

# Lessons Learned Building a Product with Clean Core ABAP on S/4HANA Cloud, public edition



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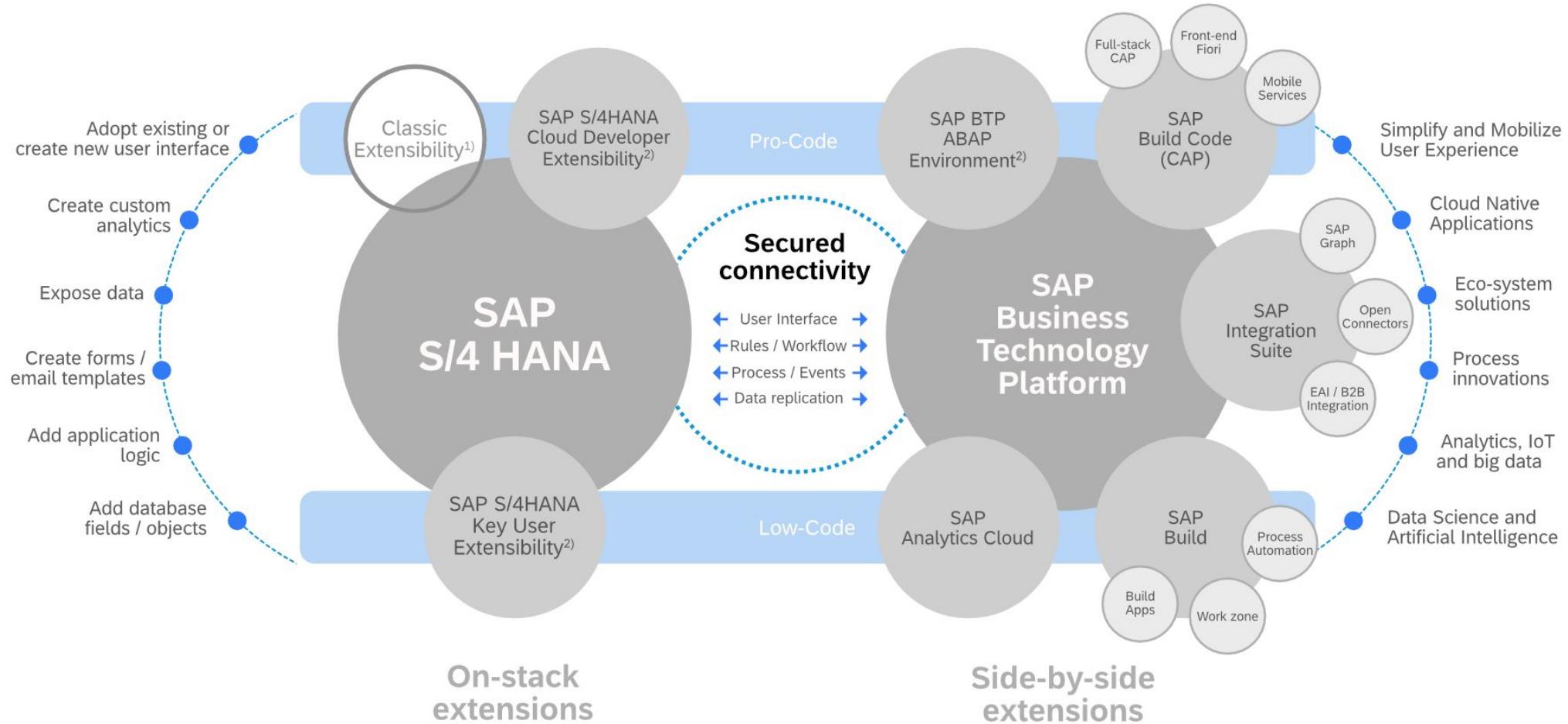
# Agenda

- The Opportunity
- Our Feeling Starting with ABAP Cloud
- ABAP Clean Core Challenges and Workarounds
- Take Away Points



# S/4HANA Extensibility Options

## Custom Build Solution



<sup>1</sup> SAP S/4HANA Cloud Private Edition and on-premise only; not "clean core"

<sup>2</sup> Integrated in SAP Build Code via Extensibility Wizard

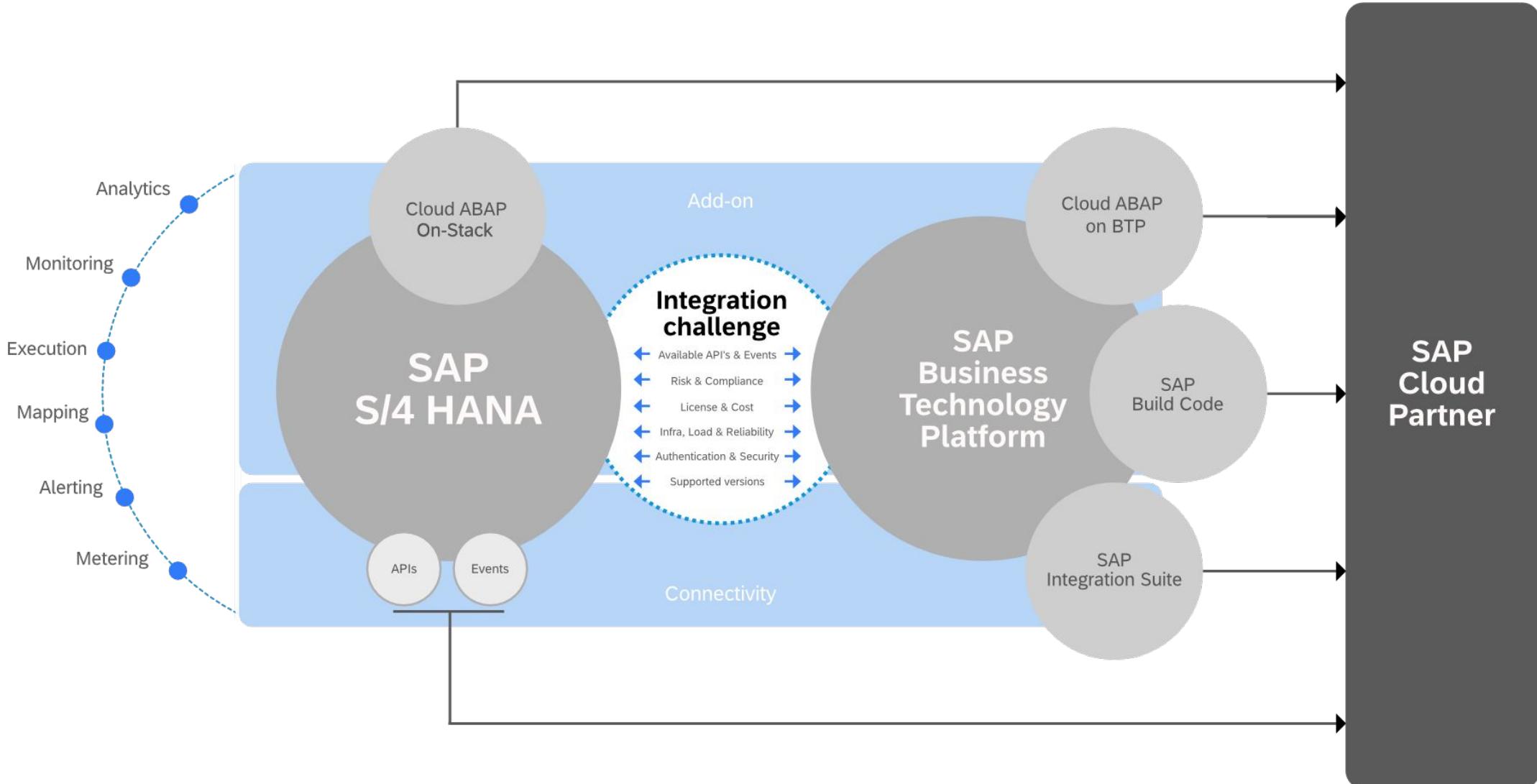
More info:

Which S/4HANA Extensibility Options should I use as a SAP customer?



# S/4HANA Partner Solutions

On-stack or Side-by-Side or API Enabled



More info:

Which S/4HANA extensibility option is the best for thriving as an SAP partner in the cloud space?

# Clean Core Code with ABAP Cloud

ABAP Cloud  
on SAP BTP<sup>1)</sup>

since 2018  
ongoing updates

S/4HANA Public Cloud  
with embedded  
ABAP Cloud

since 2022  
ongoing updates

S/4HANA Private  
Cloud  
with embedded  
Cloud ABAP<sup>2)</sup>

since 2023  
updates once every 2 years  
in October

## ABAP Cloud

wrapped and restricted access

ABAP RAP (2018)

ABAP OBJECTS (1999)

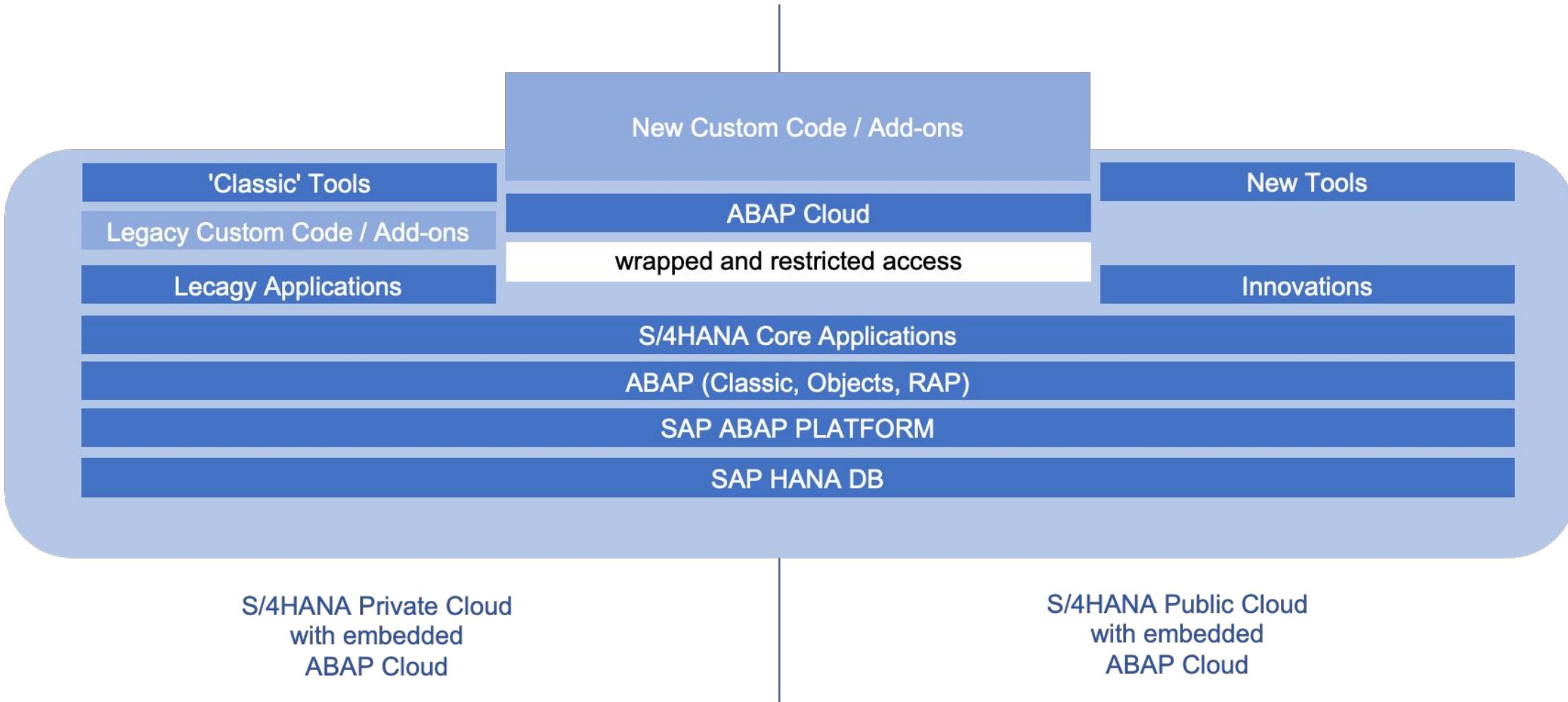
'Classic' ABAP (1983)

SAP ABAP PLATFORM (2018)

SAP NETWEAVER PLATFORM (2004)

SAP BASIS (1983)

# S/4HANA Cloud Private and Public Edition



# Partner Opportunity

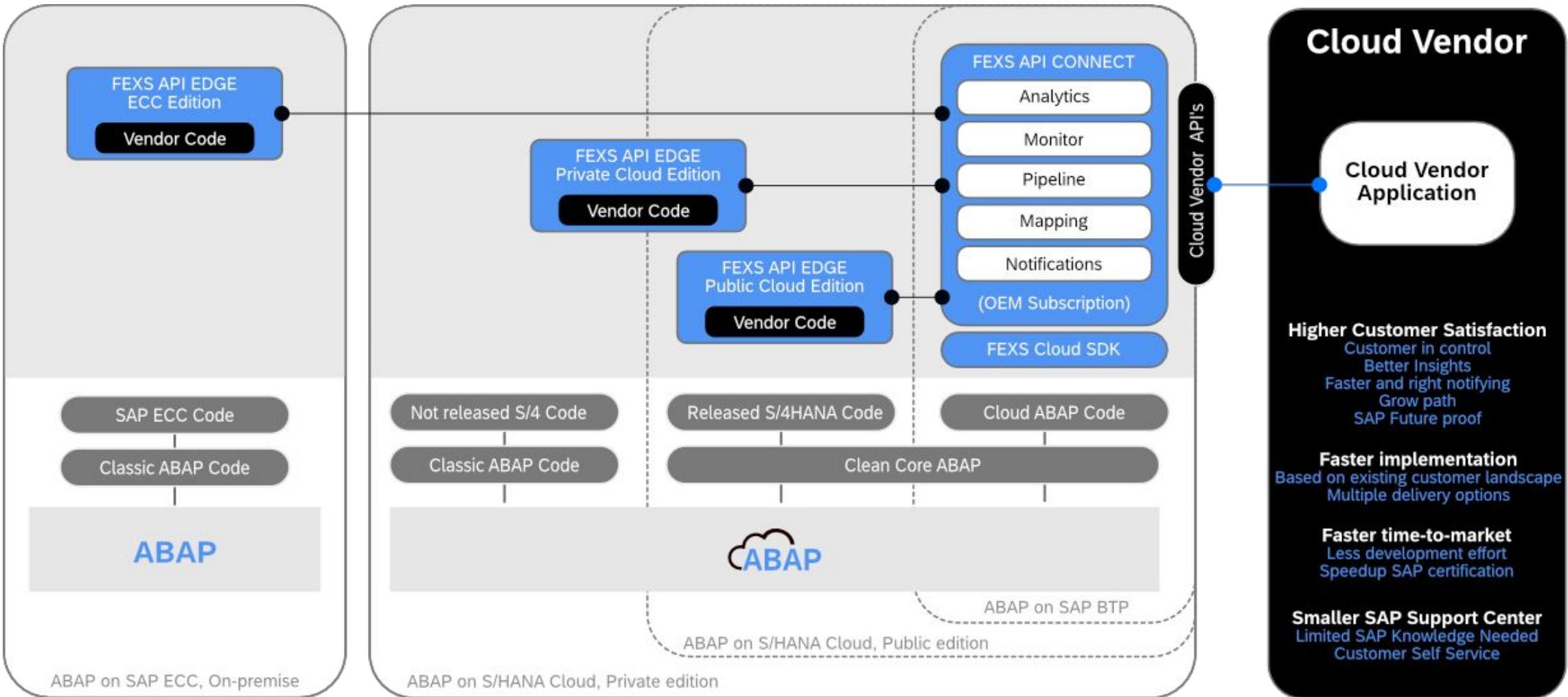
## SAP Shift to the Cloud

	SAP ECC 6.0	S/4HANA Cloud Private Edition	S/4HANA Cloud Public Edition	ABAP Cloud on SAP BTP
Runtime	On-stack	On-stack	On-stack	Side-by-side
Partner Software	Partner Add-on	Partner Add-on	Partner Add-on	Partner Add-on or <b>SAAS</b>
ABAP Code line	'Classic' ABAP	<b>ABAP Cloud</b> 'Classic' ABAP	<b>ABAP Cloud</b>	<b>ABAP Cloud</b>
SAP Certified	Certify ABAP Code	Certify ABAP Clean Core	Certify ABAP Clean Core or <b>Multi-off delivery</b>	Certify ABAP Clean Core or <b>Certified SAAS</b>
Update ABAP Stack	Yearly	<b>Every 2 years</b>	<b>Every half year</b>	<b>Every quarter</b>
Partner Software Delivery	Transports	Transports	Transports or <b>Partner Git-Delivery</b>	Transports

- Existing SAP Addon partners should shift their code and
- New Cloud Vendors can quickly enter the SAP Partner network

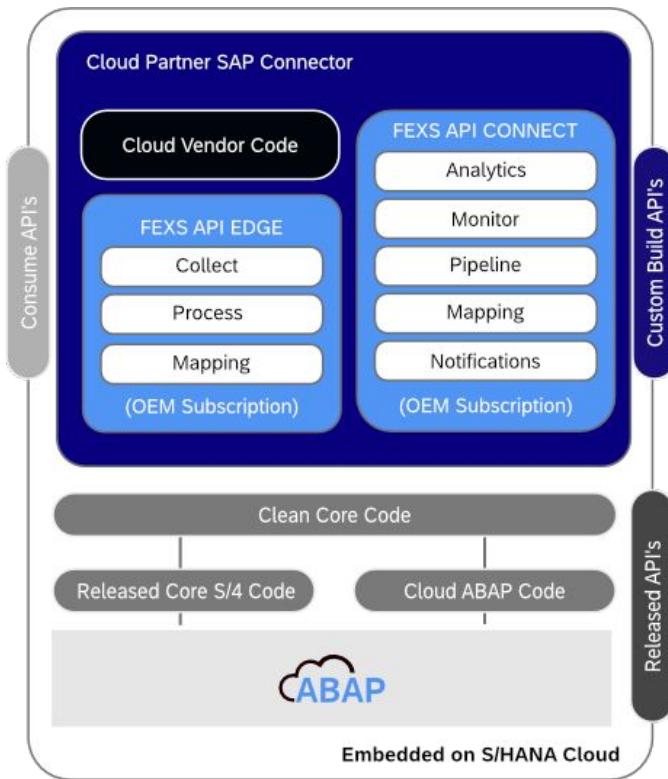
# Our Opportunity

## FEXS API Connect

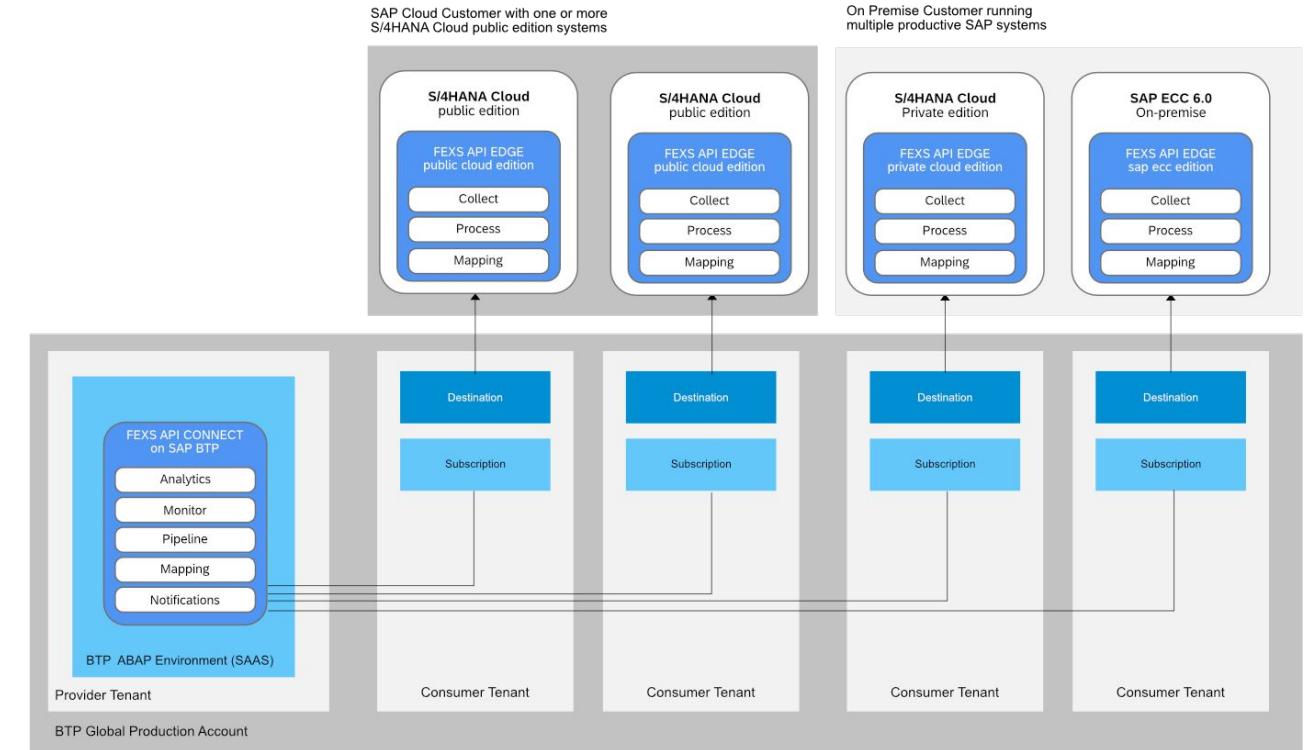


# FEXS API Connect

## One Delivery Code Line



as add-on  
product



as BTP SAAS  
solution

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# ABAP Cloud Experience

## ABAP Cloud and Clean Core ABAP



# Existing ABAP Knowledge

ABAP Cloud and Clean Core ABAP



# Forget your classic ABAP Knowledge

ABAP Cloud and Clean Core ABAP



# Forget your classic ABAP Knowledge

## ABAP Cloud and Clean Core ABAP

**No SAPGui ->**

**No SE80 or other SAP GUI development tools**

**New ABAP syntax ->**  
a lot of **obsolete** statements and syntaxes

**Fiori only ->**

**No Dynpro, ALV, BSP, WDA, Reports**

**No ABAP Reports ->**

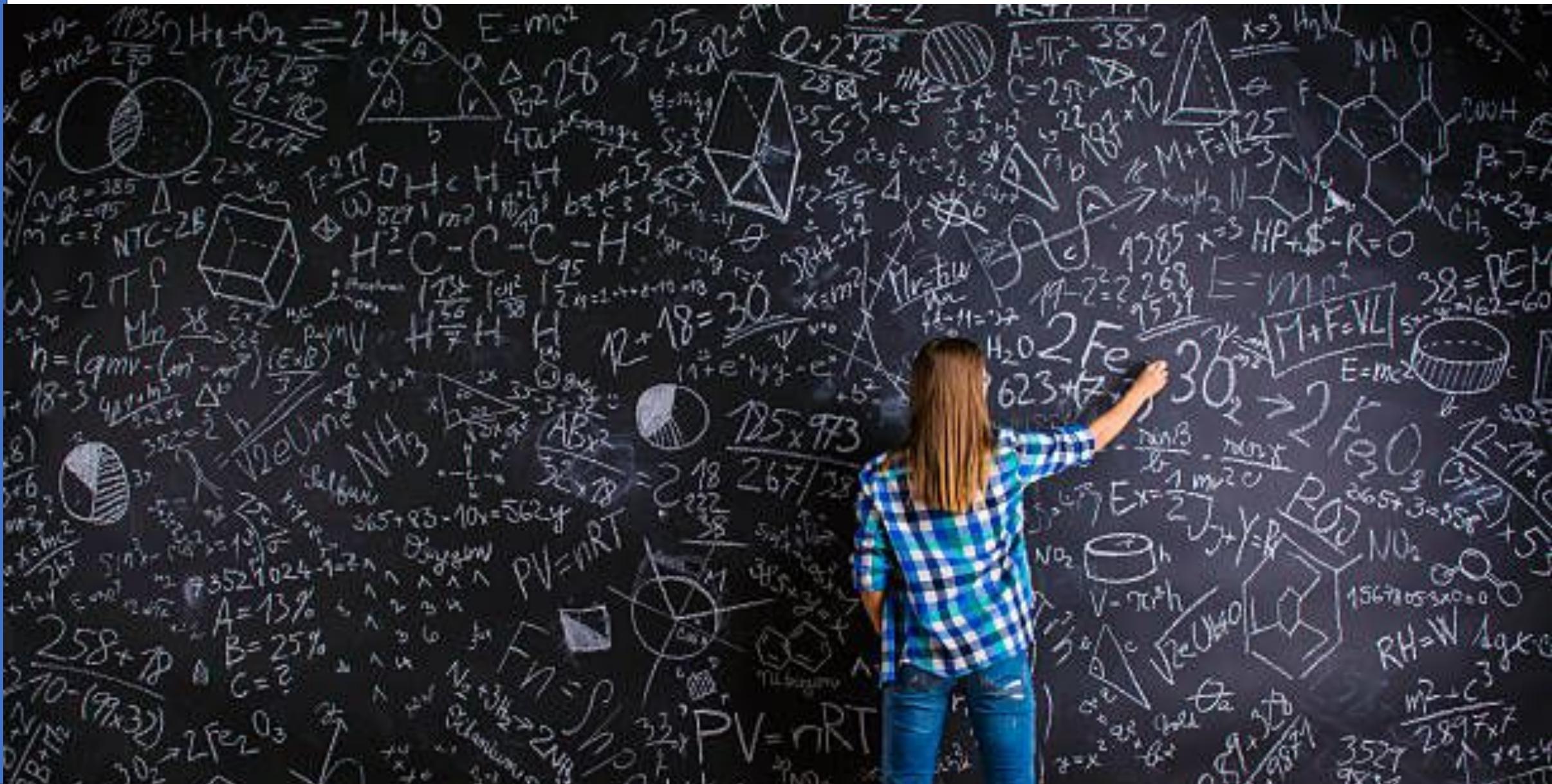
**No selection screen and write statements**

**No direct SAP table access ->**

learn CDS and new RAP model

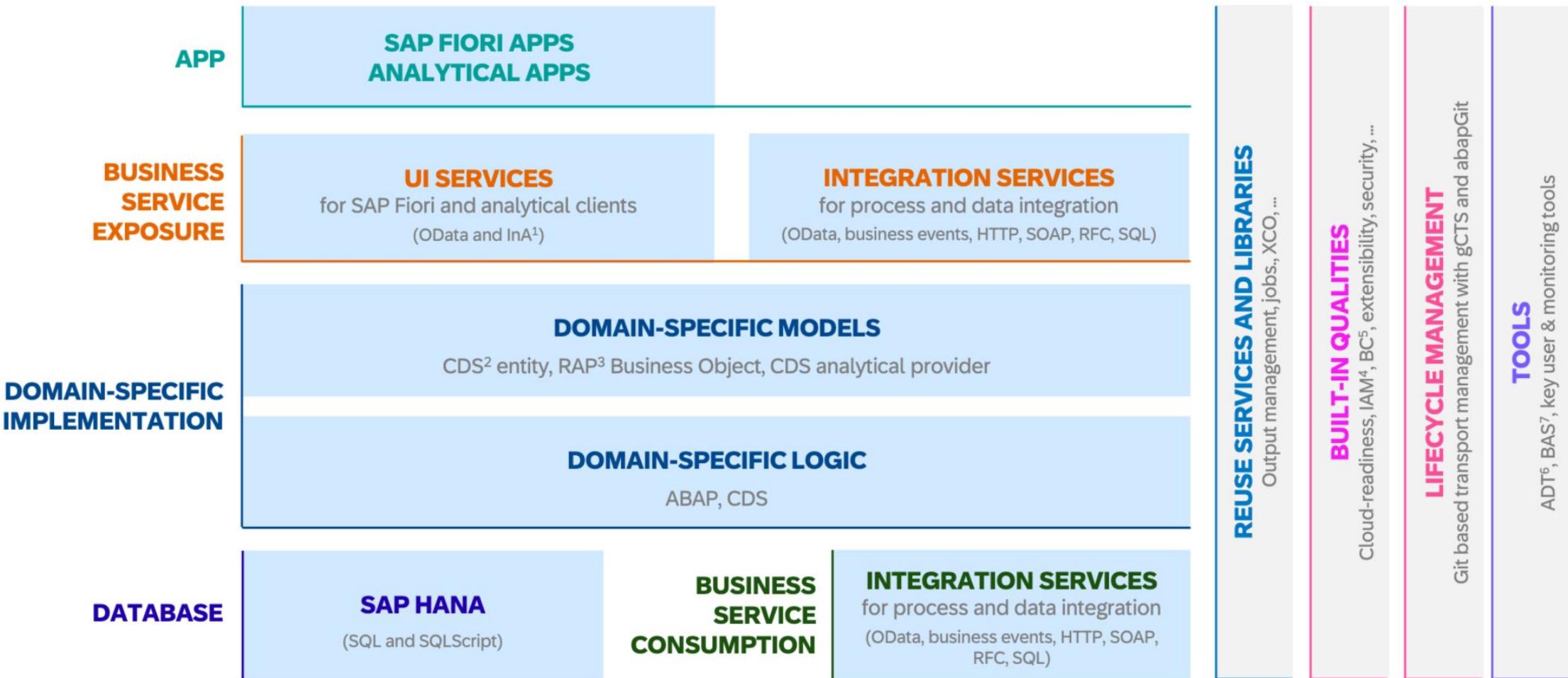
# Extend our ABAP Knowledge

ABAP Cloud and Clean Core ABAP



# ABAP Cloud

## ABAP RESTful Application Programming Model (RAP)



Source:

ABAP RESTful Application Programming Model (RAP) – Overview



# Coding ABAP Cloud

The New Syntax is Sometimes a Labyrinth



# Coding ABAP Cloud

## New Syntax is Sometimes a Labyrinth

'Classic' ABAP	ABAP Cloud Statement	Remarks
<pre>DATA reason type string. reason = 'REASON_100'.</pre>	<pre>DATA(reason) = 'REASON_100'.</pre>	<ul style="list-style-type: none"> <li>- Inline declaration</li> <li>- Type of field depends on quote type</li> </ul>
<pre>DATA customer_name TYPE string. SELECT SINGLE name1   INTO customer_name   FROM kna1  WHERE kunnr = '0037100081'.</pre>	<pre>SELECT SINGLE FROM i_customer   FIELDS customername   WHERE customer = '0037100081'     INTO @DATA(customer_name).</pre>	<ul style="list-style-type: none"> <li>- Inline declaration</li> <li>- New Syntax</li> <li>- No tables but CDS access</li> </ul>
<pre>FIELD-SYMBOLS: &lt;fs&gt; TYPE any. <u>ASSIGN ('IF_HTTP_STATUS=&gt;REASON_100') TO &lt;fs&gt;.</u></pre>	<pre>FIELD-SYMBOLS: &lt;fs&gt; TYPE any. ASSIGN ('IF_WEB_HTTP_STATUS')=&gt;('REASON_100') TO &lt;fs&gt;.</pre>	<ul style="list-style-type: none"> <li>- Other interface</li> <li>- New syntax</li> </ul>
<pre>DATA(user_datum) = sy-datlo.</pre>	<pre>DATA(user_datum) = xco_cp=&gt;sy-&gt;date(   xco_cp_time=&gt;time_zone-&gt;user )-&gt;as( xco_cp_time=&gt;format-&gt;abap   )-&gt;value.  DATA(lo_datetime) = xco_cp_time=&gt;get_current_utctimestamp(   )-&gt;to_local( xco_cp_time=&gt;time_zone-&gt;user )-&gt;get_date( )</pre>	<ul style="list-style-type: none"> <li>- Obsolete system variables</li> <li>- New XCO libraries</li> </ul>
<p>Working with business objects</p>	<pre>COMMIT ENTITIES. COMMIT WORK.</pre>	<ul style="list-style-type: none"> <li>- SAP LUW versus DB LUW</li> <li>- Modify phase versus Save phase in RAP</li> </ul>
<p>Usages of DDIC Artifacts</p>	<p>A lot of them are obsolete</p>	<ul style="list-style-type: none"> <li>- Create your own</li> </ul>

... and much more

# ABAP Statements and Libraries

## ABAP Cloud and Clean Core ABAP



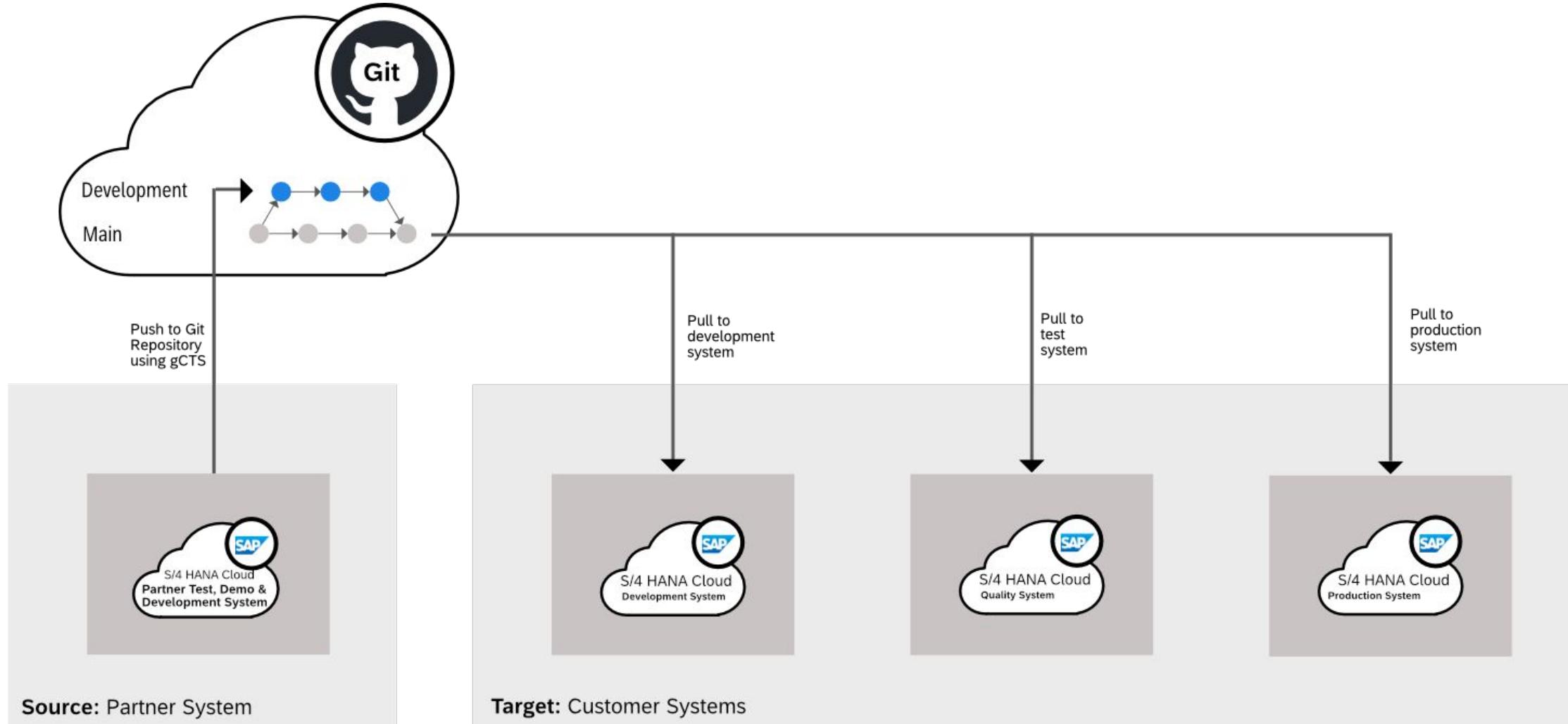
# ABAP Stack Capabilities

## with wrapped and limited/restricted functionality

'Classic' ABAP	ABAP Cloud
ABAP Classes and Function Modules	renamed and wrapped Classes and XCO libraries
bgRFC	bgPF
Background Jobs	Application Job Framework
ABAP Workbench and ADT	ADT and SAP Build Code
BALOG functions	Application Log Framework
Reports, Dynpro, ITS, BSP, WebDynpro, Fiori	Fiori only
TMS - Transport Management System	gCTS - git-enabled Change and Transport System

# Multi-off Delivery

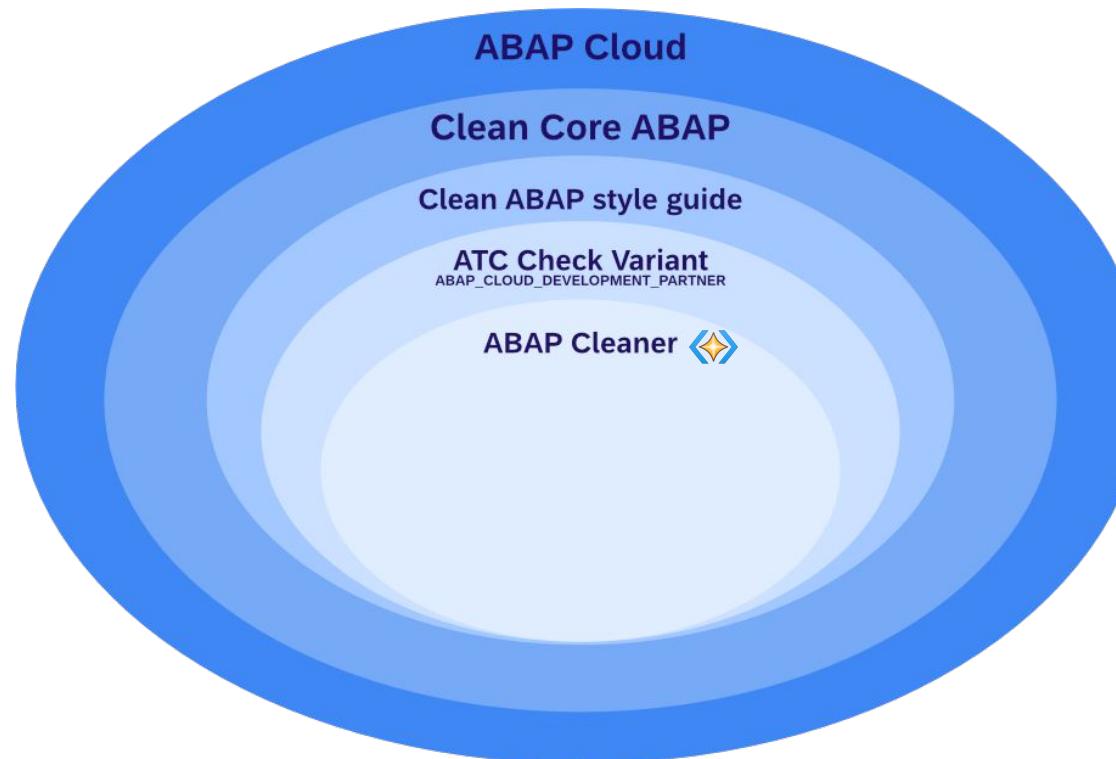
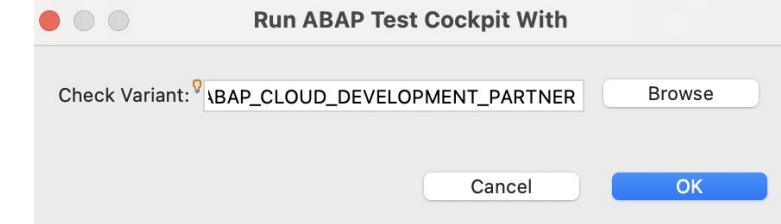
## Following Clean Core ABAP Syntax



# Clean Core ABAP

ABAP Cloud is not by default Clean Core ABAP

- Clean ABAP style guide
- ADT Plugin for ABAP Cleaner
- ABAP Unit tests
- ATC checks for Partner Artifacts



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- **ABAP Clean Core Challenges and Workarounds**
- Take Away Points



# Make Use of S/4HANA Business Eventing

## ABAP Clean Core Challenges and Workarounds

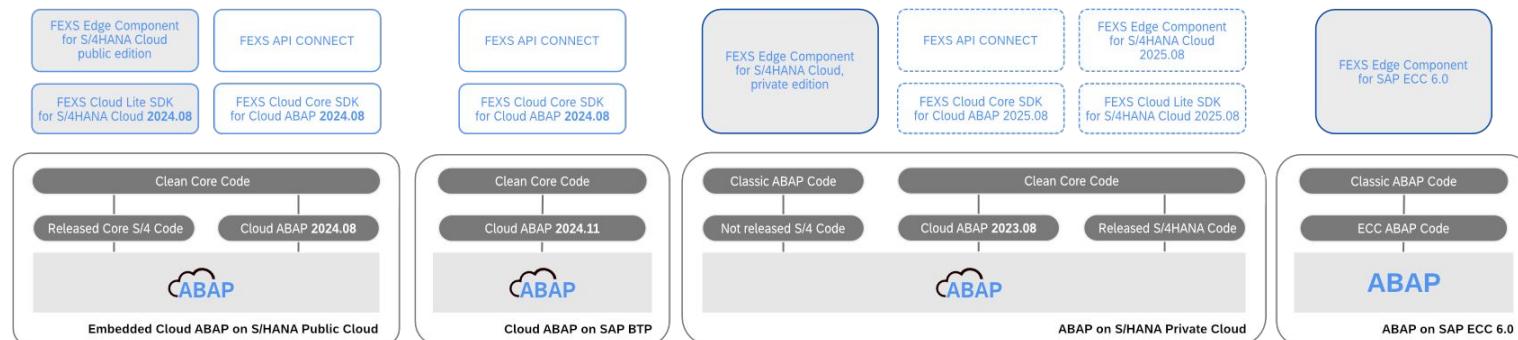
- Our products should be run on any ABAP Cloud-supported environment.

### Challenge

- ABAP Cloud release is not the same in all environments
  - S/4HANA Cloud, private edition, every 2 years, an updated release
  - S/4HANA Cloud, public edition, every 6 months, an updated release
  - ABAP Cloud on BTP, every 3 months, an updated release

### Solution

- We don't use SAP artifacts directly in the products but use an intermediate layer FEXS Cloud SDK.
- Starting development on S/4HANA Cloud, public edition.



# Make Use of S/4HANA Business Eventing

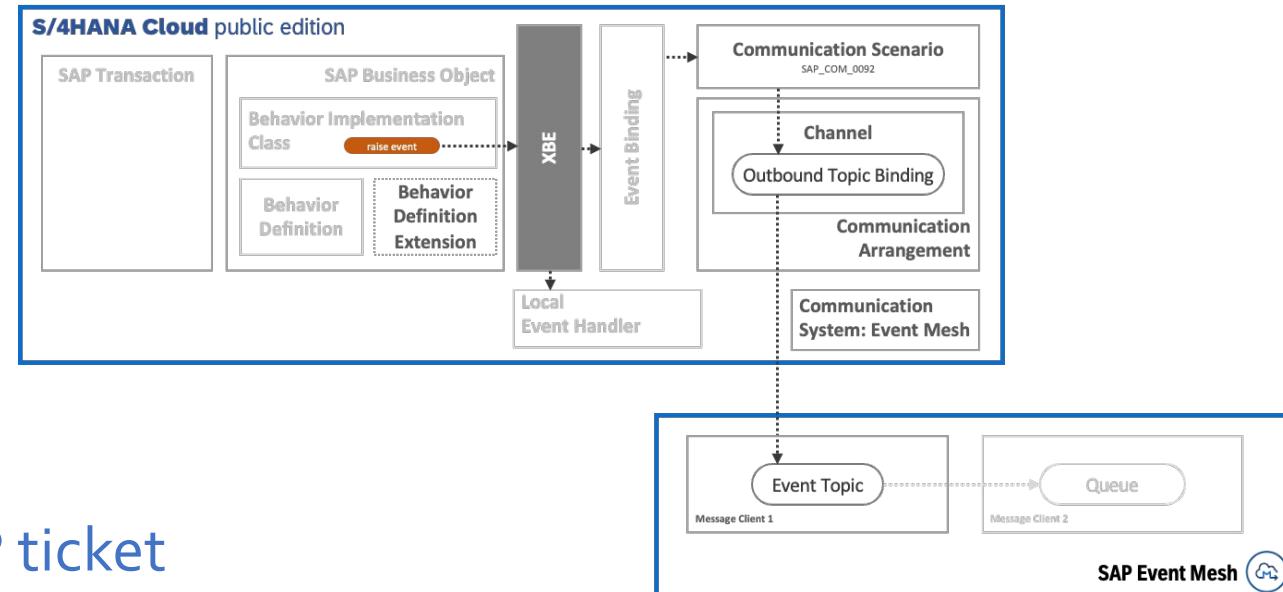
## ABAP Clean Core Challenges and Workarounds

- Event Mesh is needed to handle S/4HANA business events.
  - Need an Event Mesh subscription on BTP
  - Activate scope item 1NN in S/4HANA Cloud, public edition



### Challenge

- By default, scope item 1NN is not available in a SAP S/4HANA TTD system

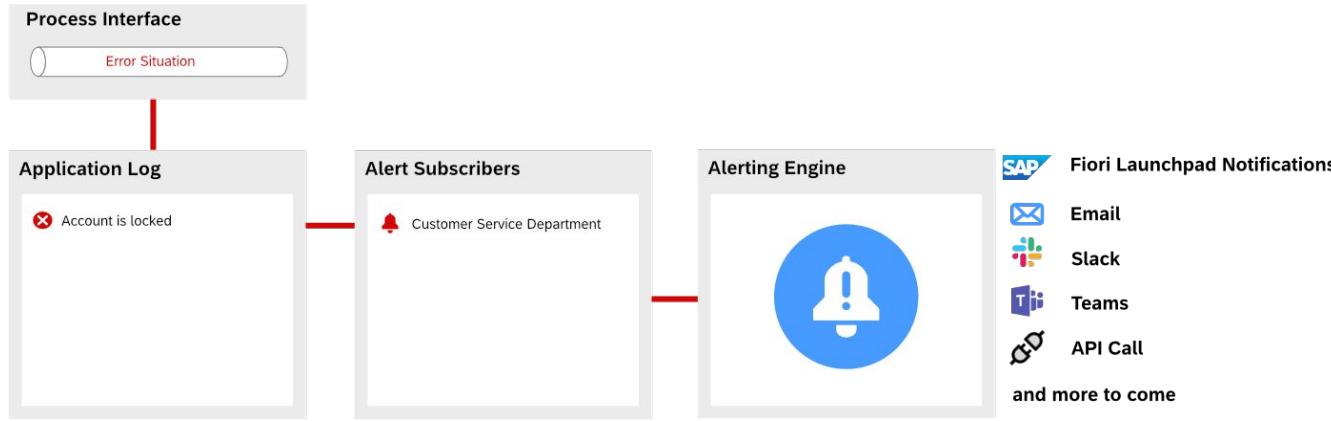


### Solution

- Request the scope item using a SAP ticket

# Sending Alerts to Multiple Streams, Including Email

## ABAP Clean Core Challenges and Workarounds



## Challenge

- S/4HANA ABAP Cloud provided a class `cl_bcs_mail_message`, which works without an error but didn't send out any email

## Solution

- Setup Output Management for email (see sap note 2941522)
- Sent a ticket to SAP to set DomainKeys Identified Mail (DKIM) records for your domain



# Showing Application Logs in the Custom Fiori App

## ABAP Clean Core Challenges and Workarounds

- There is a standard Fiori application for showing the Application Log
- This Fiori App uses a standard OData version 2 service named APL\_LOG\_MANAGEMENT\_SRV

Application Logs					
Standard		Category		Subcategory	
Severity	Items	Category Description	Subcategory Description	Creation Date	Created By
6	Plant Deliveries			04/03/2016, 16:22	Oliver Adams
6	Plant Deliveries			03/03/2016, 09:45	Oliver Adams
2	Plant Deliveries			01/03/2016, 10:52	Oliver Adams
10	Plant Deliveries			08/02/2016, 17:30	Oliver Adams
14	Plant Deliveries			08/02/2016, 17:28	Oliver Adams
12	Plant Deliveries			05/02/2016, 15:20	Oliver Adams
12	Plant Deliveries			04/02/2016, 13:49	Ina Purchaser
134	Plant Deliveries			04/02/2016, 10:25	Ina Purchaser

## Challenge

- SAP doesn't allow the usage of OData version 2 service when deploying custom build Fiori App to S/4HANA

MASTERDATA/CUSTOMER/CREATE/SCHEDULED					
Process Phase	Result Phase	Archive Phase	Overall Phase	Partner Demo Development: ZSK090	
Success	Success			<a href="#">Set to failed</a>	<a href="#">Set to success</a>
				<a href="#">Set to skipped</a>	<a href="#">Set to obsolete</a>
<a href="#">Start</a> <a href="#">Restart</a> <a href="#">Restart at</a> <a href="#">[refresh]</a>					
Interface Info	Interface Details	Application Log	Payload	Audit Trail	Attributes
Api Group: MASTERDATA	Api Object: CUSTOMER	Api Action: CREATE	Api System: SCHEDULED		
Interface Details					
Process Id: 77e43f3a-3619-1eeb-aee7-f4cd81477ed93	External Id: Unit Tests: Scheduled_20241125	Document Id: -	Reference Id: -	Reference Uuid: 00000000-0000-0000-0000-000000000000	Parent Uuid: 00000000-0000-0000-0000-000000000000
Application Log (4)					
Log Source	Line	Severity	Description	Log at	Level
INTERFACE	1	This is the #_pipeline_check_authorize of flexsicl_inbound_example for MASTERDATA/CUSTOMER/CREATE/SCHEDULED		11/25/2024, 15:12:15	6
INTERFACE	2	This is the #_process_phase_execute_main of flexsicl_inbound_example		11/25/2024, 15:12:15	6
INTERFACE	3	This is the #_process_phase_execute_main of flexsicl_inbound_example for 77e43f3a-3619-1eeb-aee7-f4cd81477ed93		11/25/2024, 15:12:21	6
INTERFACE	4	Set the correlation_id abc		11/25/2024, 15:12:21	6
Payload					

## Solution

- Creating a **custom entity** to read the Application Log and expose it as OData version 4

# Show the Logo on the Fiori Tiles and App Headers

## ABAP Clean Core Challenges and Workarounds

### Challenge

- FEXS API Connect is an OEM product, so it must be easy to change the tiles' logo and the app's header by configuration.

### Solution

- Creating an **HTTP service** that dynamically provides the logo and a **CSS file** based on configuration.
- Extend the Fiori application with a header for the logo.**

The screenshot shows the SAP Fiori Launchpad with the FEXS API Connect application selected. The application interface is divided into several sections:

- FEXS Mapping:** Includes tabs for 'Mappings FEXS API Connect', 'Map Ranges FEXS API Connect', and 'Constants FEXS API Connect'.
- FEXS Alerting Framework:** Includes tabs for 'Configuration FEXS Alerting', 'Alert Groups FEXS Alerting', 'Alert Types FEXS Alerting', 'Contacts FEXS Alerting', 'Maintain Test FEXS Alerting', and 'Substitutions FEXS Alerting'.
- FEXS API Connect Settings:** Includes tabs for 'Configuration FEXS API Connect', 'Settings FEXS API Connect', and 'HTTP Responses FEXS API Connect'.
- A central panel displays a JSON configuration snippet related to cross-navigation and alerting parameters.

The screenshot shows the SAP Fiori Launchpad with the API Connect Monitor application selected. The application interface includes a search bar and a table titled "API Connect Monitor (837)". The table lists the following data:

Api Group	Api Object	Api Action	Overall phase status	Process phase: Local status	Process phase: Edge status	Process phase: External status
DEMO	INVOICE	EDGE_POST	Running	Skipped	Success	Skipped
MASTERDATA	CUSTOMER	CREATE	Successful finished	Success	Skipped	Success
DEMO	GENERAL_LEDGER	EDGE_POST	Waiting	User action needed	Skipped	>
DEMO	INVOICE	EDGE_POST	Running	Skipped	Success	Skipped
DEMO	INVOICE	EDGE_POST	Running	Skipped	Success	Skipped
MASTERDATA	CUSTOMER	CREATE	Waiting			>
MASTERDATA	CUSTOMER	CREATE	Waiting			>
MASTERDATA	CUSTOMER	CREATE	Waiting			>
MASTERDATA	CUSTOMER	CREATE	Waiting			>

# Custom XML Handler

## ABAP Clean Core Challenges and Workarounds

### Challenge

- Not all SAP ECC releases can handle JSON, and we want to be sure that we can convert XML into an ABAP structure as we can with JSON, ignoring unnecessary tags and using booleans and timestamps correctly.

### Solution

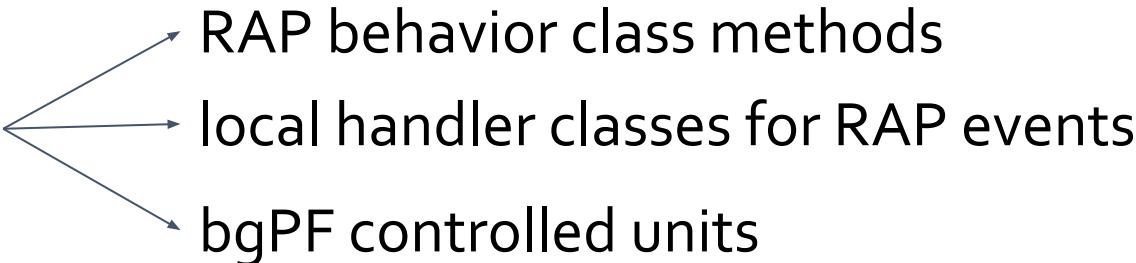
- Build our own XML handler.



# Restrictions for Working with SAP Controlled LUW

## ABAP Clean Core Challenges and Workarounds

SAP Controlled LUW



### Challenge

- To fulfill a task, we must perform a **commit work** or **commit entities** in our SAP-controlled LUW.
  - Throw an event for the next task, which can be handled independently
  - Use Fiori Actions, which updates tables that aren't directly related to the RAP BO

### Partial Solutions

- Use **uncontrolled bgPF units** instead of raising RAP Events.
- Implement an **HTTP handler class** for handling isolated Fiori Actions and extend the Fiori App

```
DATA(process_factory) = cl_bgmc_process_factory->get_default( ).  
DATA(process) = process_factory->create( ).  
process->set_name( CONV #( name ) )->set_operation_tx_uncontrolled( operation ).  
  
DATA(bgpf_monitor) = process->save_for_execution( ).  
  
bgpf_unit_id_base64 = _get_unit_id_from_monitor( bgpf_monitor ).
```

# bgRFC Queue in bgPF Framework is Very Slow

## ABAP Clean Core Challenges and Workarounds

- RAP ABAP events trigger a controlled bgPF unit to handle the event.

## Challenges

- We need many small sequential event-based tasks. Due to SAP's current implementation, using RAP events leads to many bgPF units processing very slowly.
- The tracking of many active bgPF units in the Fiori app is horrible.

## Solutions

- Use uncontrolled bgPF units instead of business events.
- Raise a ticket to SAP to increase the number of WP assigned for bgRFC processing.
- Build our own tracker for ABAP internal sessions.



# Tracking Internal Sessions in ABAP Cloud

## ABAP Clean Core Challenges and Workarounds

- Each call of an ABAP program creates a new **internal session** in which the called program is loaded.

### Challenges

- We cannot get real-time information about an ABAP internal session.
- We cannot catch a short dump at runtime by code.

### Solution

- Session tracker functionality to follow ABAP internal sessions.

API_CO...	V	STACK_START_POINT	BGPF_UNIT_ID	STARTED_AT	ENDED_AT	IS_FINISHED
DEMO/GENERA	DIA	SAPMHTTP [system] %_http_start ...		20241127144302.4141960	20241127144302.5087320	X
DEMO/GENE...	DIA	SAPMSSY1 [system] %_rfc_start [...]	d+Q/OjYZHu+rmbz...	20241127144302.5616100	20241127144302.6839770	X
DEMO/GENE...	DIA	SAPMSSY1 [system] %_rfc_start [...]	d+Q/OjYZHu+rmbz...	20241127144302.7992840	20241127144303.5160400	X
DEMO/GENE...	DIA	SAPMSSY1 [system] %_rfc_start [...]	d+Q/OjYZHu+rmbz...	20241127144303.6254310	20241127144303.6779340	X
DEMO/GENE...	DIA	SAPMSSY1 [system] %_rfc_start [...]	d+Q/OjYZHu+rmb0...	20241127144303.7841840	20241127144303.8888930	X

# ABAP Cloud Application Jobs

## ABAP Clean Core Challenges and Workarounds

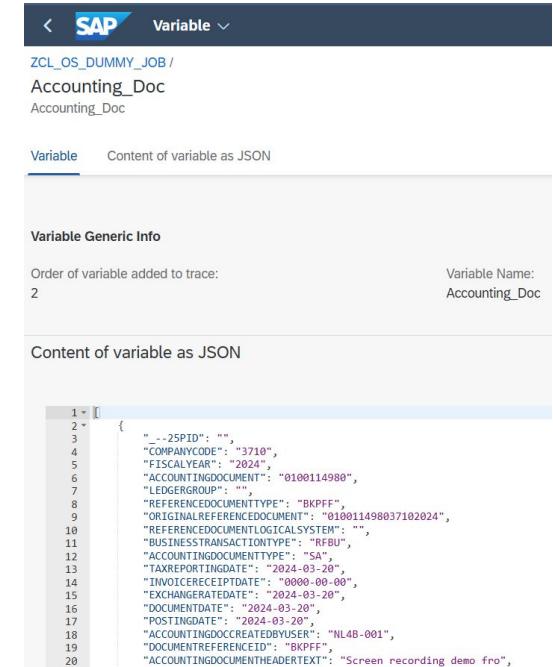
- The application job framework classes are the only option to start and manage jobs in ABAP Cloud.

## Challenges

- Debug an application job.
- Starting a job with a technical user is not supported yet.
- Prevent multiple instances of the same job to run simultaneously.

## Solutions

- Build our own utility tool to trace variables content during a job run.
- Use a running job initiated by a business user to start other jobs.
- Check if another instance of the same job is running by code.



The screenshot shows the SAP Fiori Variable trace interface. At the top, it displays the path: ZCL\_OS\_DUMMY\_JOB / Accounting\_Doc Accounting\_Doc. Below this, there are tabs for 'Variable' (which is selected) and 'Content of variable as JSON'. The 'Variable Generic Info' section shows the order of variables added to the trace (2) and the variable name (Accounting\_Doc). The 'Content of variable as JSON' section shows a JSON dump of the variable's content, with line numbers from 1 to 20. The JSON data includes fields like COMPANYCODE, FISCALYEAR, ACCOUNTINGDOCUMENT, LEDGERGROUP, REFERENCEDOCUMENTTYPE, ORIGINALREFERENCEDOCUMENT, REFERENCEDOCUMENTLOGICALSYSTEM, BUSINESSACTIONTYPE, ACCOUNTINGDOCSTATUS, TAXREPORTINGDATE, INVOICERECIPTDATE, DOCUMENTDATE, POSTINGDATE, ACCOUNTINGDOCREATEDBYUSER, DOCUMENTREFERENCEID, and ACCOUNTINGDOCUMENTHEADERTEXT.

```
1: [
2:   {
3:     "--2SPID": "",
4:     "COMPANYCODE": "3710",
5:     "FISCALYEAR": "2024",
6:     "ACCOUNTINGDOCUMENT": "0100114980",
7:     "LEDGERGROUP": "",
8:     "REFERENCEDOCUMENTTYPE": "BKPFF",
9:     "ORIGINALREFERENCEDOCUMENT": "010011498037102024",
10:    "REFERENCEDOCUMENTLOGICALSYSTEM": "",
11:    "BUSINESSACTIONTYPE": "RFBU",
12:    "ACCOUNTINGDOCSTATUS": "0000-00-00",
13:    "TAXREPORTINGDATE": "2024-03-20",
14:    "INVOICERECIPTDATE": "0000-00-00",
15:    "DOCUMENTDATE": "2024-03-20",
16:    "POSTINGDATE": "2024-03-20",
17:    "ACCOUNTINGDOC.CREATEDBYUSER": "NL4B-001",
18:    "DOCUMENTREFERENCEID": "BKPFF",
19:    "ACCOUNTINGDOCUMENTHEADERTEXT": "Screen recording demo fro",
20:  }
]
```

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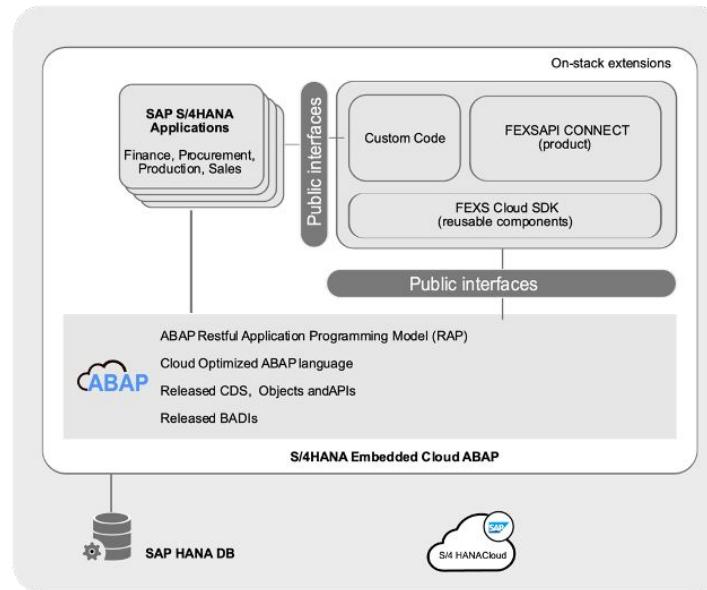
# Take Away Points

- ABAP Cloud is a challenge for ‘traditional’ ABAP developers. There is a lot to learn.
- ABAP Cloud is still under construction, but the existing feature set is rich and proven
- *Many roads lead to Rome*. You need to decide first which S/4HANA editions you want to support for your partner solution.
- We can help you speed up and simplify your ABAP Cloud development and partner solutions with our knowledge.



Octavian  
Savu  
SAP Developer

A black and white portrait of a young man with short dark hair, wearing a dark suit jacket over a light-colored shirt. He is looking directly at the camera with a slight smile. In the bottom left corner of the slide, there is a QR code.



# Thank you



Robert Eijpe MSc.  
Strategic Enterprise Architect for SAP

A black and white portrait of a middle-aged man with glasses, wearing a dark polo shirt. He is looking slightly to the right of the camera. In the bottom right corner of the slide, there is a QR code.



# More info...

Create barcodes  
<https://barcode.tec-it.com/en/MobileQRUrl>



Website: FEXS API Connect and Cloud SDK

Blog: Which S/4HANA extensibility option is the best for thriving as an SAP partner in the cloud space?



Blog: ABAP Cloud Application Jobs: Overcoming Key Challenges



Blog: Working with Internal Sessions in ABAP Cloud

YouTube: What's New in the ABAP RESTful Application Programming Model (RAP)?



Website: Clean ABAP style guide



Website: ADT Plugin ABAP Cleaner