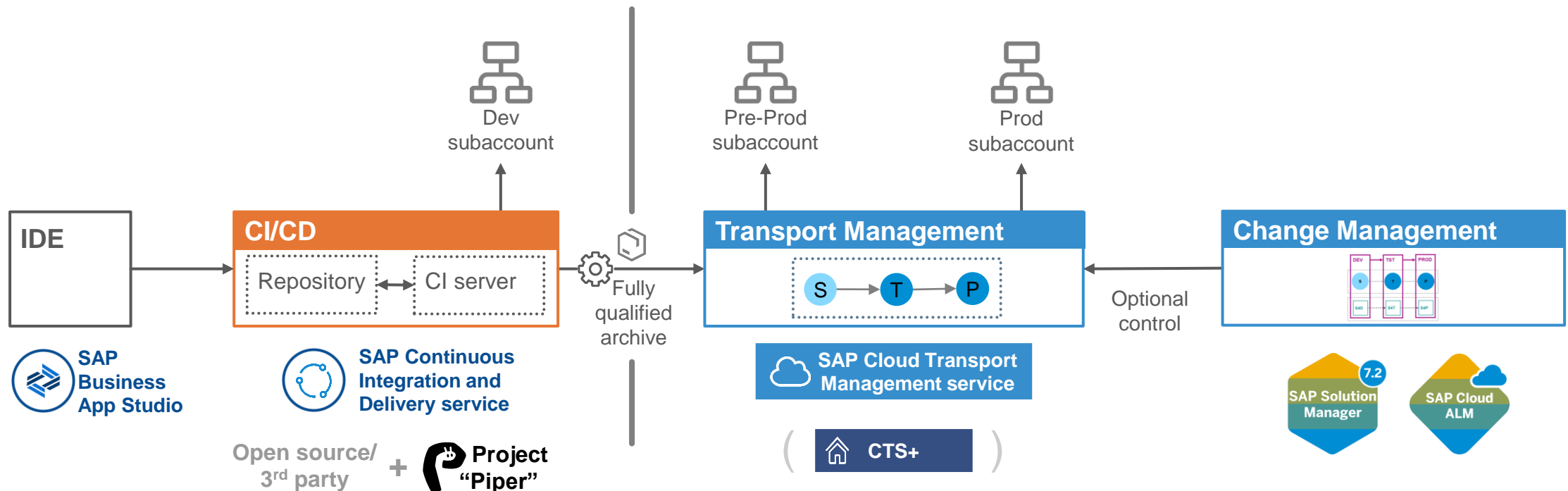
Integration into CI/CD: Combining agility + control

## Development landscape

- Based on *Continuous Integration* principles, managed by DevOps team
- Verification of single developer change
- Typically fully automated

## Delivery landscape

- Based on strict *Transport Management* rules (policies, schedules), managed by ops/approvers
- Verification of release candidate version
- Typically done with manual confirmation





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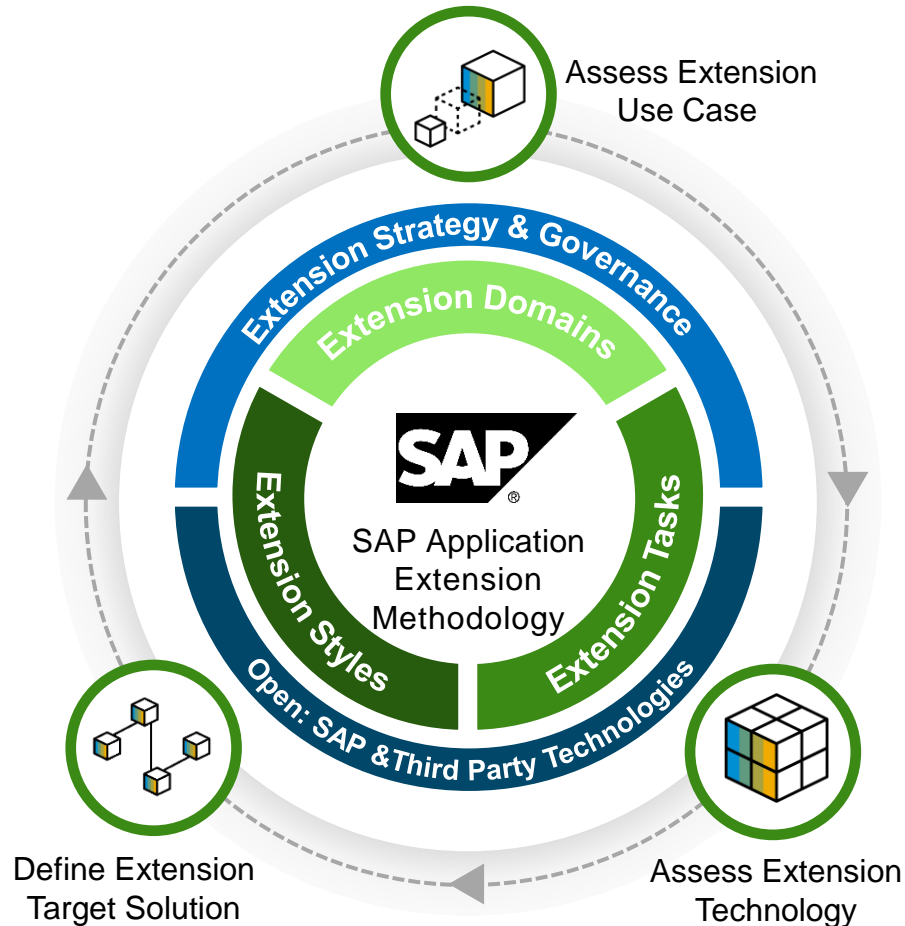
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# SAP Application Extension Methodology

## Goal & Outcome



### ■ Goal:

- SAP Application Extension Methodology provides a structured, technology agnostic approach for customers and partners to define an organization specific extension strategy, that guides and supports the extension implementation of standard business applications

### ■ Outcome:

- Enable Enterprise Architects to assess extension use cases and define an extension target solution

Please request access to our community via e-mail to: [sapaem@sap.com](mailto:sapaem@sap.com) and you will be invited to join.

# SAP Application Extension Methodology

Simplify extensions by a systematic approach

Extension Domains

Extension Domain

An Extension Domain describes the "location" of the Technical Extension Building Block and explains where it "runs"

1

Core Solution Extension Domain:  
Running on the same technology stack as the core solution  
(Example: SAP S/4HANA Cloud)

2

Side-by-Side Extension Domain:  
Using extensibility capabilities outside the core solution like using the SAP Business Technology Platform based on standard APIs/events  
(Example: SAP Business Technology Platform)

3

Hybrid Extension Domain:  
Extension using a combination of Core Solution Extension and Side-by-Side Extension Domain

Phase 2: Assess Extension Technology

Extension Styles

Extension Tasks

Extension Technology Mapping

Core Solution

Core Solution Extension

1

Side-by-Side Extension Platform

Side-by-Side Extension

2

Side-by-Side Extension Platform

Hybrid Extension Domain

Side-by-Side Extension

Core Solution Extension

3

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Extension Styles and Extension Tasks

Extension Styles

Phase 2: Assess Extension Technology

Extension Styles

Extension Tasks

Extension Technology Mapping

Presentation Tier

Application Tier

Data Tier

User Interface Extension

New User Interface

Form and Template

Business Logic Extension

Data Model Extension

Adapt the standard User Interface of the core solution by adding, removing and changing UI elements like labels, buttons and input fields

Create a custom user interface in addition to or in replacement of a standard UI catering for specific usability needs

Adapt existing or create new forms and e-mail templates

Realize business requirements by implementing additional business logic and add, exchange or re-wire a process by creating additional process steps

Store additional information by extending the entities of an existing data model or define a new data model

Explanation

Extension Styles frame the overall technology for building extensions and structure extension tasks. They can be categorized into the Three-Tier Architecture model: Presentation Tier, Application Tier and Data Tier.

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Extension Technology Mapping

Three-Tier Architecture	Extension Styles	Extension Task (agnostic)	Extension Domain	Techn
Presentation tier	User Interface Extension	Adapt standard UI: add/hide/create/re-name/re-arrange label or headlines	Core	SAP C
			Core	SAP C
			Core	SAP C
			Core	SAP W
			Core	SAP W
			Core	SAP K
			Core	SAPUI
			Core	SAPUI
		Add custom field to standard UI	Core	SAP C
			Core	SAP C
	New User Interface	Create custom UI	Core	SAP C
			Core	SAP W
			Side-by-Side	SAPUI
			Core	SAPUI
			Side-by-Side	SAP FI
			Core	SAP FI
			Side-by-Side	SAP N
			Side-by-Side	SIS Ex
			Side-by-Side	SIS Ex
			Side-by-Side	SAP TI
	Form and Template	Create custom form templates based on standard object	Rapide	
			Side-by-Side	SAP B
			Side-by-Side	SAP A
			Core	SAP K
			Core	SAP C
			Core	Devel
			Side-by-Side	SIS Ex
			Side-by-Side	SIS Ex
			Side-by-Side	SAP Ex
			Core	SAP K

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# With BTP You will not start from Scratch.... with **pre-defined Business Content**

**>5500 CDS Views**

264 iRPA **Bots**

covering **285** SAP Application **Events**

**70 Process Visibility** Packages

**>20** ready to use Business Services

**59 Workflow** Packages

Open Connectors (aligned APIs)  
to **170 3rd-party products**

**105** Decision/Business **Rules**

SAP Cloud **SDK**

**>2500** Integration Scenarios

# Thank you.

Contact information:

Arne Speck  
arne.speck@sap.com



# How to start: BTP Free Tier Model

## You can use Free Tier to...



### Explore & try SAP BTP services

get started with your own instance of SAP BTP and free tier services.



### Start developing

take advantage of step-by-step guided missions and SAP Community



### Learn the basics

see how services work, get ready for development (developer tutorials)



## What are the restrictions?



### Accessing free tier services

- PAYG & CPEA customers get immediate access via SAP BTP cockpit
- All others will sign up for a SAP Pay-As-You-Go account via SAP Store or account executive

### Each service limited by capacity

- E.g., Mobile – 3 users, 10 apps; Kyma Runtime – 4CPUs
- Use free tier services as long as account is active and capacity limits not reached

### Free tier not meant for productive use

- Capacity limits may be adjusted over time
- Community support only, no SLAs