SIDE-BY-SIDE EXTENSIONS – INTRODUCTION

S4T – Preißler (CI/DAE2.2)

01.09.2020 – First iteration

Side-by-Side Extensions – Introduction
Why Side-by-Side?

- Agile and efficient use of the best solution for the specific use case
  - Access to state-of-the-art technologies, services and environments outside of the ABAP world
  - No limitations due to the monolithic architecture of S/4HANA on-prem systems

- Reduce S/4HANA transition and future maintenance efforts
  - Applications can connect to R/3 and S/4HANA during the transition phase reducing double work
  - “Keep the core clean” by having only necessary developments in S/4HANA

- Reduce tradeoff between stability and flexibility
  - “Keep the core clean” by having only necessary developments in S/4HANA
  - Make use of the scalability of the Side-by-Side environment to reduce peak loads

RECAP –
RB DEVELOPMENT MODEL S/4HANA

RB Development Model S/4HANA
Vision

“ CI develops IT products that support standardization, market differentiation and IT efficiency. ”

End to end solutions are built from a **stable core** and **reusable components** that can be tailored to individual business requirements.

The stable core is extended by **loosely coupled extensions based on APIs** for open integration and continuous side-by-side development.

All components and solutions follow a **common development standard** and are built on a **harmonized platform** that enables low lifecycle costs and fast rollouts.

Guiding Principles

RB Development Model S/4HANA

Guiding Principles for S/4HANA Design & Development

API first design

- Custom business objects are delivered with APIs
- APIs are documented in Bosch **API Management**

Design for reuse

- Build E2E customer solutions based on **reusable components**
- Layered development based on corporate-/reuse-concept

User centric design

- Fiori as the default UI technology with SAP GUI as fallback
- **UI is optimized for role specific task** flows (limit switching of UI technologies)

Flexible extensions Side-by-Side

- **Decouple solutions via SbS** extensions where applicable
- Only necessary developments on the S/4HANA core system

Clean and stable core

- Call the core via whitelisted APIs
- Use released extension points
- **Don't modify the core**

Full test coverage

- Unit tests are mandatory
- All changes that can have automated tests should
- Use of **Solution Manager** incl. process documentation

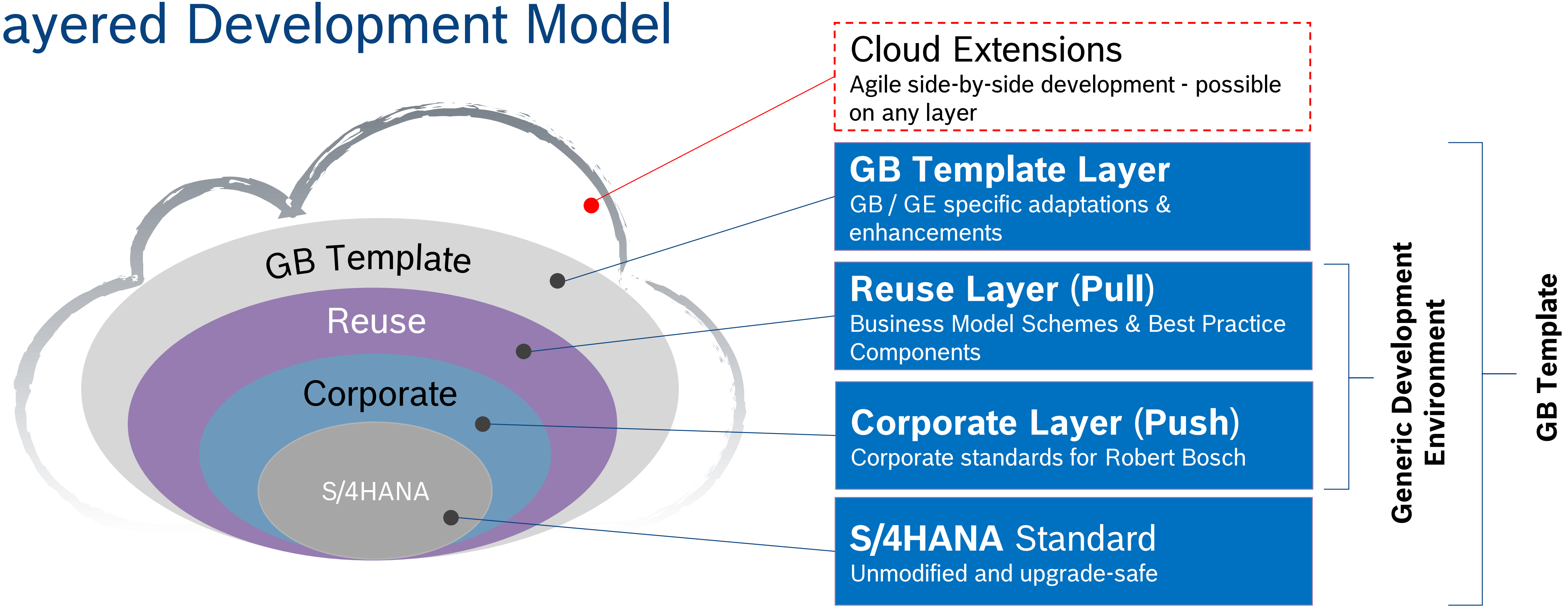
Quality has priority

- **Quality over features and time**
- Verified code quality (automated checks and reviews)
- Up to date documentation

Clean and modern code

- Always use current technologies and methodologies
- Consequent redesign of legacy code (refactoring)
- **No HANA native access**

RB Development Model S/4HANA
Layered Development Model



Cloud Extensions
Agile side-by-side development - possible on any layer

GB Template Layer
GB / GE specific adaptations & enhancements

Reuse Layer (Pull)
Business Model Schemes & Best Practice Components

Corporate Layer (Push)
Corporate standards for Robert Bosch

S/4HANA Standard
Unmodified and upgrade-safe

Generic Development Environment

GB Template

"End to end solutions are composed from reusable components based on a highly standardized core. Solutions are tailored to GB template requirements by configuration and extension."

SAP Standard & Rules RB Development

RB SAP Standard

SAP-Standard Producer	RB restriction	Control check	Approval by
Customizing (Only Transaction SPRO)		No check	
Forms (Custom Development)		No check	
Embedded Analytics	without custom development	No check	
Custom Development S/4HANA (e.g. BADI, User-Exit, custom table)	RB Development Guidelines	≤ 100 TEUR* > 100 TEUR* * CI-Costs (internal+external)	BMS Owner (response within 7 days) Gx (response within x days)

SAP Standard & Rules RB Development

Custom Development Details

What is custom development ?

- Custom development is an extension of the SAP standard using development tools to create UI elements, business logic coding, database tables, interfaces etc.
- Custom development may be required for process differentiation and optimization, legal requirements, mandatory technical extensions etc.

How to extend SAP standard ?

- Follow RB development guidelines based on SAP recommendations for upgrade-safe extension of SAP standard
- Use in-app extensions (inside S/4HANA) based on stable APIs and extension technologies for small to medium extensions deeply integrated into standard processes at points pre-defined by SAP (e.g. key-user extensions, BADI, explicit enhancement points,…)
- Use side-by-side development (outside S/4HANA, e.g. on SAP-SCP) for larger blocks of functionality running before / after / in parallel to the SAP standard process (decoupled applications)

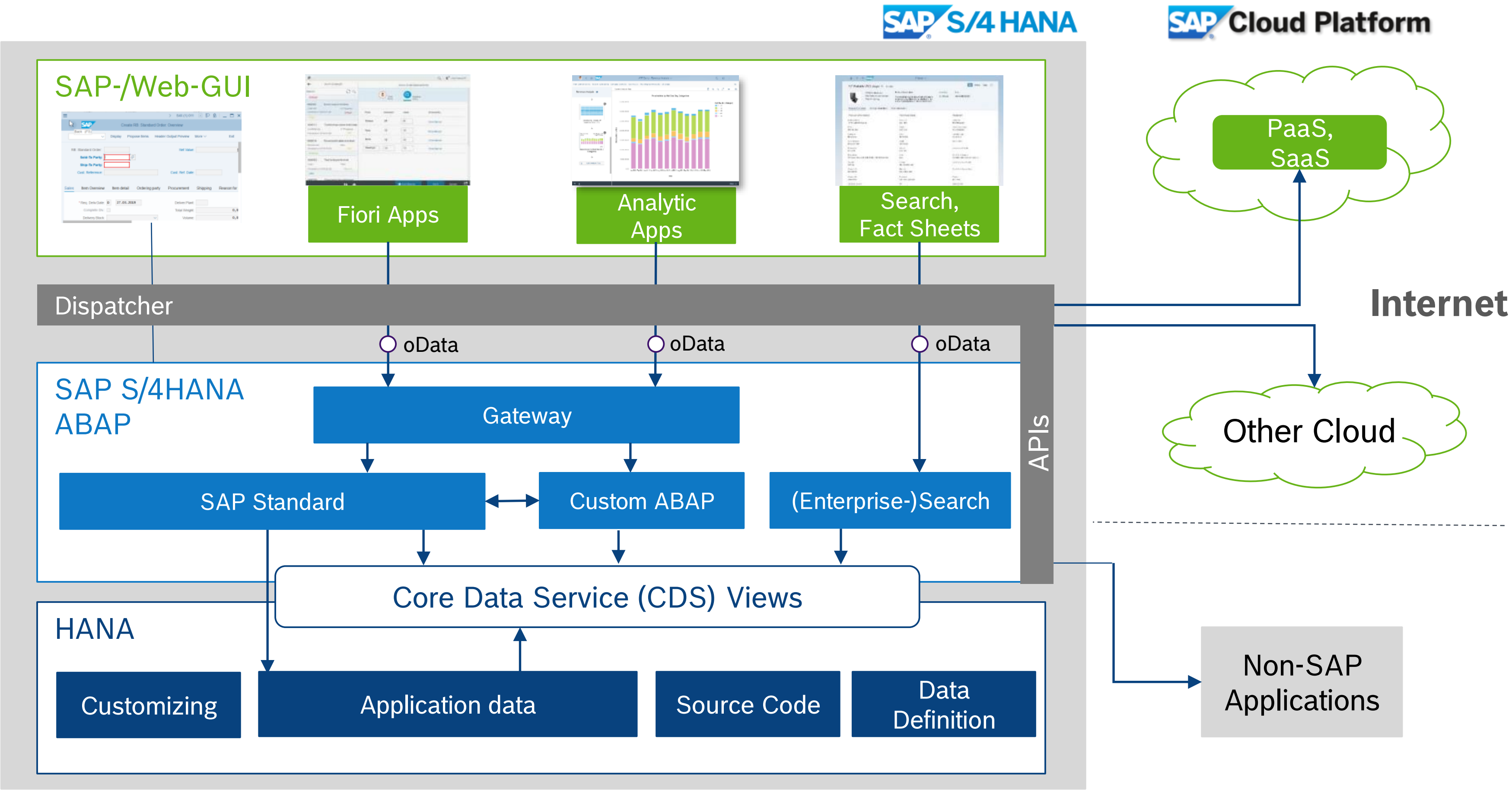
S/4HANA ARCHITECTURE

S/4HANA Architecture
Overview

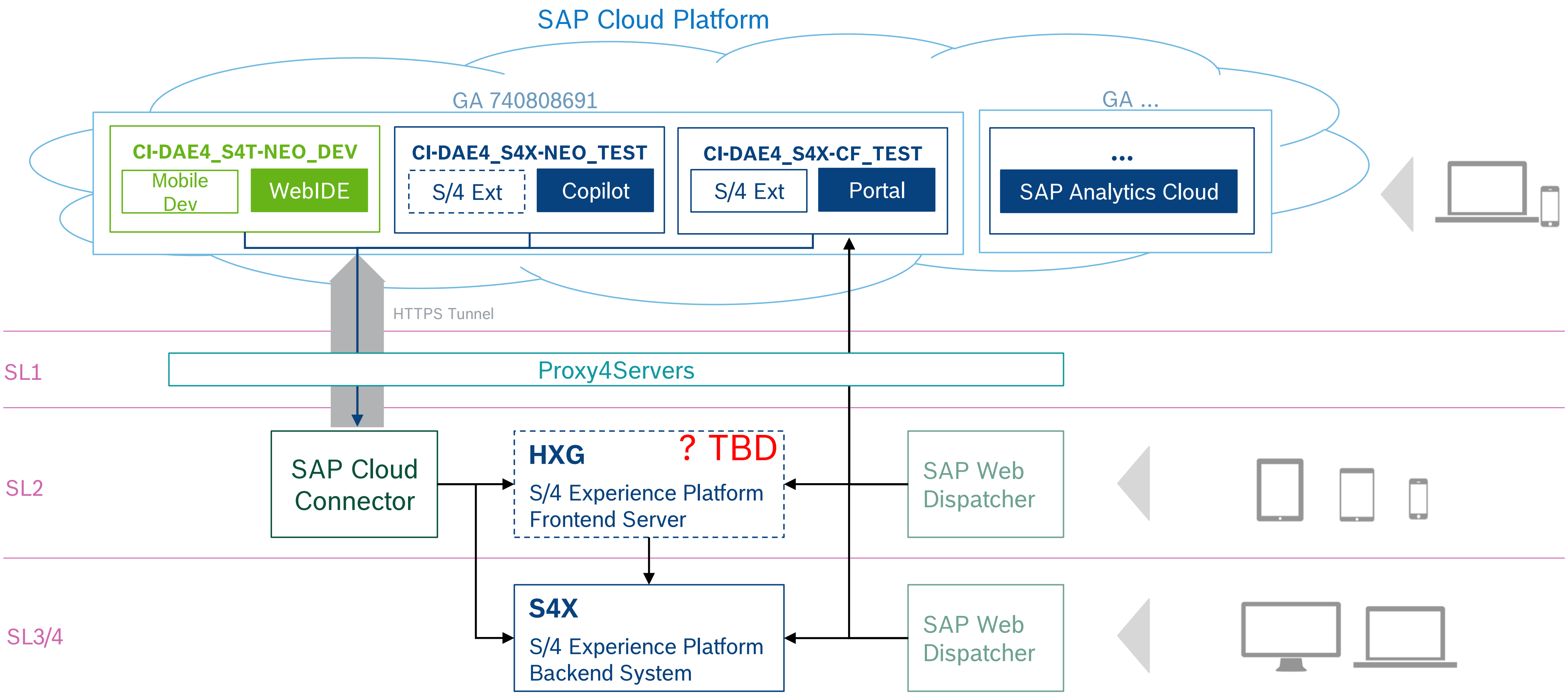
UI Layer (Fiori, SAP- and Web-GUI)

SAP S/4HANA ABAP Platform

SAP HANA Platform

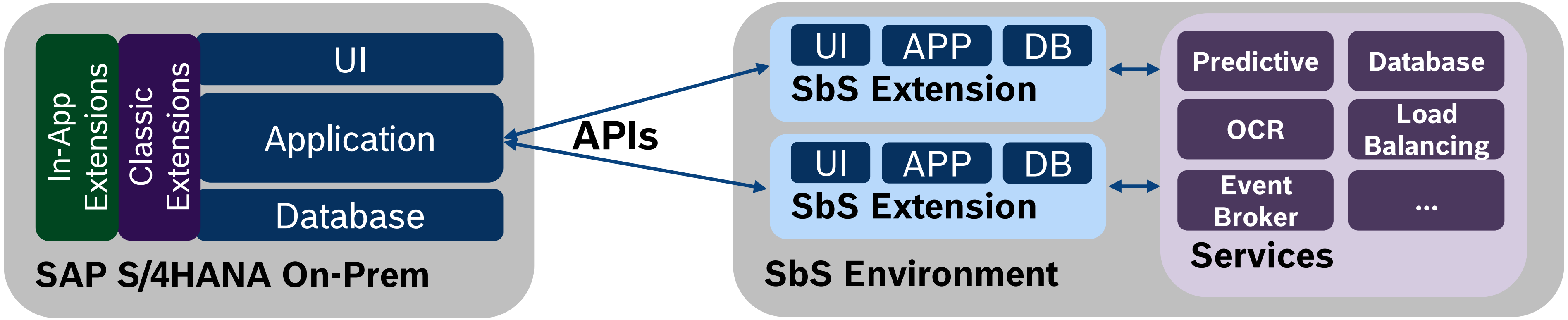


S/4HANA Architecture
Landscape components example based on S/4 Exp. Pl.



WHAT IS SIDE-BY-SIDE?

Side-by-Side Extensions – Introduction
What’s Side by Side (SbS)?



- Side-by-Side extensions:
  - Connect to the S/4HANA on-prem system only via APIs like OData, SOAP, RFC
  - Usually use modern environments like Clouds providing many additional state of the art capabilities
  - Are developed in the language that’s best for the use case like Java or JavaScript (Node.JS)
  - Run mostly independent from each other in their own runtime environment

Side-by-Side Extensions – Introduction
What's a SbS Extension and what not?

Side-by-Side Extension

- Focused on enriching a S/4HANA process e.g. by adding additional process steps before or after the standard steps
- Cannot work independently of the S/4HANA system for an extended timeframe

Something else

- 3rd party applications
- Large developments that implement multiple processes where the S/4HANA is just an interface to an ERP system that could easily be replaced (e.g. a Webshop)
- Custom processes that run without any connection to the S/4HANA processes

Important

- This is a simplification and there is a large "gray" area on what can be considered an SbS extension
- Non-SbS extensions can benefit from and use the same platform too where appropriate

Side-by-Side Extensions – Introduction
Typical SbS use cases

- **Proxy applications** are usually public-facing and shield the SAP system from direct access like a mobile application for getting product information or registration web sites with batch synchronization
- **Convenience applications** are used to simplify the process by using e.g. default values or having only input fields for a very specific use case like a mobile application supporting a field engineer
- **Substitute applications** replace SAP standard processes or process steps to e.g. provide missing functionality or changing functionality without modifying SAP standard
- **Preprocessing applications** are used before or after a process step in the SAP system usually collecting data and doing some sanity checks before the data is transferred
- **Postprocessing applications** start additional activities after a process step is completed in the SAP system like e.g. updating an external customer database after an order was shipped
- **Analytical applications** connect data from multiple sources and provide them centrally

Side-by-Side Extensions – Introduction
Use cases not suited well for SbS

- Modification of the S/4HANA on-Prem system
- Implementation of system internal extension points like BADIs, Exits, Includes
- Mass data processing of data stored inside the S/4HANA system
- Very latency critical applications requiring S/4HANA reaction times in the range of 0.1 seconds or less
- Very high frequency use cases using proprietary protocols where already the protocol change to a web based API like OData will cause problematic overhead
- High availability requirements that cannot be covered by the runtime SLA (e.g. SCP)

Side-by-Side Extensions – Introduction
Major Advantages and Challenges

Advantages

- Mostly independent of typical change cycles like fixed deployment dates and upgrades
- Supports a higher change frequency and better integration of other systems and services
- Usage of modern technologies, environments, services and tools possible independent of the backend release cycle
- Less code and changes in the ABAP system increases stability and reduces upgrade durations and maintenance efforts

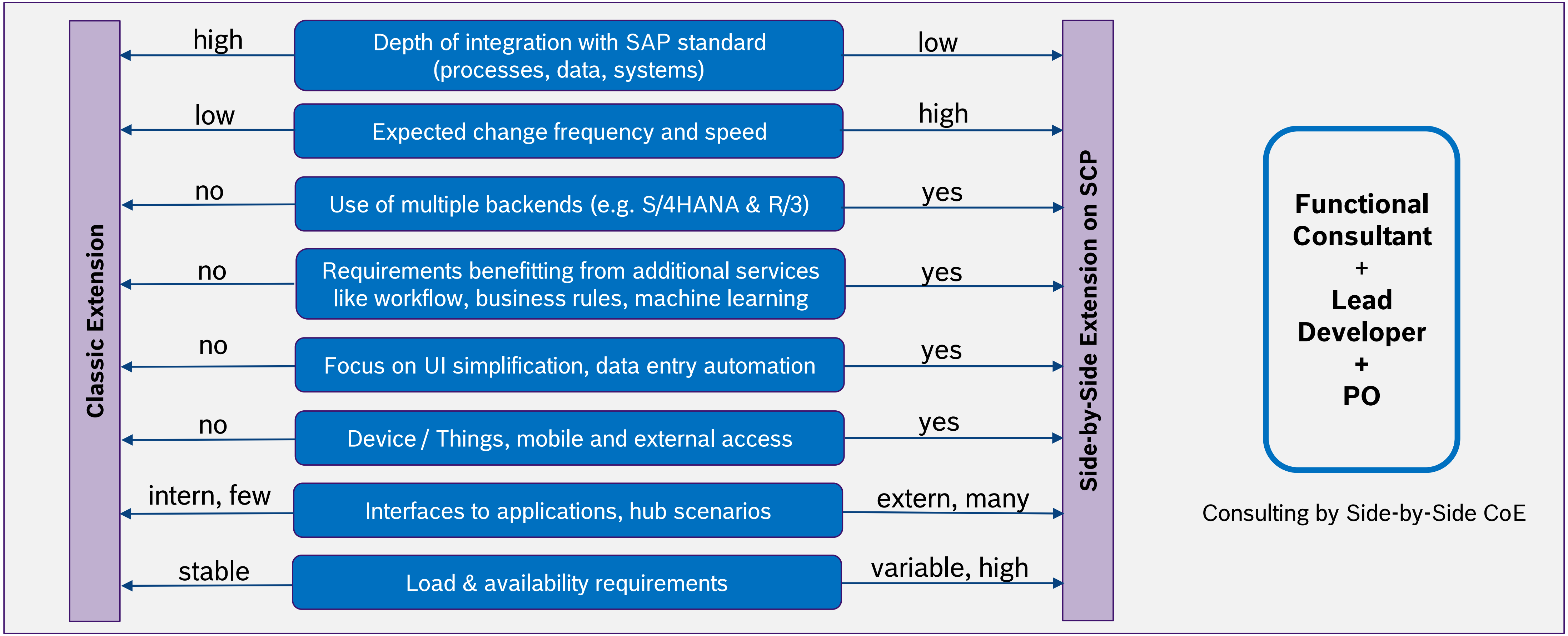
Challenges

- Operating costs for the used services and tools like SCP runtime or development tools
- Additional knowledge or experts necessary
- APIs necessary → initial higher efforts where missing but benefits for general system integration
- More frequent deprecation of outdated technologies

Side-by-Side Extensions – Introduction

Decision Criteria for Side-by-Side Development

Start: Custom Development required, In-App (key user) extension not possible



Classic Extension		Side-by-Side Extension on SCP
high	Depth of integration with SAP standard (processes, data, systems)	low
low	Expected change frequency and speed	high
no	Use of multiple backends (e.g. S/4HANA & R/3)	yes
no	Requirements benefitting from additional services like workflow, business rules, machine learning	yes
no	Focus on UI simplification, data entry automation	yes
no	Device / Things, mobile and external access	yes
intern, few	Interfaces to applications, hub scenarios	extern, many
stable	Load & availability requirements	variable, high

Functional Consultant
+
Lead Developer
+
PO

Consulting by Side-by-Side CoE

Side-by-Side Extensions – Introduction
Extensibility Overview

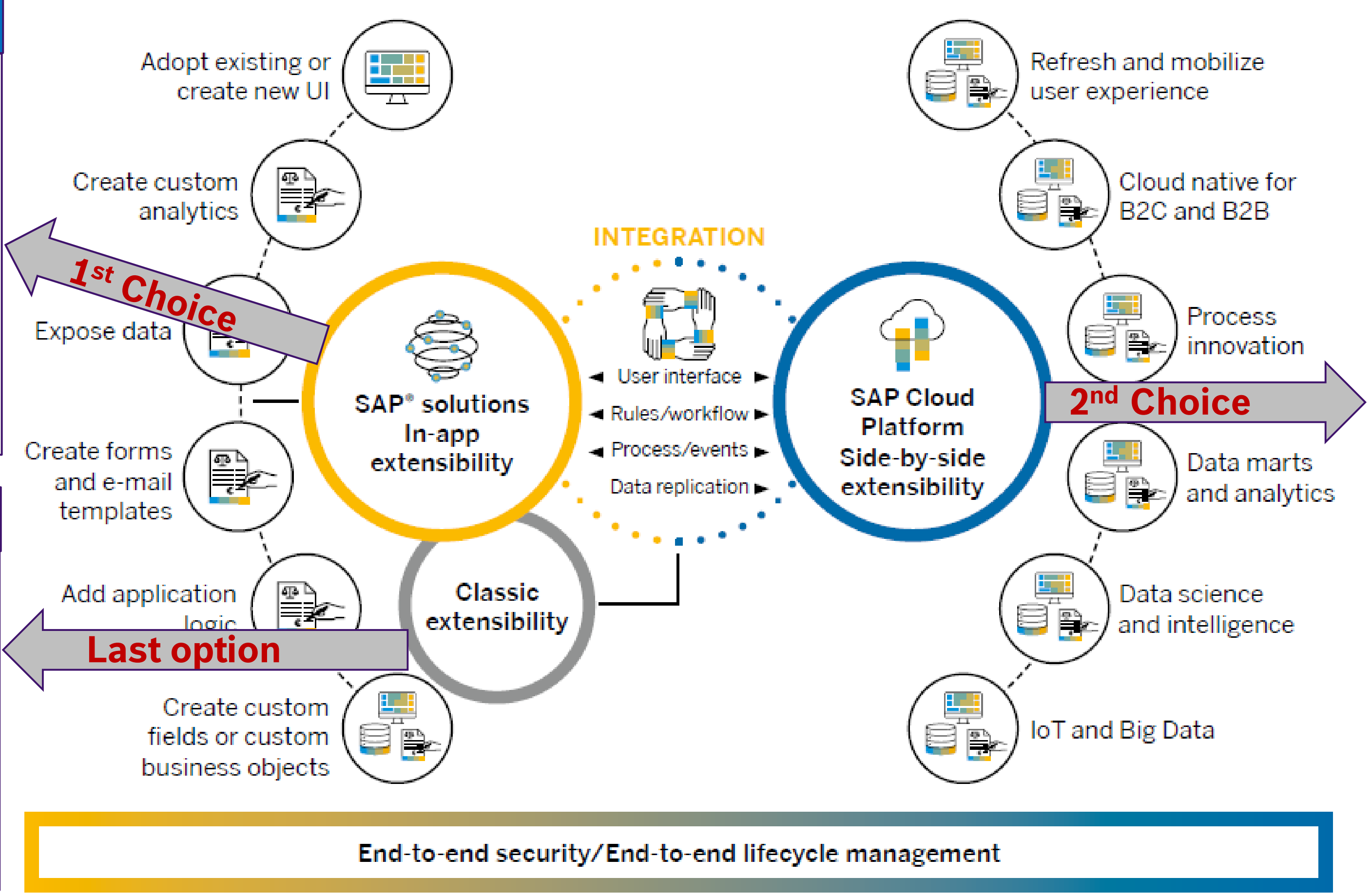
Hints

- Key-user tools as first choice where possible
- Technical limitations not critical
- Coverage is currently extended based on Bosch requirements

Hints

- Use only stable extension points
- Encapsulate if not possible and address requirement to SAP
- Recheck after every upgrade

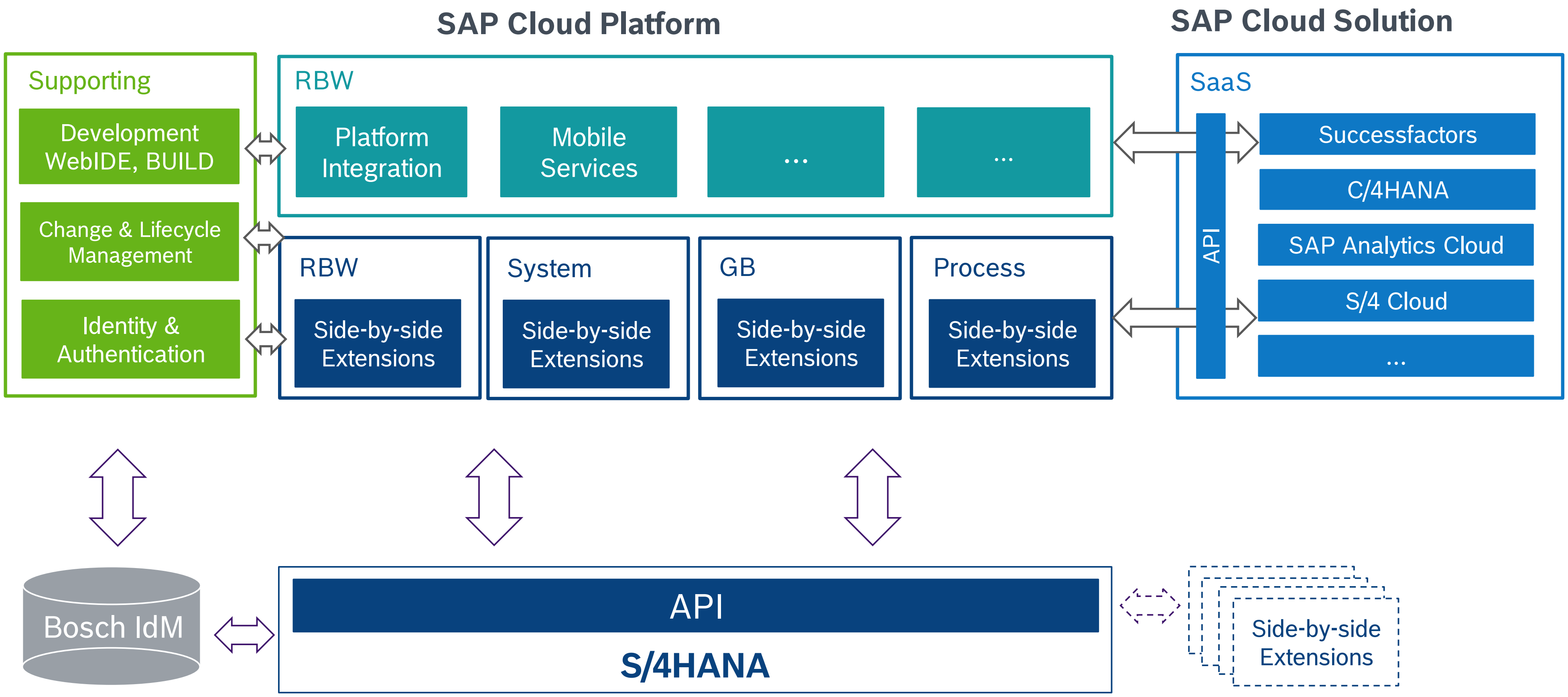
Figure 2: Extensibility Framework of SAP S/4HANA®


Adopt existing or create new UI
Create custom analytics
Expose data
Create forms and e-mail templates
Add application logic
Create custom fields or custom business objects
1st Choice
Last option
SAP® solutions In-app extensibility
Classic extensibility
INTEGRATION
User interface
Rules/workflow
Process/events
Data replication
SAP Cloud Platform Side-by-side extensibility
2nd Choice
Refresh and mobilize user experience
Cloud native for B2C and B2B
Process innovation
Data marts and analytics
Data science and intelligence
IoT and Big Data
End-to-end security/End-to-end lifecycle management

Hints

- On-prem API documentation ongoing
- Not suited for every use case (see SbS decision criteria)
- May be enhanced by low code platforms like Mendix

Side-by-Side Extensions – Introduction
Extend Digital Core based on S/4HANA and SAP SaaS



Side-by-Side Extensions – Introduction

Principles for Side-by-side extension development

SAP Cloud Platform first

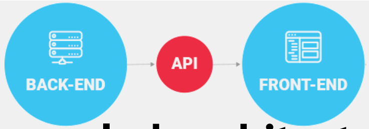
- Simplify enterprise integration between SAP and cloud
- Flexible and powerful business extension to cloud

Cloud Service first

- Adopt cloud service for scalability, security and convenience
- Fast track development utilizing cloud service

Cloud SDK first

- First choice to interact with S/4HANA system in service layer of cloud applications
- Tools integrated in Cloud SDK are preferred

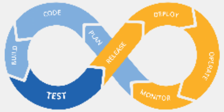


Decoupled architecture

- Flexibility for Constant Evolution
- Cross platform and different technology stacks
- Independent development & release

SAP UI5 technology

- Unified Fiori UX with SAP UI5
- Out of box SAP UI5 solutions for UI components and libraries



CICD Integration

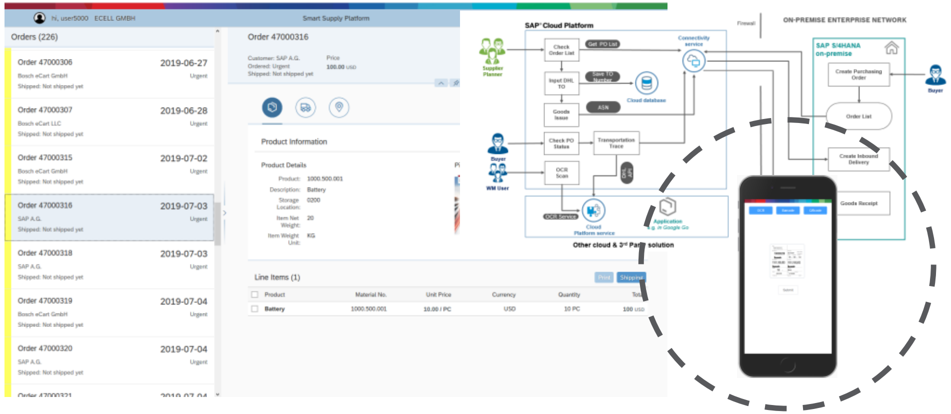
- Automatic development process with corporation regulation
- Integrate testing & security tools for good quality
- Fast & reliable release cycle

EXAMPLE USE CASES

Side-by-Side Extensions – Introduction

Proxy application

Smart supplier platform(indirect purchase)



hi, user5000 ECELL GMBH — Smart Supply Platform

Orders (226)

Order 47000306 — 2019-06-27
Bosch eCart GmbH — Urgent
Shipped: Not shipped yet

Order 47000307 — 2019-06-28
Bosch eCart LLC — Urgent
Shipped: Not shipped yet

Order 47000315 — 2019-07-02
Bosch eCart GmbH — Urgent
Shipped: Not shipped yet

Order 47000316 — 2019-07-03
SAP A.G. — Urgent
Shipped: Not shipped yet

Order 47000318 — 2019-07-03
SAP A.G. — Urgent
Shipped: Not shipped yet

Order 47000319 — 2019-07-04
Bosch eCart GmbH — Urgent
Shipped: Not shipped yet

Order 47000320 — 2019-07-04
SAP A.G. — Urgent
Shipped: Not shipped yet

Order 47000316

Customer: SAP A.G.
Ordered: Urgent
Shipped: Not shipped yet
Price: 100.00 USD

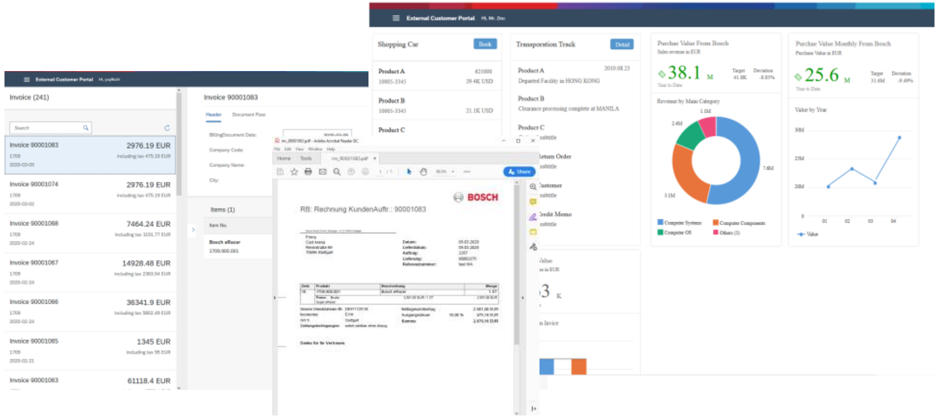
Product Information

Product Details
Product: 1000.500.001
Description: Battery
Storage Location: 0200
Item Net Weight: 20
Item Weight Unit: KG

Line Items (1)

Product	Material No.	Unit Price	Currency	Quantity	Total
Battery	1000.500.001	10.00 / PC	USD	10 PC	100 USD

External customer Portal



External Customer Portal — Hi, yuplbuh

Invoice (241)

Invoice 90001083 — 2976.19 EUR
1709 — including tax 475.19 EUR
2020-03-05

Invoice 90001074 — 2976.19 EUR
1709 — including tax 475.19 EUR
2020-03-02

Invoice 90001068 — 7464.24 EUR
1709 — including tax 1191.77 EUR
2020-02-24

Invoice 90001067 — 14928.48 EUR
1709 — including tax 2383.54 EUR
2020-02-24

Invoice 90001066 — 36341.9 EUR
1709 — including tax 5802.49 EUR
2020-02-24

Invoice 90001065 — 1345 EUR
1709 — including tax 95 EUR
2020-02-21

Invoice 90001063 — 61118.4 EUR

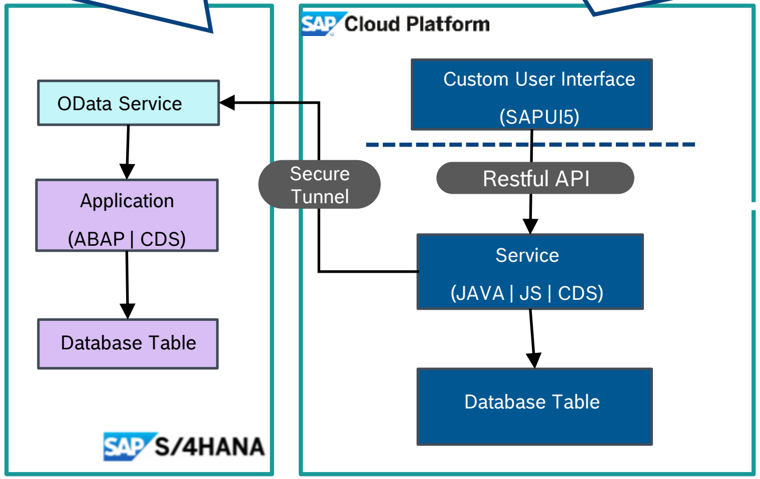
Invoice 90001083
Header | Document Flow
BillingDocument Date:
Company Code:
Company Name:
City:

Items (1)
Item No.
Bosch eRacer
1709.900.001

RB: Rechnung KundenAuftr.: 90001083

Features & Business Value

- Solution for some vendor who provide stationary or IT accessory that do not have platform can connect with EDI
- Real time order list display
- Easy goods receipt and transpiration No saved on cloud database
- Real time transportation info tracing
- OCR goods receipt via mobile device avoid goods receipt delay



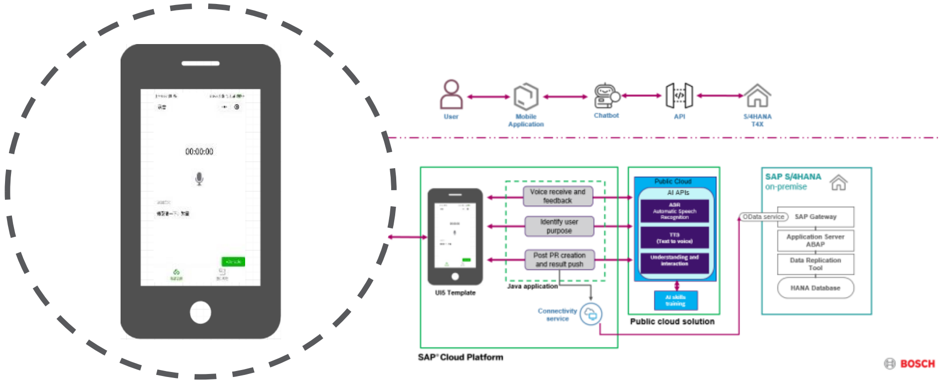
Features & Business Value

- Solution for some external customer like dealer or agent as a online store
- Sales value reporting and analyze
- Self-service of invoice
- Real time transportation info tracing

Side-by-Side Extensions – Introduction

Convenience application

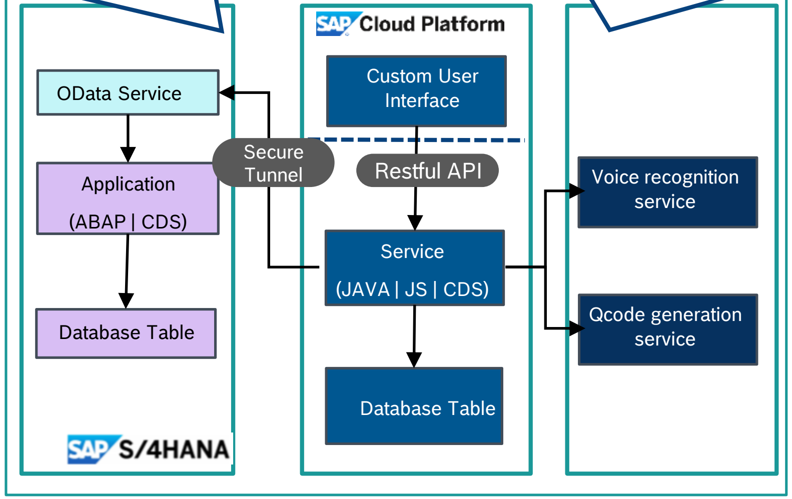
PR creation via voice recognition



Indirect goods receipt via Qcode scan

Features & Business Value

- PR creation via voice recognition instead of complex operation of standard transaction
- Use existing mature cloud service of voice recognition speed up the solution delivery



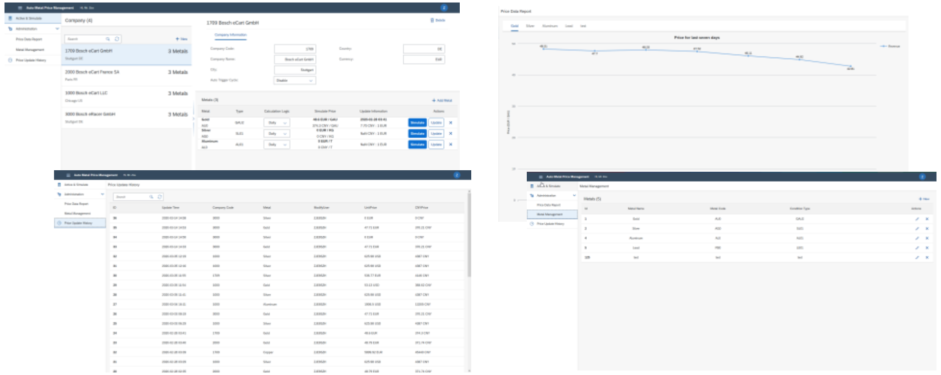
Features & Business Value

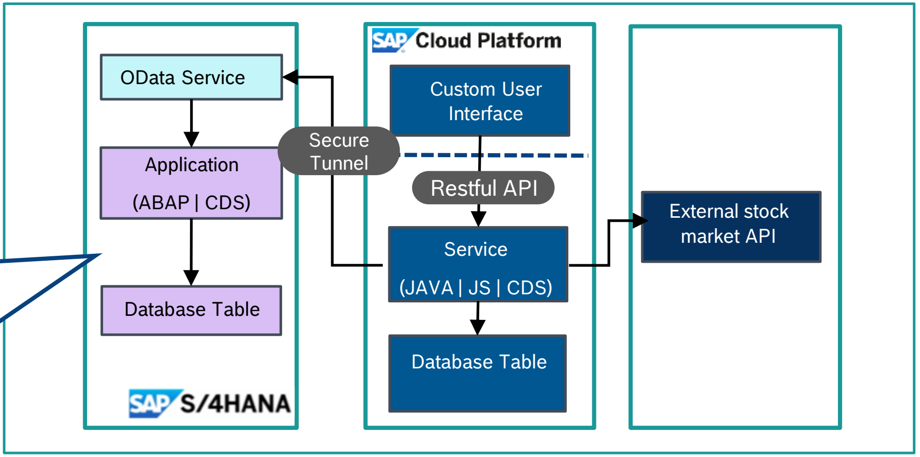
- Solution is to solve indirect purchasing goods receipt delay pain point
- Provide a web-base application for external vendor generate the Qrcode base on purchase order
- End user can easily and real-time post goods receipt by Qrcode scan via any mobile devices

Side-by-Side Extensions – Introduction

Substitute application

Metal price surcharges





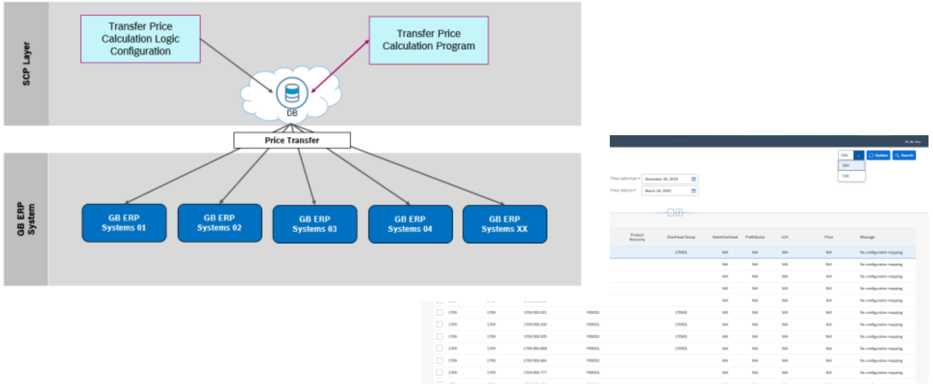
Features & Business Value

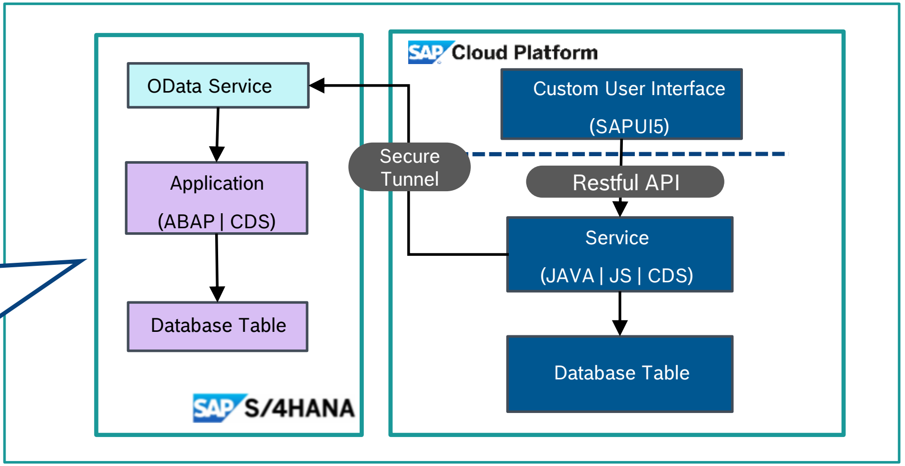
- The solution is to handle the Raw material surcharge due to Non-ferrous Metal price variance based on frequent fluctuation in market rate
- Use web-based app on SCP connect to external API real time get the metal price and auto transfer price to condition record on OP system
- Reduce the manual work and the metal price maintain latency avoid price difference

Side-by-Side Extensions – Introduction

Preprocessing application

Auto price calculation and transfer



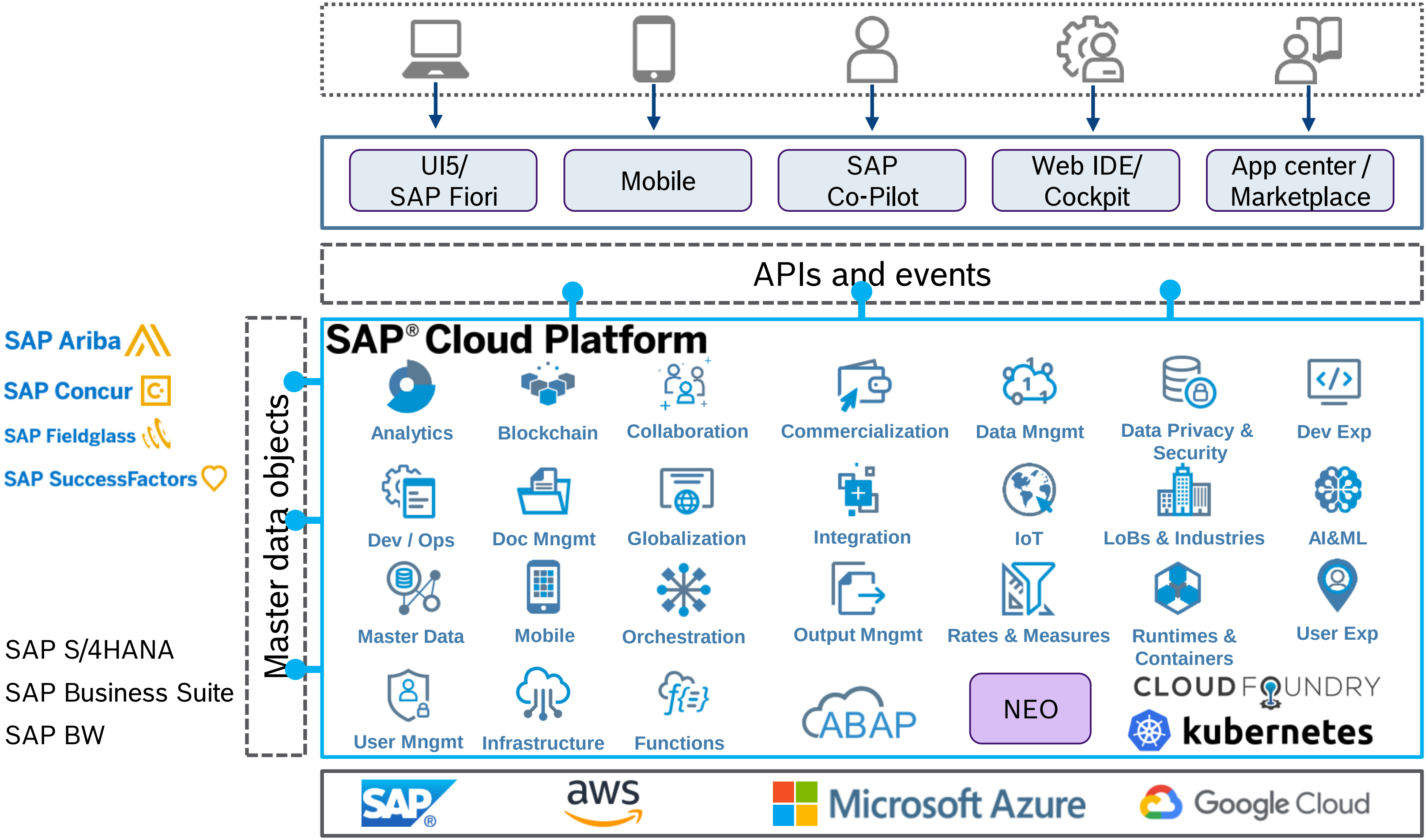


Features & Business Value

- Centralized application solution manage the price calculation logic and auto transfer to vertical system
- Cost efficiency to develop a web-base application on SCP compare to set up a centralized SAP system with RFC connection
- Centralized program and calculation logic management avoid program and data redundancy

SAP CLOUD PLATFORM

Side-by-Side Extensions – Introduction
SAP Cloud Platform



UI5/ SAP Fiori | Mobile | SAP Co-Pilot | Web IDE/ Cockpit | App center / Marketplace

APIs and events

SAP Ariba
SAP Concur
SAP Fieldglass
SAP SuccessFactors

SAP S/4HANA
SAP Business Suite
SAP BW

Master data objects

SAP® Cloud Platform

Analytics, Blockchain, Collaboration, Commercialization, Data Mngmt, Data Privacy & Security, Dev Exp, Dev / Ops, Doc Mngmt, Globalization, Integration, IoT, LoBs & Industries, AI&ML, Master Data, Mobile, Orchestration, Output Mngmt, Rates & Measures, Runtimes & Containers, User Exp, User Mngmt, Infrastructure, Functions

ABAP | NEO | CLOUD FOUNDRY | kubernetes

SAP | aws | Microsoft Azure | Google Cloud

User Experience

Channels / Commercialization

NEO and CF environment with:

- Smart Business Services
- SAP Leonardo technologies
- Platform services

Multi-cloud, private cloud

Side-by-Side Extensions – Introduction
Why Cloud and SCP?

- ▶ Side-by-Side opens up a highly agile and modern environment where cloud with fast updates and constant evolution fits very well
- ▶ CI has a multi cloud strategy and in general any cloud can be used for Side-by-Side
- ▶ SAP Cloud Platform with specialized development models and tools like the SAP Cloud Connector provides easy access to our on-prem S/4HANA systems and other SAP Cloud solutions
- ▶ SAP works on leveraging more and more relevant features of the underlying Hyperscalers and on top of that providing relevant business specific services

➔ SCP is currently the default environment for Side-by-Side extensions

➔ Other cloud providers and/or on-premise environments can be used where they provide major benefits keeping TCO and landscape complexity in mind

Side-by-Side Extensions – Introduction
Bosch Cloud Platform Onboarding Overview (PaaS)

Bosch Cloud Platform Onboarding (PaaS) has three major areas:

Cloud Platform – IT Security Risk Assessment

Targets

- Identify Risks of Cloud Platform according Bosch IT Security Questionnaire (CD 07900)
- Define responsibilities and treatment of identified risks

Cloud Platform – Service Onboarding

Targets

- White- & Blacklisting of SCP Services
- Define Impl. Guidelines according Bosch EISA (Technical & Organizational Measures)

Cloud Platform – Subaccount Onboarding

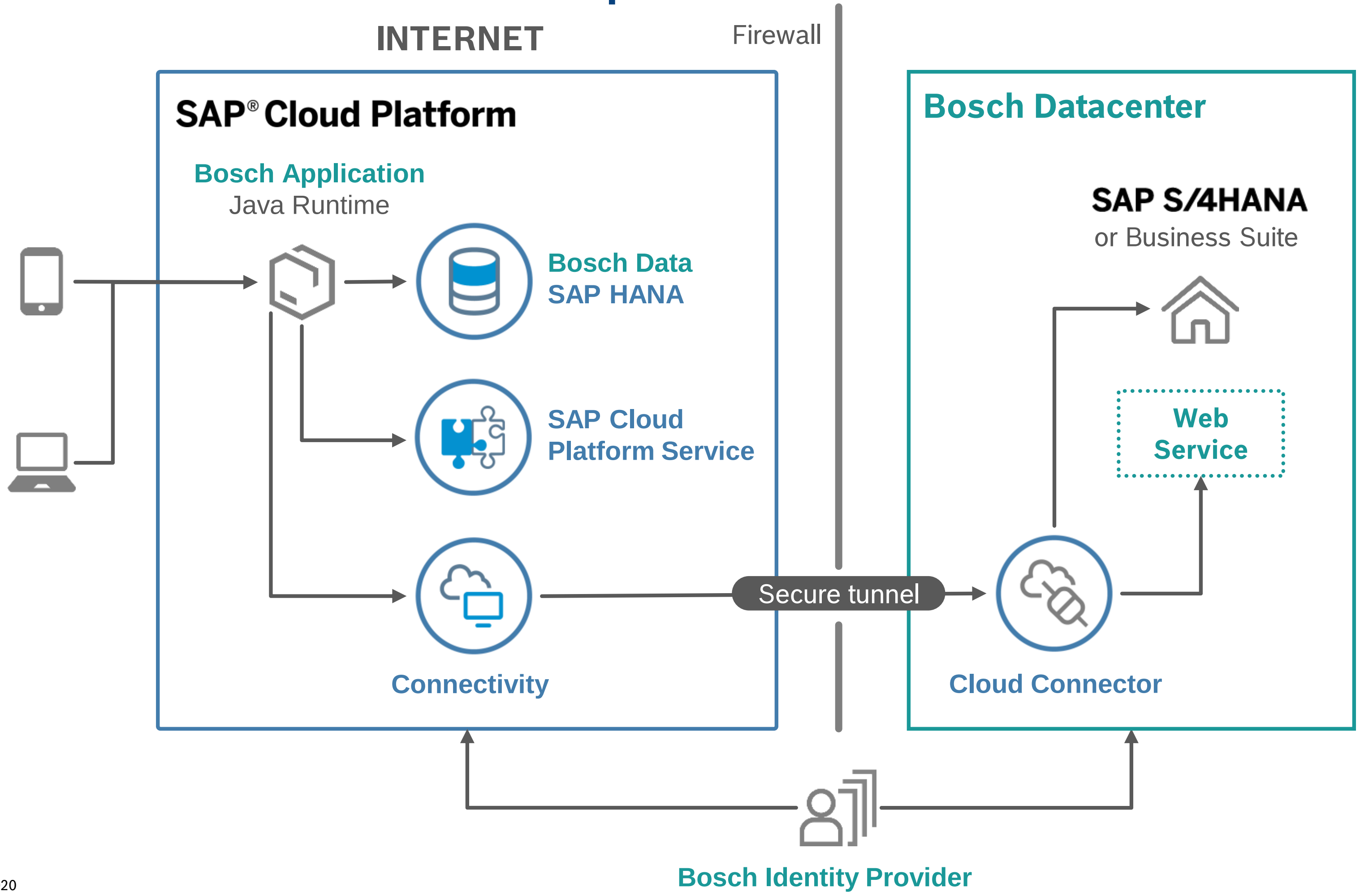
Targets

- Bosch Process for Subaccount requests (WorkOn)
- Definition of Solution-, Integration Architecture patterns
- Define responsible Bosch Contacts for Subaccounts

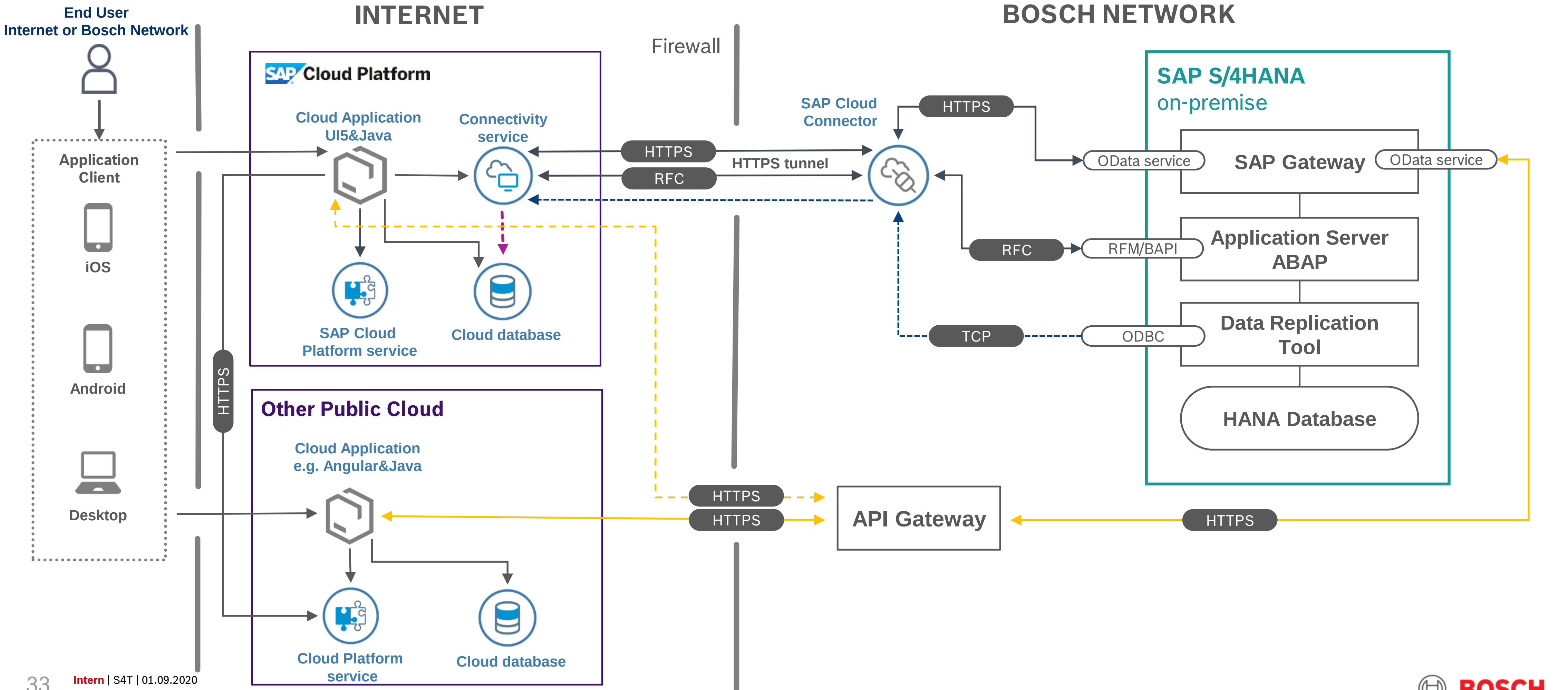
TECHNOLOGY (HIGH LEVEL)

Side-by-Side Extensions – Introduction

Runtime Architecture – Simplified

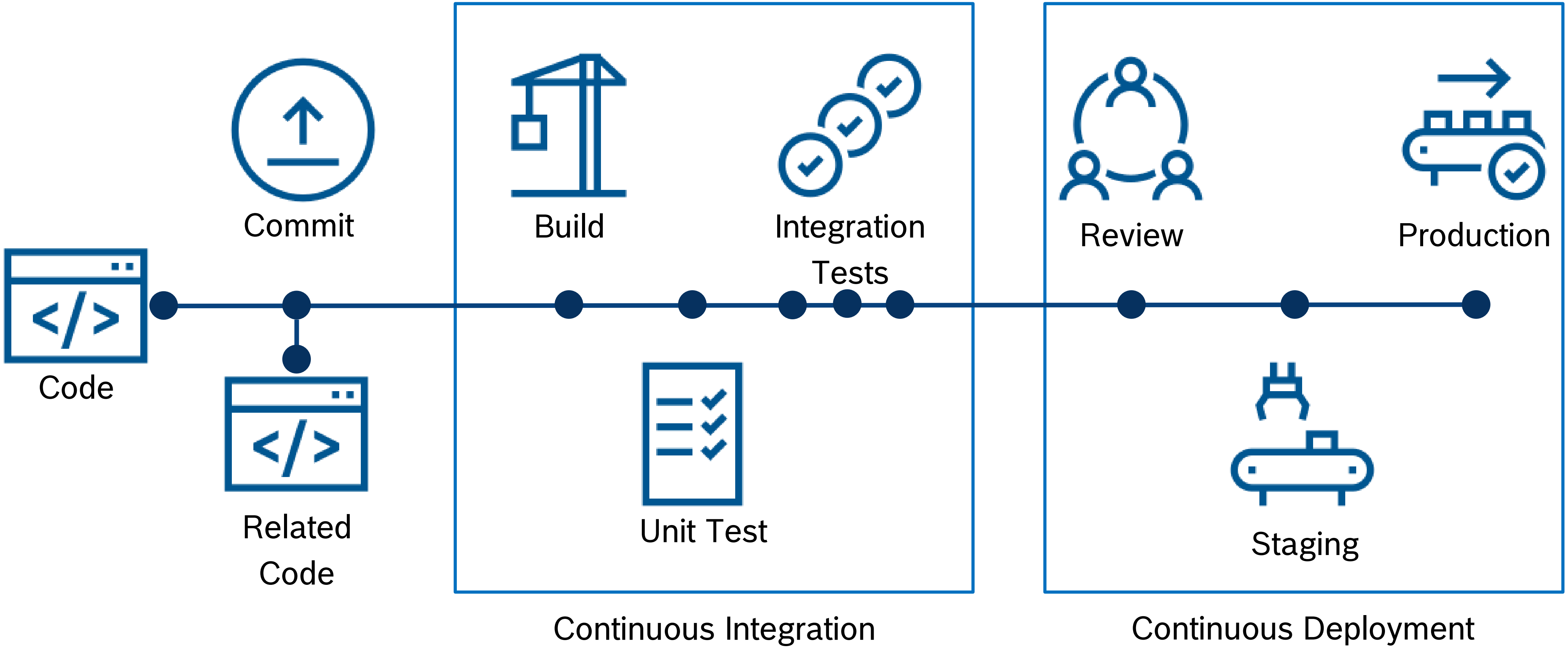


Side-by-Side Extensions – Introduction
Runtime Architecture



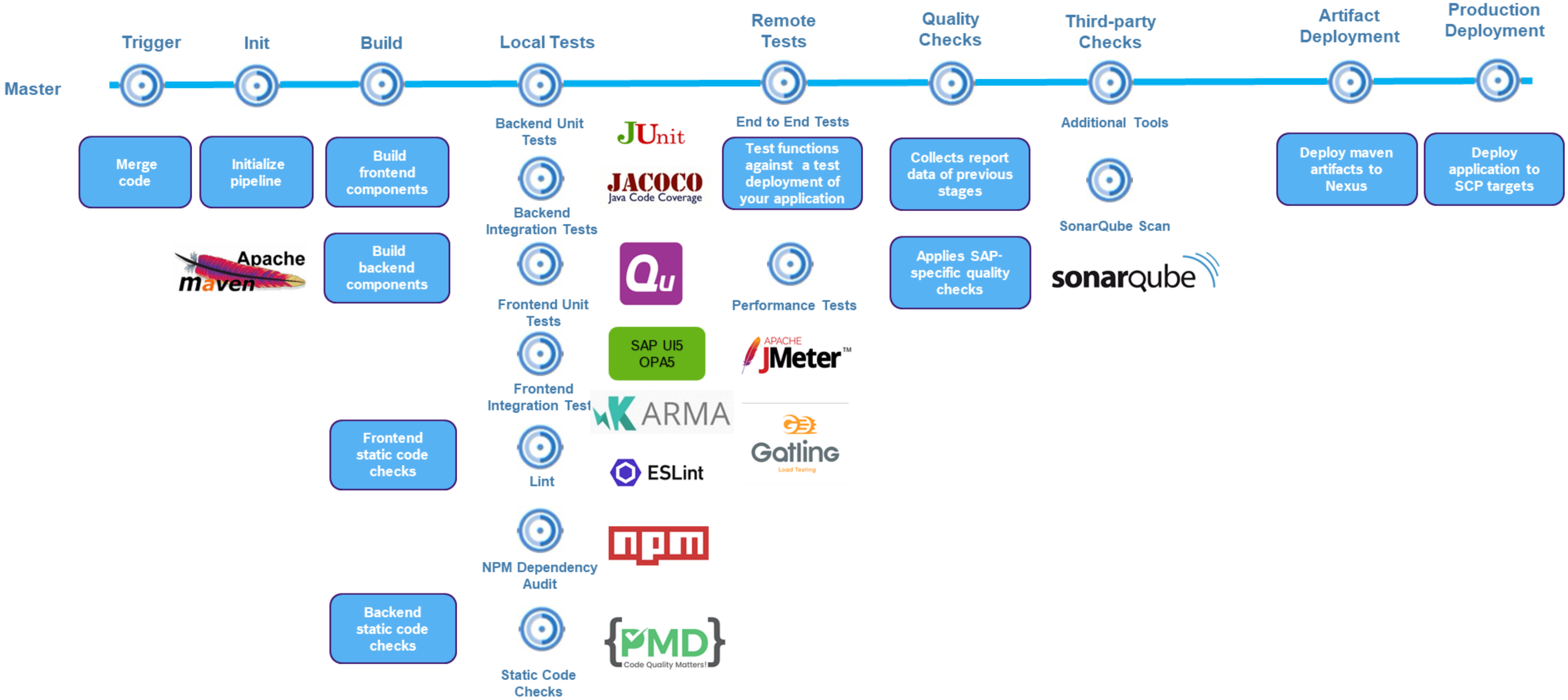
Side-by-Side Extensions – Introduction

Code To Deploy – Continuous Integration/Continuous Deployment



Draft

Side-by-Side Extensions – Introduction
CI/CD Pipeline



Master

Trigger
- Merge code

Init
- Initialize pipeline

Build
- Build frontend components
- Build backend components
- Frontend static code checks
- Backend static code checks

Local Tests
- Backend Unit Tests
- Backend Integration Tests
- Frontend Unit Tests
- Frontend Integration Test
- Lint
- NPM Dependency Audit
- Static Code Checks

Remote Tests
- End to End Tests
- Test functions against a test deployment of your application
- Performance Tests

Quality Checks
- Collects report data of previous stages
- Applies SAP-specific quality checks

Third-party Checks
- Additional Tools
- SonarQube Scan

Artifact Deployment
- Deploy maven artifacts to Nexus

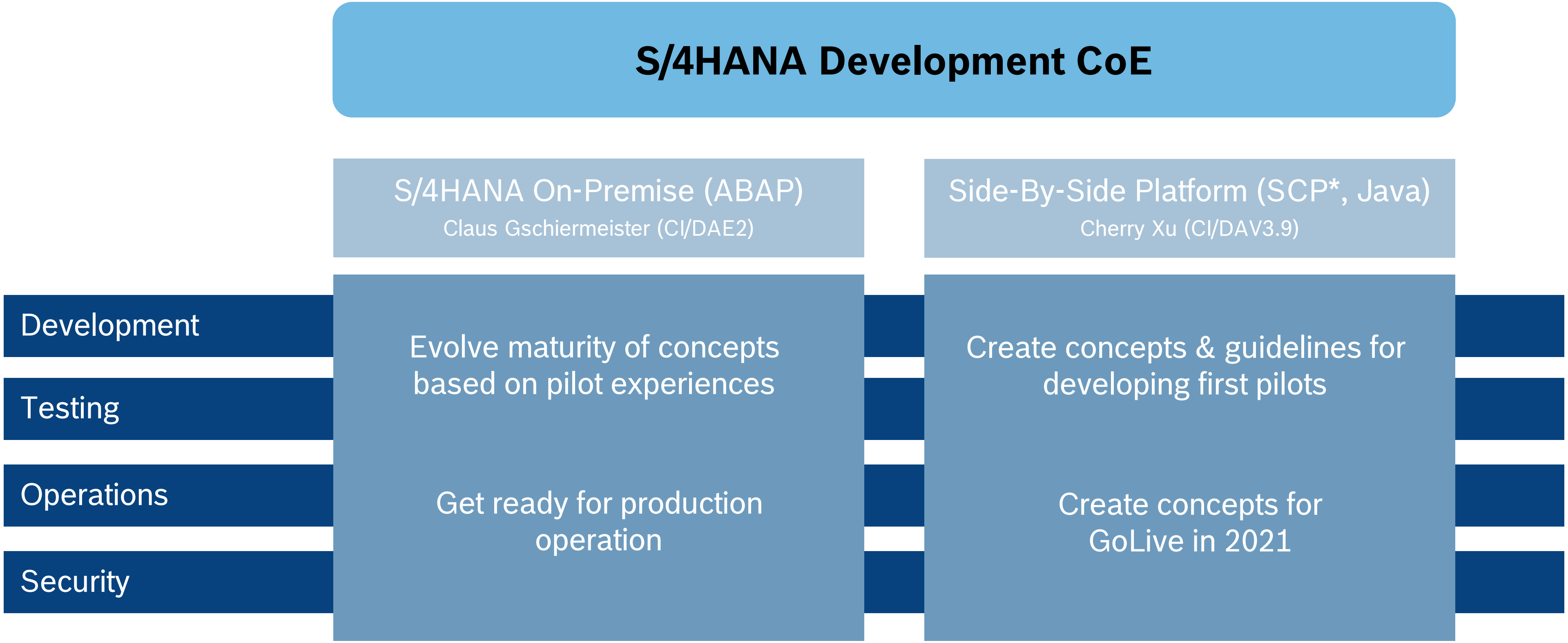
Production Deployment
- Deploy application to SCP targets

Side-by-Side Extensions – Introduction
Major Differences to ABAP

- There is no central application server with different process types, each application (component) is running in it’s own environment
- If necessary, at all the applications have usually dedicated database spaces instead of one common database for everything
- The code is stored in a central repository and not within the executing system environment
- Connections to other applications and the S/4HANA system only via interfaces e.g. OData
- Different programming languages can be used but with SCP Java and JavaScript (Node.JS) are preferred due to availability of the SAP Cloud SDK
- Developers can usually test locally and work on multiple versions of an application together with only small overhead

GETTING STARTED

Center of Expertise (CoE) Development S/4HANA
CoE Collaboration OnPremise and Side-by-Side



S/4HANA Development CoE

S/4HANA On-Premise (ABAP)
Claus Gschiermeister (CI/DAE2)

Side-By-Side Platform (SCP*, Java)
Cherry Xu (CI/DAV3.9)

Development

Testing

Operations

Security

Evolve maturity of concepts based on pilot experiences

Get ready for production operation

Create concepts & guidelines for developing first pilots

Create concepts for GoLive in 2021

Side-by-Side Extensions – Introduction
Getting Started

- Contact C/IDA21 (Oliver Walter) regarding architecture and support for the onboarding process
- Ensure subaccount onboarding prior to planned usage
- Ensure configuration for the required systems like connection to the SAP Cloud Connector
- In cooperation with Side-by-Side CoE (XU Cherry CI/DAV3.9) and your TDM:
  - Plan development teams and required trainings
  - Setup development environment
  - Create line specific development handbook

Side-by-Side Extensions – Introduction
Links

- S/4HANA Development CoE – Side-by-Side starting page
- Side-by-Side Community
- SCP Meta Development Handbook
- Side-by-Side Teams Channel
- S/4HANA Development CoE Teams Channel