Leveraging SAP S/4HANA AI + ML capabilities to solve real world business challenges

Intelligent Scenario Lifecycle Management

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S/4 HANA / Business Technology Platform Center of Excellence

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Agenda

How the Business Technology Platform enhances S/4HANA Solutions

Why is Machine Learning is important?

Intelligent ERP: Prebuilt Embedded Machine Learning

Intelligent Scenario Lifecycle Management (ISLM)

What about embedding Custom Scenarios?

Questions

RISE WITH SAP | Business Transformation as a Service

THE BEST RUN SAP

How the Business Technology Platform enhances S/4HANA Solutions

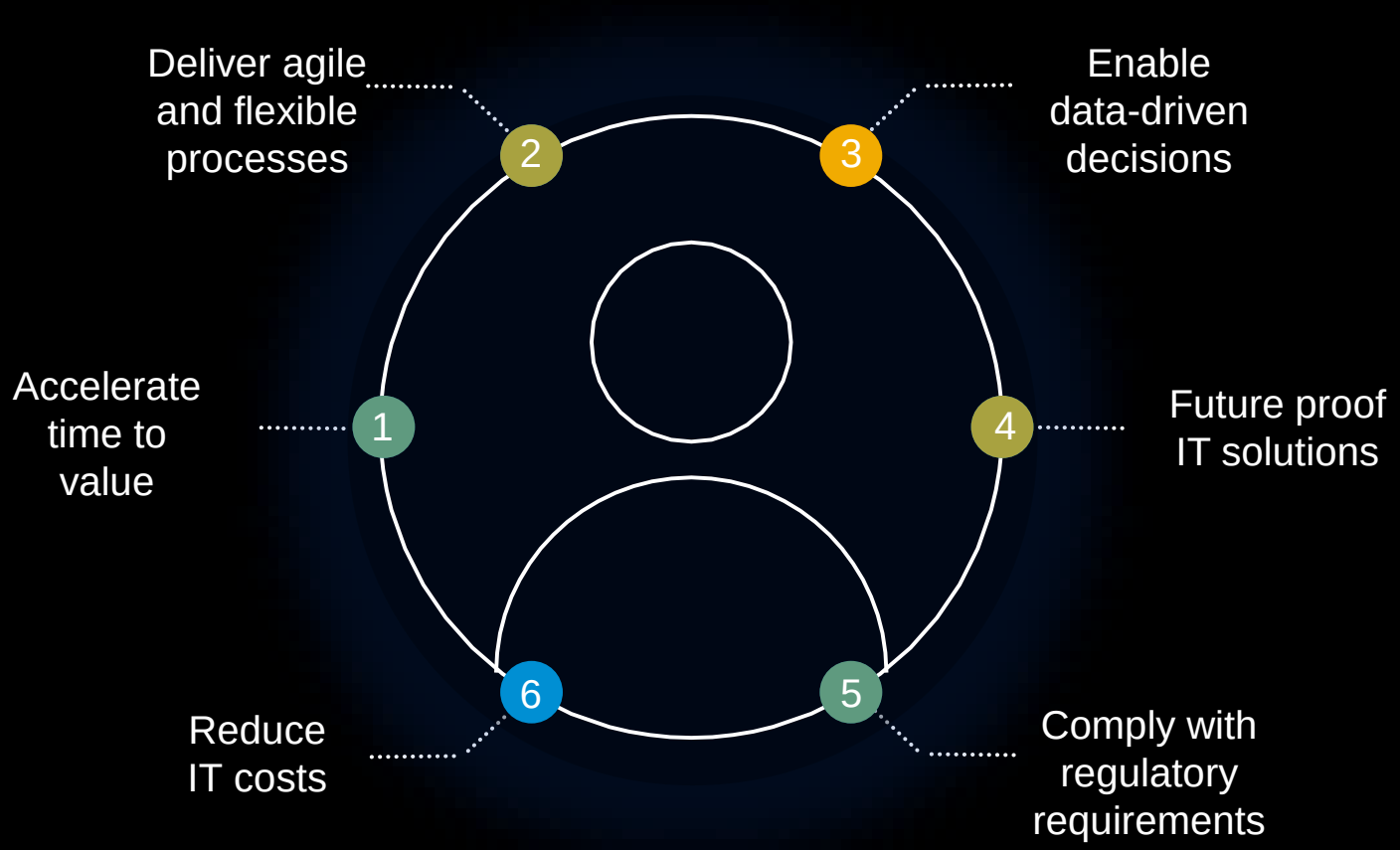
Enabling the Intelligent Enterprise

In the digital economy businesses must stay agile to succeed

[1] IDC FutureScape: Worldwide Digital Transformation 2021 Predictions, Oct 29, 2021 | [2] Gartner CFO Survey Reveals A Dramatic Digital Acceleration Since COVID-19, Nov 12, 2021

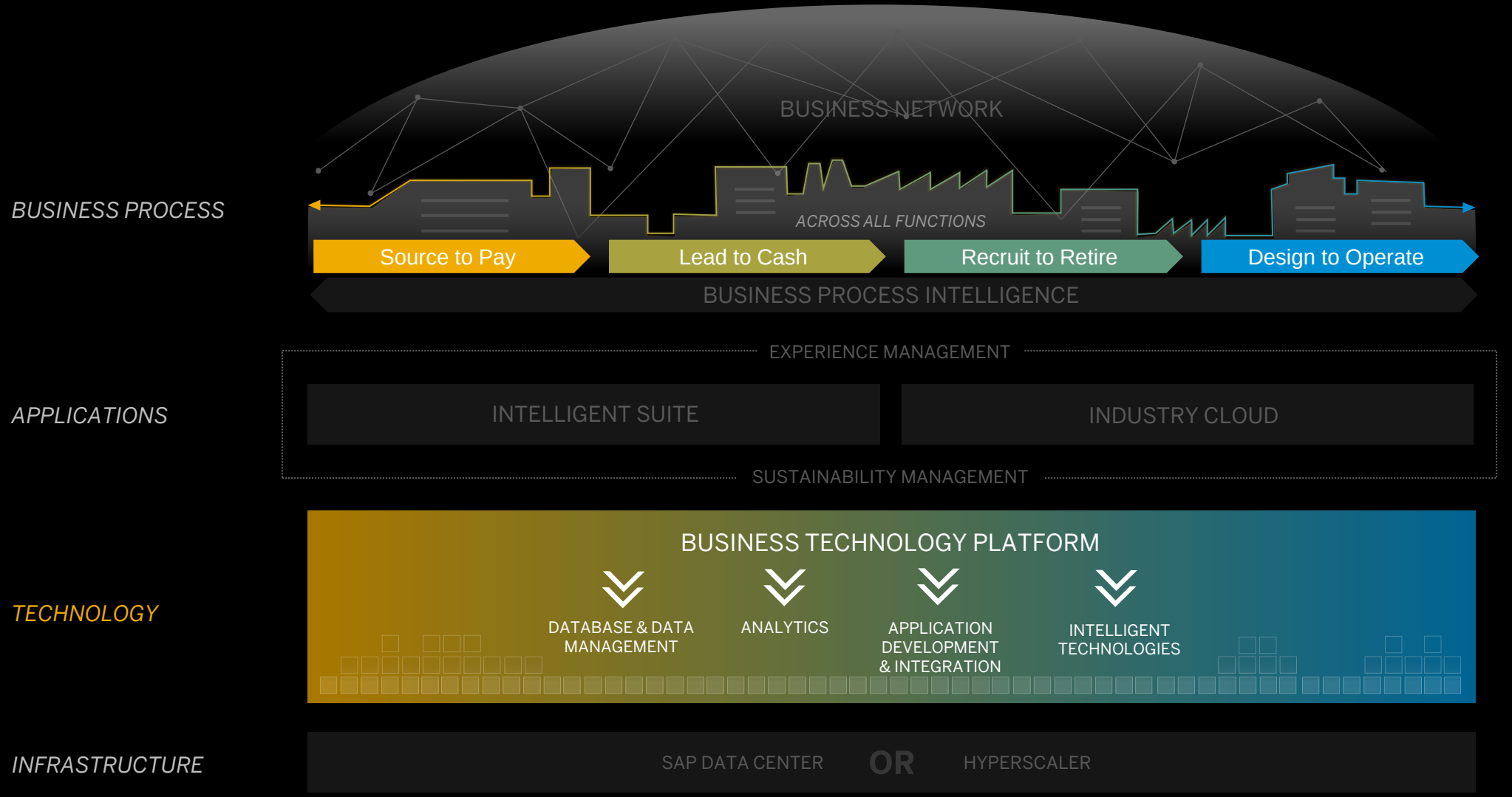
Priorities for an intelligent enterprise

The goal



SAP Business Technology Platform

The platform for the intelligent enterprise



Purchase Order Value

Purchase Order Item Report
DEMO Katharina

Analysis Path Framework Modeling

APF Configuration Modeler
Edit Configurations

S/4HANA

KPI Design

Manage KPIs and Reports

Query Design

View Browser
Browse Views

Custom Analytical Queries

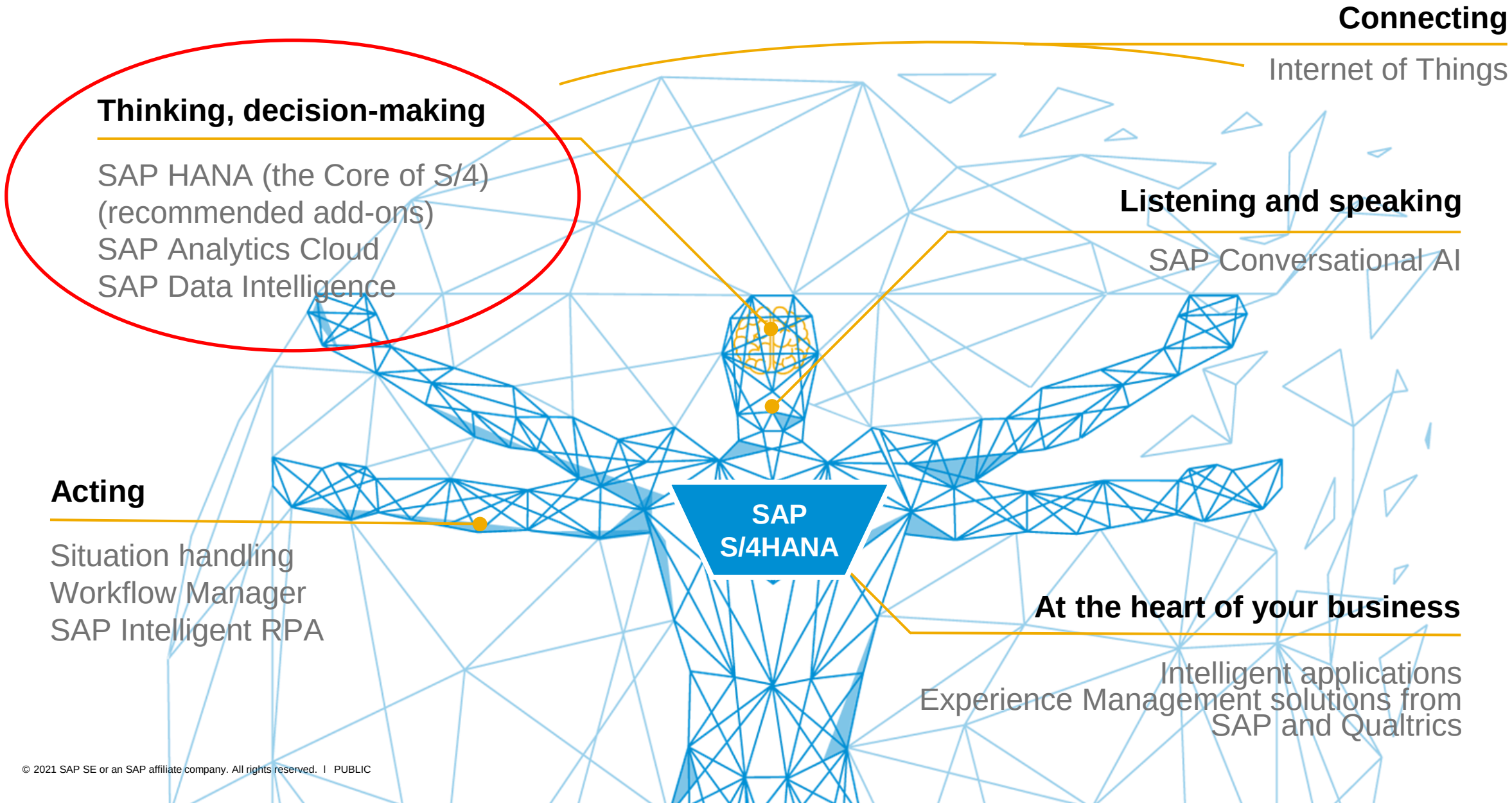
Manage Date Functions
Define dynamic date...

Predictive Models

Intelligent ERP

Embedded Machine Learning

Intelligent ERP



Connecting

Internet of Things

Thinking, decision-making

SAP HANA (the Core of S/4)
(recommended add-ons)
SAP Analytics Cloud
SAP Data Intelligence

Listening and speaking

SAP Conversational AI

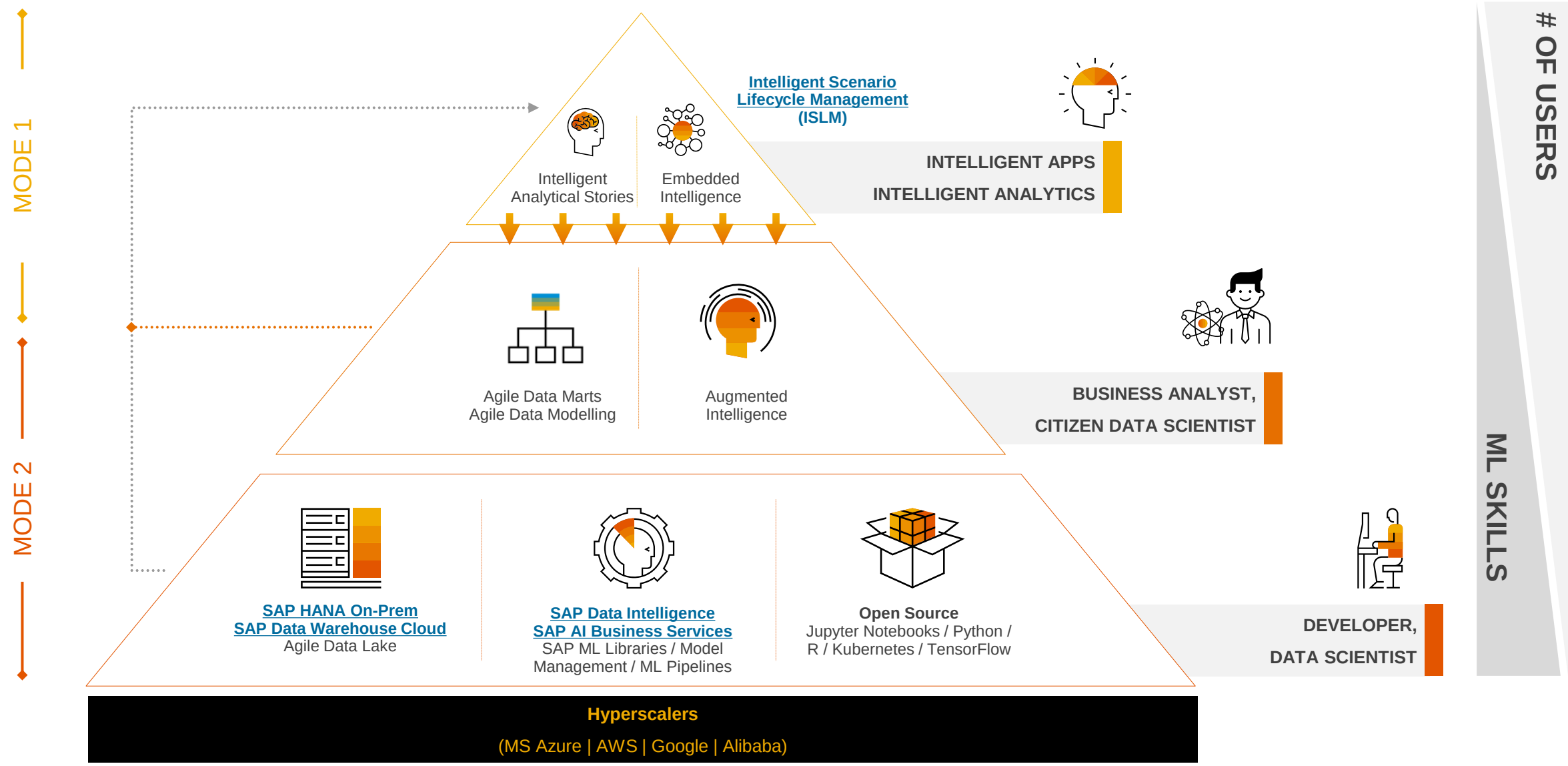
Acting

Situation handling
Workflow Manager
SAP Intelligent RPA

At the heart of your business

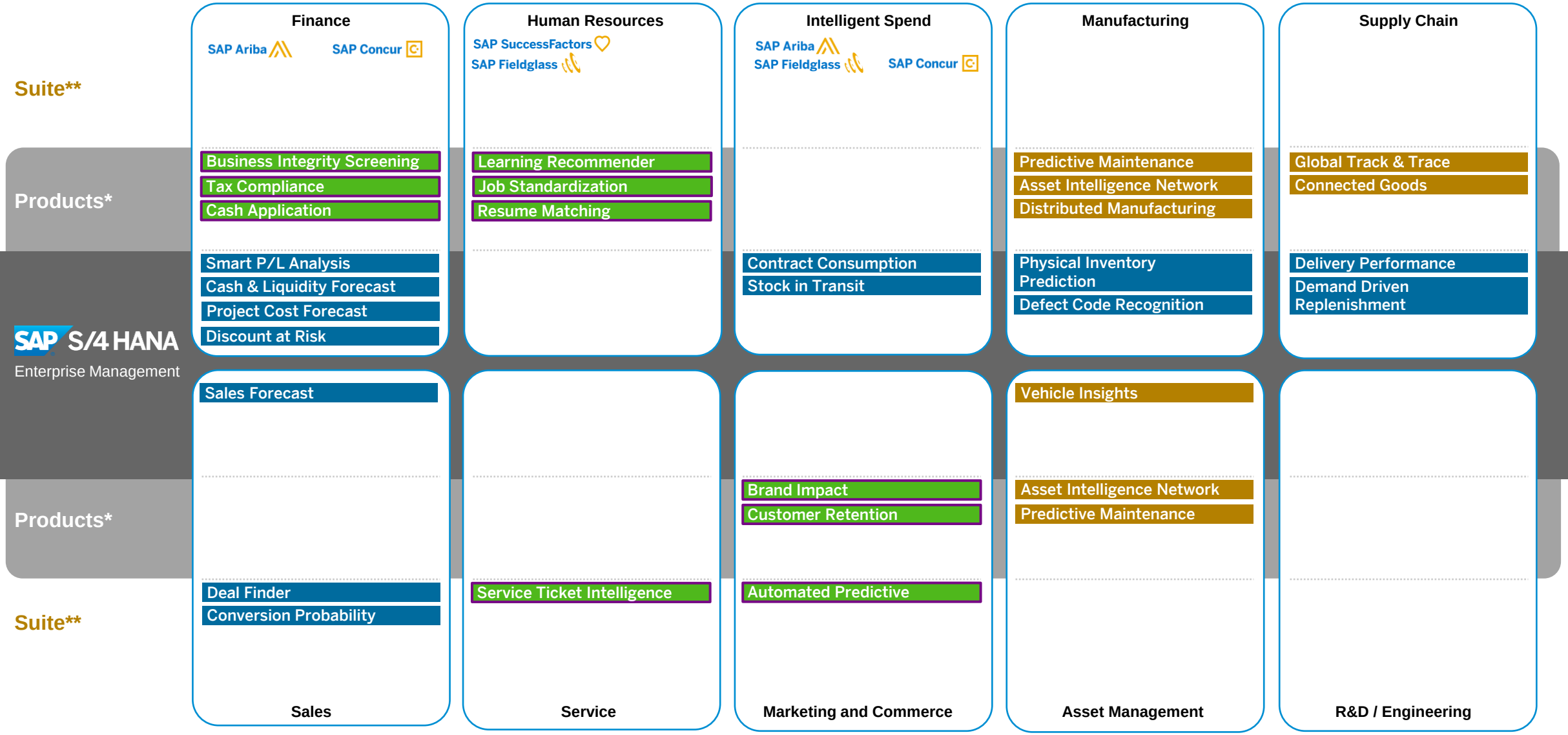
Intelligent applications
Experience Management solutions from SAP and Qualtrics

How Intelligent Enterprises Run



SAP S/4HANA – Embedded Intelligence

Embedded ML Scenarios with S/4
Add-on ML Solutions
Leonardo Innovation Kits



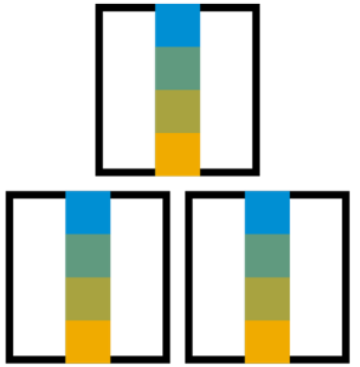
More capabilities can be built as custom scenarios

Motivation: Enable efficient operation and management of intelligent technologies in SAP S/4HANA

S/4HANA Lifecycle management for machine learning

- Select and set up scenario
- Prepare the data for training
- Trigger model training and get status

- Get overview of active model versions consumed by applications
- Monitor and retrain



- Analyze training report
- Deploy and activate to decide which model version to use in business application

SAP Predict Arrival of Stock in Transit

Predict and manage delivery delays

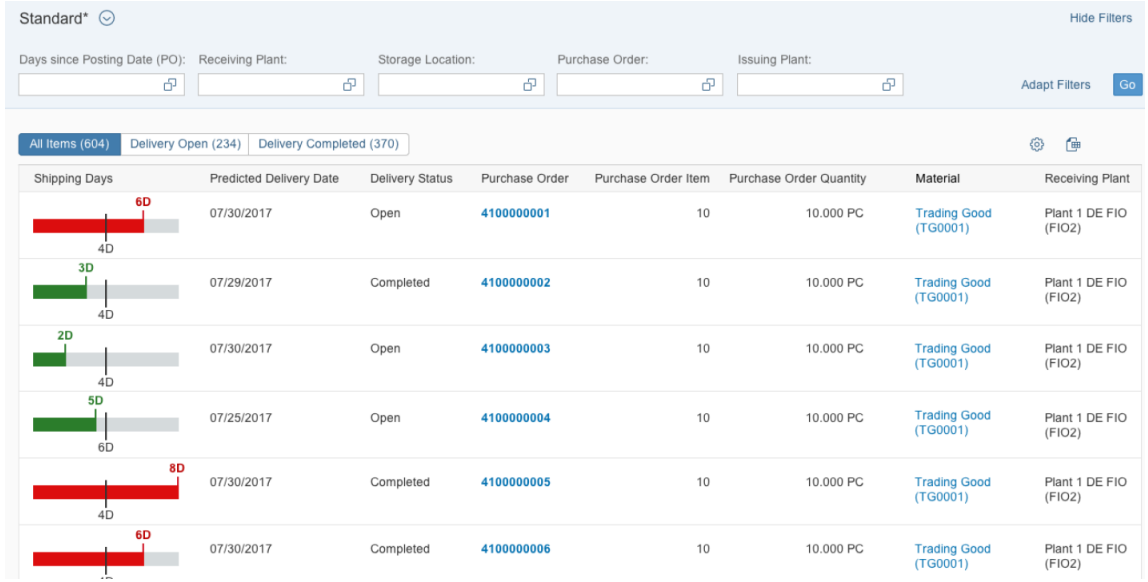
For companies issuing and receiving good from and to their plants, it is important to track the status of the materials in transit in order to take action in case of problems. The "Materials Overdue – Stock in Transit" app gives an overview of the open shipments allowing the business user to take action. 'Predicted Shipment Dates' for each Goods Movement to allow Users to take action to manage delivery delays.

SAP Predict Arrival of Stock in Transit allows warehouse managers to

- Predict the arrival date of a shipment and classify the status into different classes
- Defining the predictive models, training and running the scenarios
- Pre-built set of KPIs allow for robust analytics on S/4HANA cloud data with drill down functionality.
- Early & efficient visibility for stock transport orders
- New integration capabilities with SAP S/4HANA Cloud to gain real-time insights in produce scenario's with predictive analytics

Business Benefits

- Optimize and automate the business process of tracking Stocks In Transit
- Overall more reliable planning / scheduling of goods in transit processes
- Providing predictive analytics for the business scenarios
- Enhanced usability for the businesses visualizing with predictions



SAP Smart Alerts for Profit & Loss Analysis

Get informed of hidden unusual costs and revenue opportunities

Smart Alerts aims to autonomously detect unusual business situations in revenue and cost accounts. Smart Alerts will pro-actively inform the group controller of potential issues and propose explanations for unusual business situations by analyzing the revenue and cost data.

SAP Smart Alerts for Profit & Loss Analysis allows your controller to

- Automatically explore the multi-dimensional space of available filter combinations
- Detect unusual increases and decreases in single key figures
- Notify about changes in trending behavior
- Warn about correlation changes between multiple key figures
- Allow users to collaboratively expand on those automatic findings by placing annotations

Business Benefits

- Decrease time for investigation
- Earlier detection of unusual business situations
- Better collaboration through annotations

SAP FINANCIAL STATEMENT INSIGHTS FOR PROFIT AND LOSS

Plan Data | EUR | Year | Quarter | 2015 | 2016 | 2017 | Open Hierarchy Editor | View Line Items

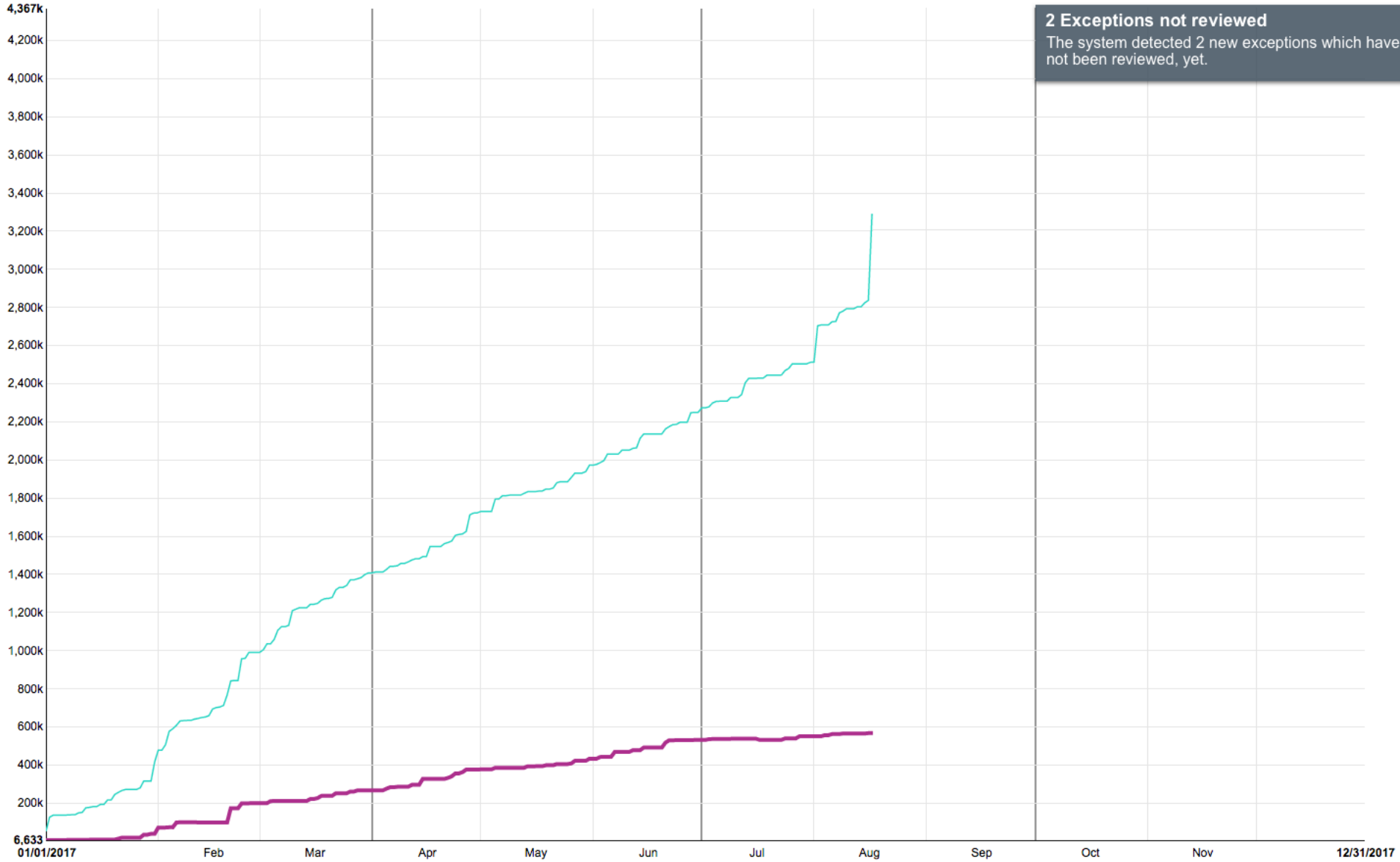
TIME SERIES | EXCEPTIONS 2

+ Add Time Series

Revenue
Actual: 593k EUR
Profit Center
Product Rel. Service (0000020PC_04)
Filter

External revenue
Actual: 3310k EUR
+ Filter

Year over Year Comparison | Quarterly Accumulation



2 Exceptions not reviewed
The system detected 2 new exceptions which have not been reviewed, yet.

TIME SERIES | EXCEPTIONS 2

Revenue extra equipment
August, 16th 2017

+17% Actual: 3,510k EUR
Expected: 2,990k EUR

Company Code
Cars Asia (000432)

Customer
Car Starter (MS0011)

Product
Seats Variant A1 (TT00931)

Show Details

Revenue Wheels
August, 17th 2017

-19% Actual: 405k EUR
Expected: 501k EUR

Company Code
Cars Europe (000998)

Customer
Easy Cars Inc. (EC0083)

Product
Wheels S3 Size M (XX0001)

Show Details

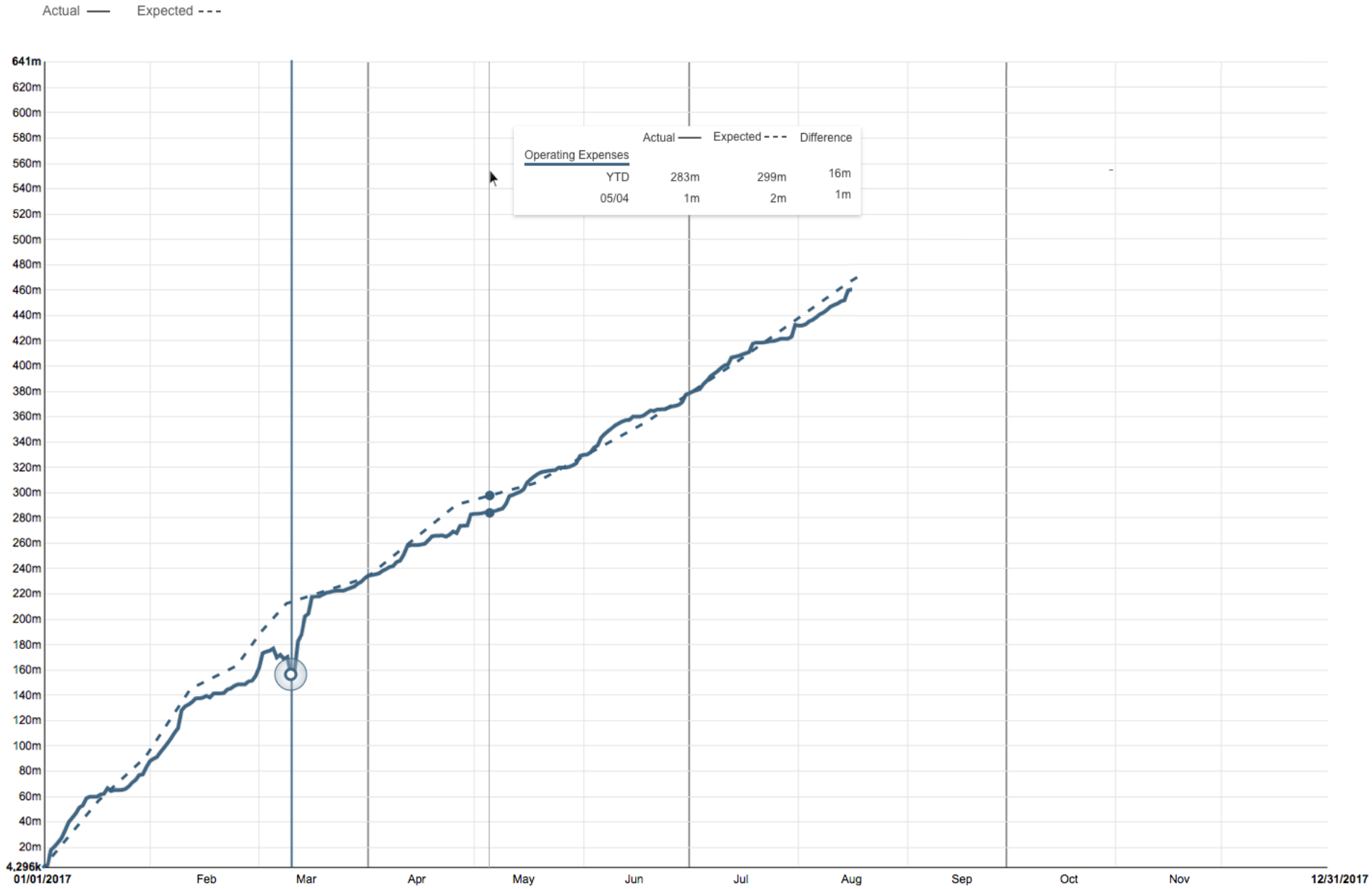
Operating Expenses
March, 10th 2017

-25% Actual: 160m EUR
Expected: 212m EUR

Segment
Services (Serv01)

Profit Center
Maintenance (000003M_X4)

Show Details



Exception Detail: Revenue Wheels

Observation

Expected increase failed to materialize on this account.

August 17th, 2017

-19%

-96k EUR

Actual: 405k EUR
Expected: 501k EUR

Automated Analysis

In the past, we saw a larger posting in the middle of Q3, which did not occure this year.

Company Code:

Cars Europe (000998)

Customer:

Easy Cars Inc. (EC0083)

Product:

Wheels S3 Size M (XX0001)

Potential Contact

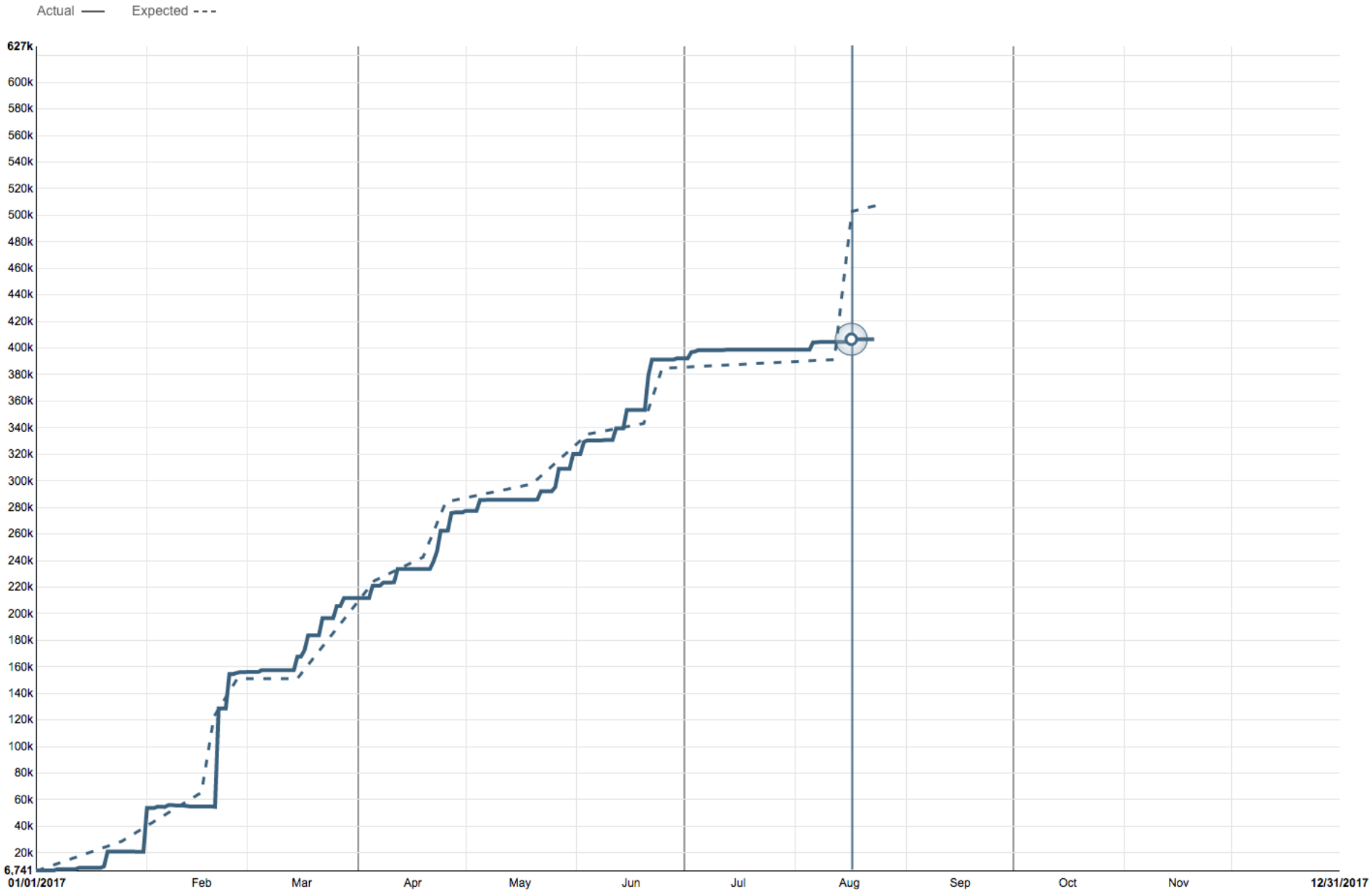
Postings have been made by:

Jessica Miller
+1212 8712 996
jessica.miller@cars-inc.com

Annotations

+ Add

No Annotations available



Exception Detail: Revenue extra equipment

Observation

Expected a steady increase, but found a high growth.

August 16th, 2017

+17%

+520k EUR

Actual: 3,510k EUR
Expected: 2,990k EUR

Automated Analysis

In the past, bookings for Seats Variant A1 had been posted to Account Revenue Seats - maybe this is a faulty allocation.

Company Code:

Cars Asia (000432)

Customer:

Car Starter (MS0011)

Product:

Seats Variant A1 (TT00931)

Potential Contact

Postings have been made by:

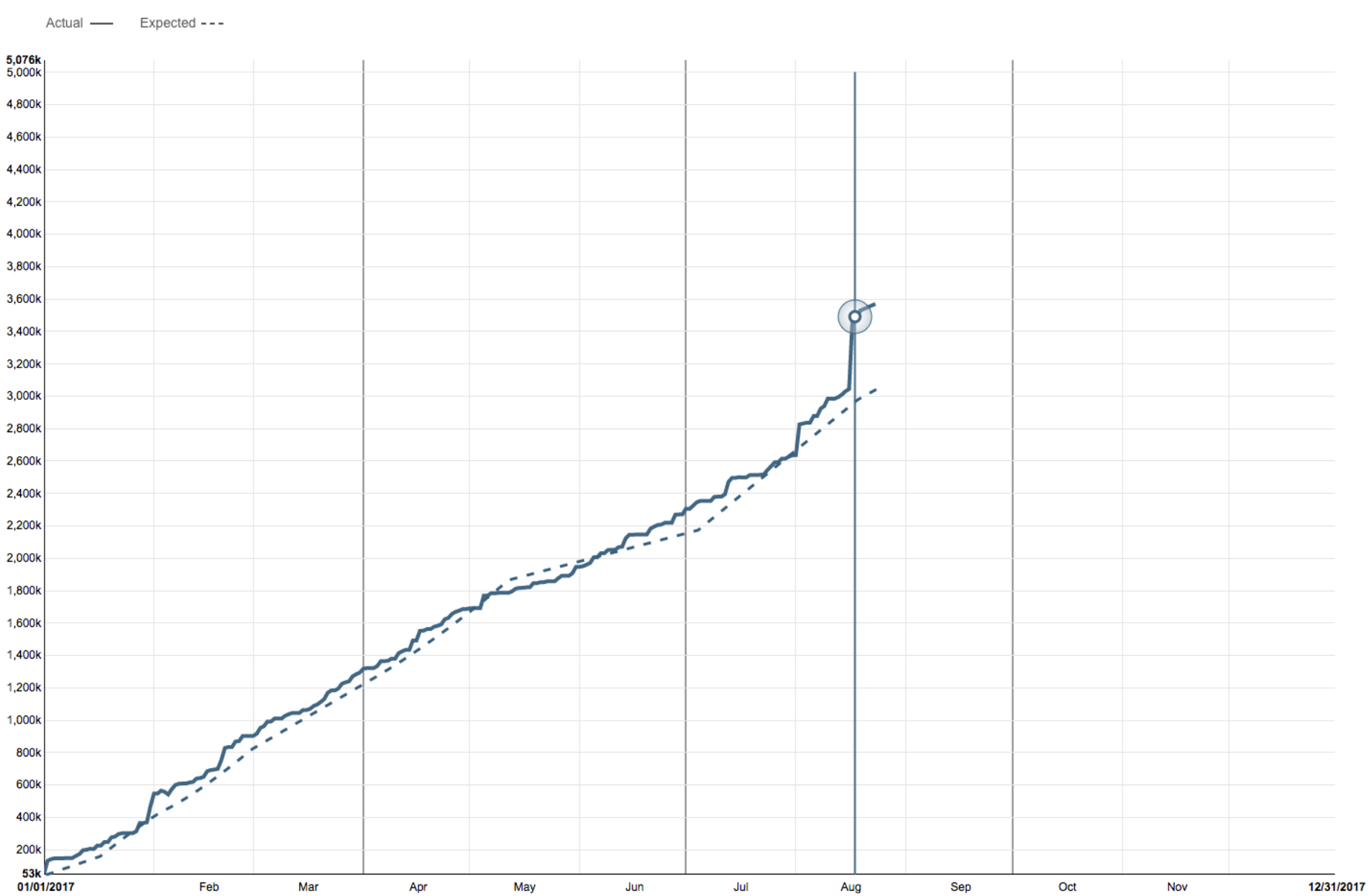
Michael Green
+1857 9971 3373
michael.green@cars-inc.com

Annotations (2)

+ Add

Kate Smith
August, 18th 2017 9:36AM
@Michael Green Could you please follow up on the wrong booking for this exception?

Michael Green
August, 18th 2017 10:12AM
Sure, I will call you when I know more.



SAP Quantity Contract Consumption

Anticipate contract renegotiations in time

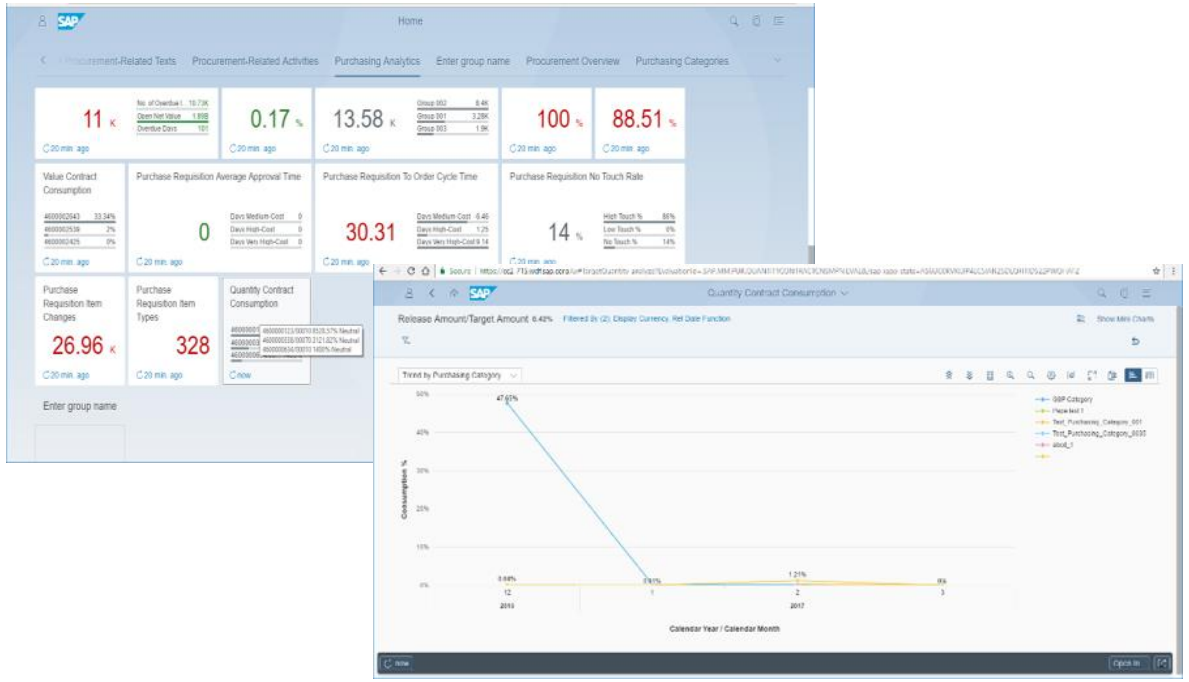
Buyers need to re-negotiate contracts that are soon to be expired. The Machine Learning algorithms identify the contracts that are at the end of the term and provide the probability if a contract is going to be consumed sooner than expected

SAP Quantity Contract Consumption advise procurement leaders to

- Anticipate contract renegotiations in time
- Negotiate with supplier early and efficiently
- Define the predictive models, train and run the scenarios
- Pre-built set of KPIs allow for robust analytics on S/4HANA cloud data with drill down functionality

Business Benefits

- Enhanced usability for the businesses visualizing with predictions
- Early & efficient supplier renegotiation
- Better prices for goods from suppliers
- Enhanced purchasing compliance
- Providing predictive analytics for the business scenarios



SAP Cash and Liquidity Management

Detect fraud in early stages and increase the accuracy of liquidity forecast

Companies are facing the challenge to increase the accuracy of liquidity forecast

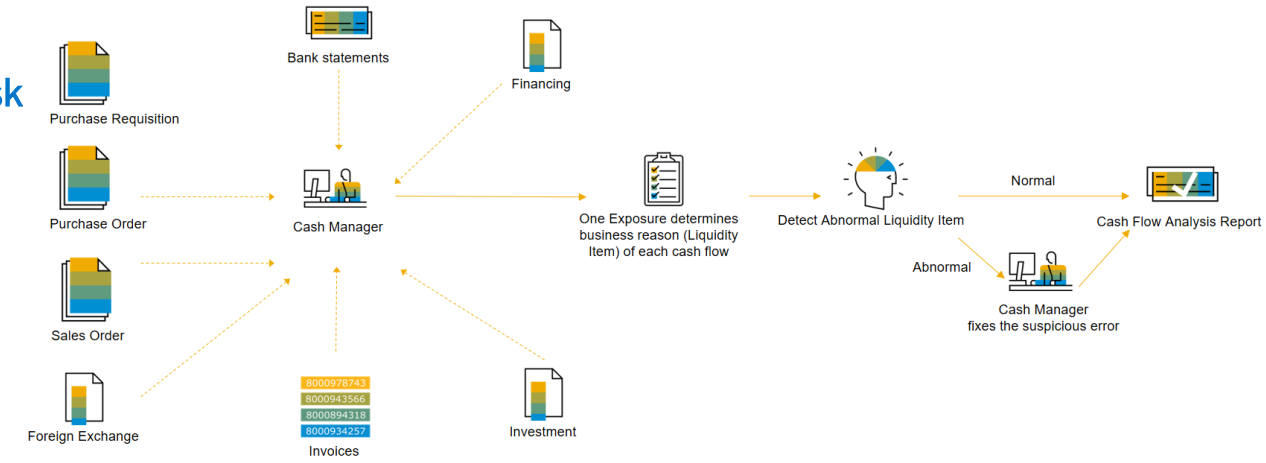
SAP Cash and Liquidity Management forecast more accurately the future cash flow with machine learning capabilities and statistical models, and show insights gathered by the machine learning algorithm as additional analytic offering

SAP Cash and Liquidity Management allows the Treasury and Risk Manager and the Cash Manager to

- Translate historical cash inflows and outflows to future performance
- Detect liquidity trends: historical/emerging, sudden changes, unusual numeric amounts that impact the business
- Identify the main influencer of the timing of cash flow? How do they impact the difference between actual date and planned date

Business Benefits

- Detect fraud in early stages
- Increase the accuracy of liquidity forecast
- Identify the correlations in the cash flow data



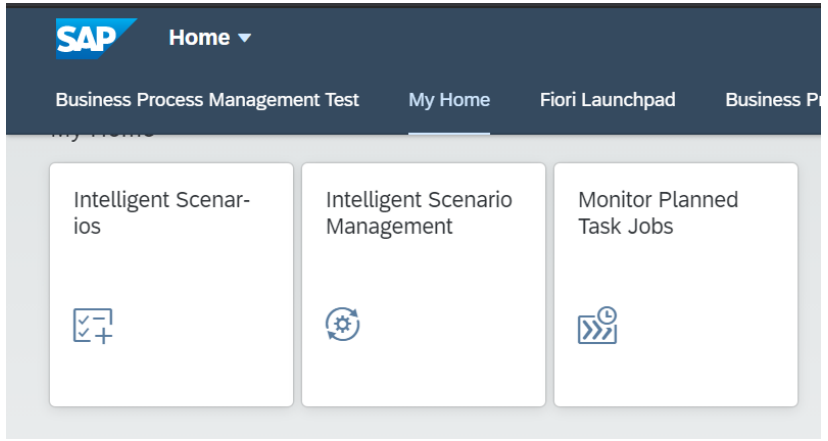
Business operations impact cash flow | **Detect abnormality and fix**

Intelligent Scenario Lifecycle Management
(ISLM – Previously PAI)

ISLM: Standardized integration of AI in SAP S/4HANA

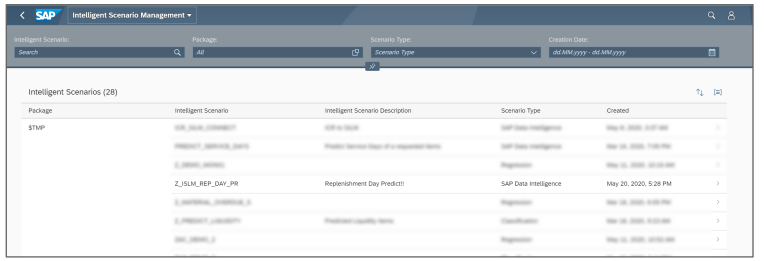
What is ISLM?

- “Intelligent Scenario Lifecycle Management”
- Generic framework in SAP BASIS
- Delivered with SAP S/4HANA (no add. license)
- Successor of Predictive Analytics integrator (PAi) for all HANA ML based scenarios (APL/PAL)



Key benefits:

- Common consumption model for application integration for SAP S/4HANA (for app developers)
- One central cockpit to operate and manage ML artefacts consumed by S/4HANA (for customers):
  - Supports train, deploy, activate (for me/for all), online/batch inference, cloud reporting, …
  - Support scheduling of training for APL, PAL & SAP DI



Intelligent Scenario Lifecycle Management (ISLM):

Standardized framework supporting end-to-end lifecycle management operations on machine learning scenarios in SAP S/4HANA & S/4HANA Cloud

Harmonized framework in basis SAP software layer

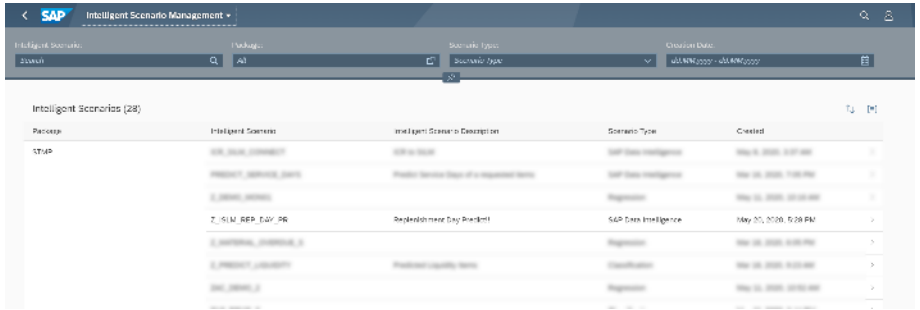
Successor of SAP Predictive Analytics integrator

Standard to train, deploy, activate even for remote ML providers

Support for all phases (readiness, first usage, lifecycle operations, deletion, decommission)

Lifecycle management for ML services provisioned as a service

Common consumption model for application integration in SAP S/4HANA Cloud

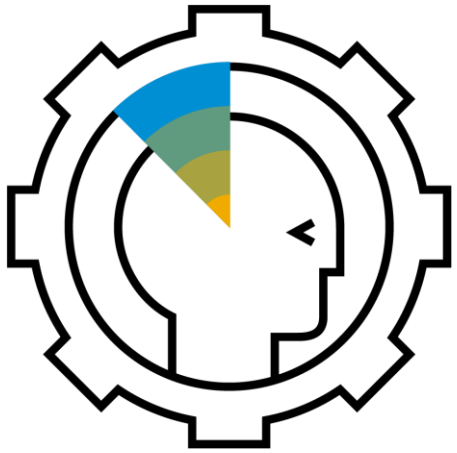


SAP Community call: Managing the lifecycle of SAP S/4HANA Cloud Machine Learning scenarios:

https://youtu.be/3DfrVyXt1Q8

Artificial intelligence technologies to deliver innovative and automated business processes

Data intelligence (including machine learning)



Learn from custom-specific history and exceptions to predict, support, automate, and optimize business user decisions.

Learn from history and exceptions

Deep learning

- A.k.a.: **Side-by-side machine learning**
- Resource-intensive cases like image or language processing
- Neural networks with high CPU–RAM–data demand
- Based on SAP Cloud Platform

Predictive analytics

- A.k.a.: **Embedded machine learning,** predictive analytics
- “Simple” cases like trending or forecasting
- Algorithms with low CPU–RAM–data demand
- SAP HANA, SAP Analytics Cloud

Machine Learning in SAP HANA: PAL and APL

APL: Automated Predictive Library

- Exposes the data mining capabilities of the Automated Analytics engine for developing predictive modelling processes for business analysts

PAL: Predictive Analytics Library

- Advanced analytics algorithms for data scientists

Supported tasks / categories:

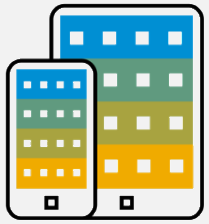
APL

- Clustering
- Classification
- Regression
- Time Series

PAL

- Clustering
- Classification
- Regression
- Time Series
- Statistics
- Data Preparation
- Social Network Analysis
- Miscellaneous
- Recommendation systems

Optimize Existing Processes with SAP AI Business Services



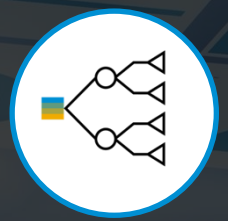
SAP AI Business Services provide strategic machine learning capabilities that help you automate and optimize processes while enriching the customer experience. These reusable services are available on SAP Business Technology Platform.

Business document processing

Business Entity Recognition
Detects and highlights named entities in unstructured text

Document Information Extraction
Automatically extracts information from unstructured documents

Document Classification
Classifies unstructured documents



Data Attribute Recommendation
Automates creation, maintenance, and management of structured data

Invoice Object Recommendation
Recommends general ledger accounts and cost centers for invoices without order reference

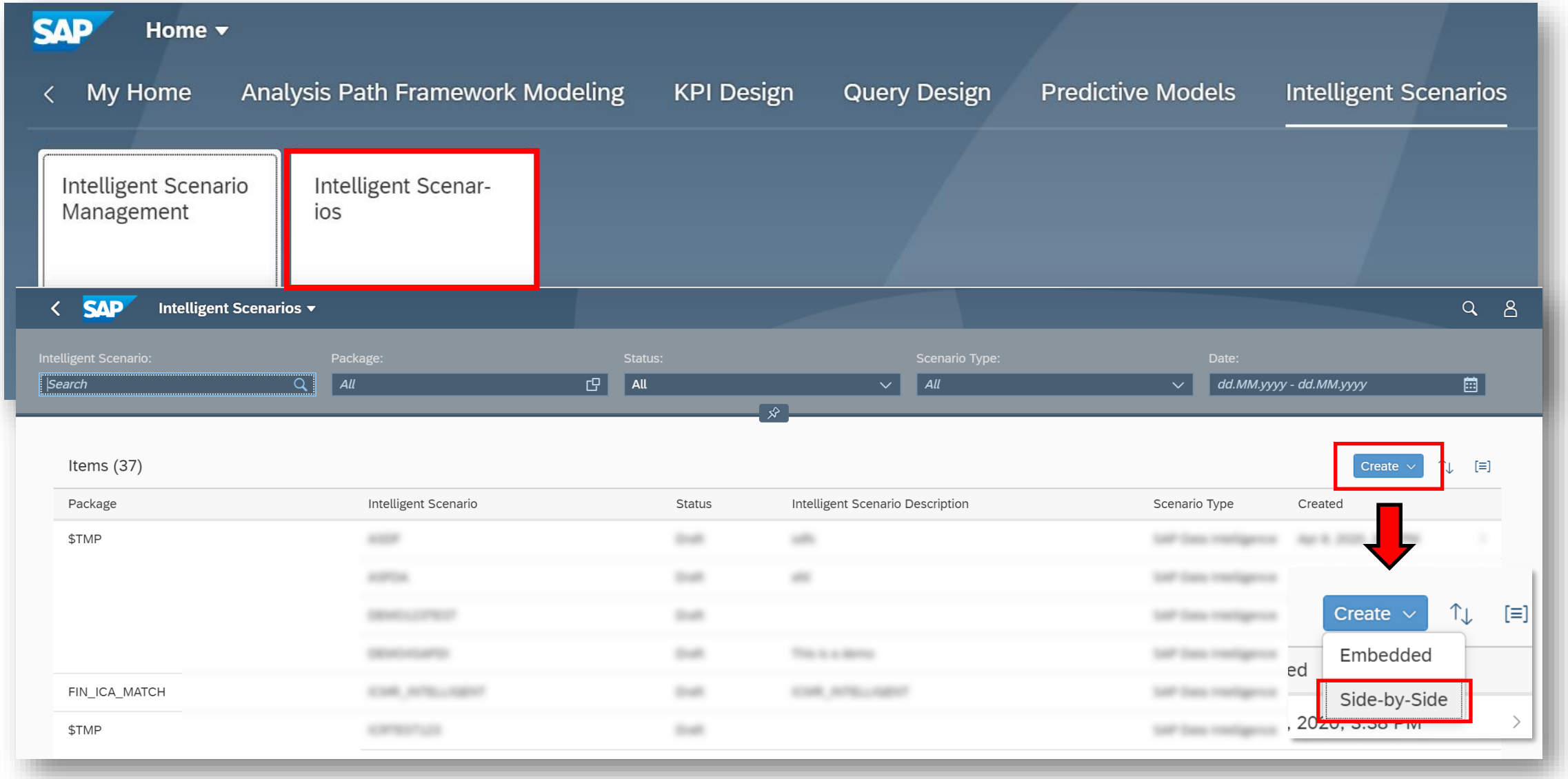
Service Ticket Intelligence
Classifies and recommends tickets automatically

Available via CPEA and SAP Store

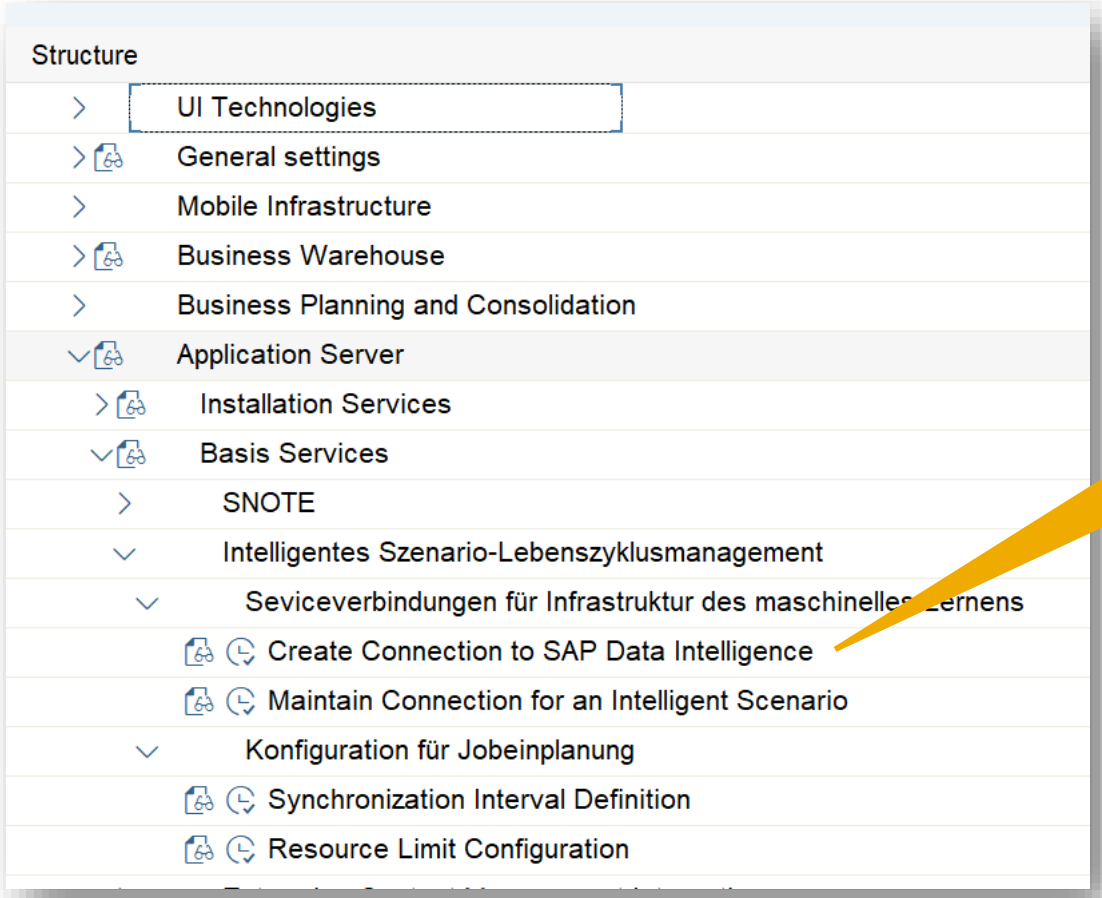
Demo

Side-by-Side
Intelligent scenario lifecycle management (ISLM)

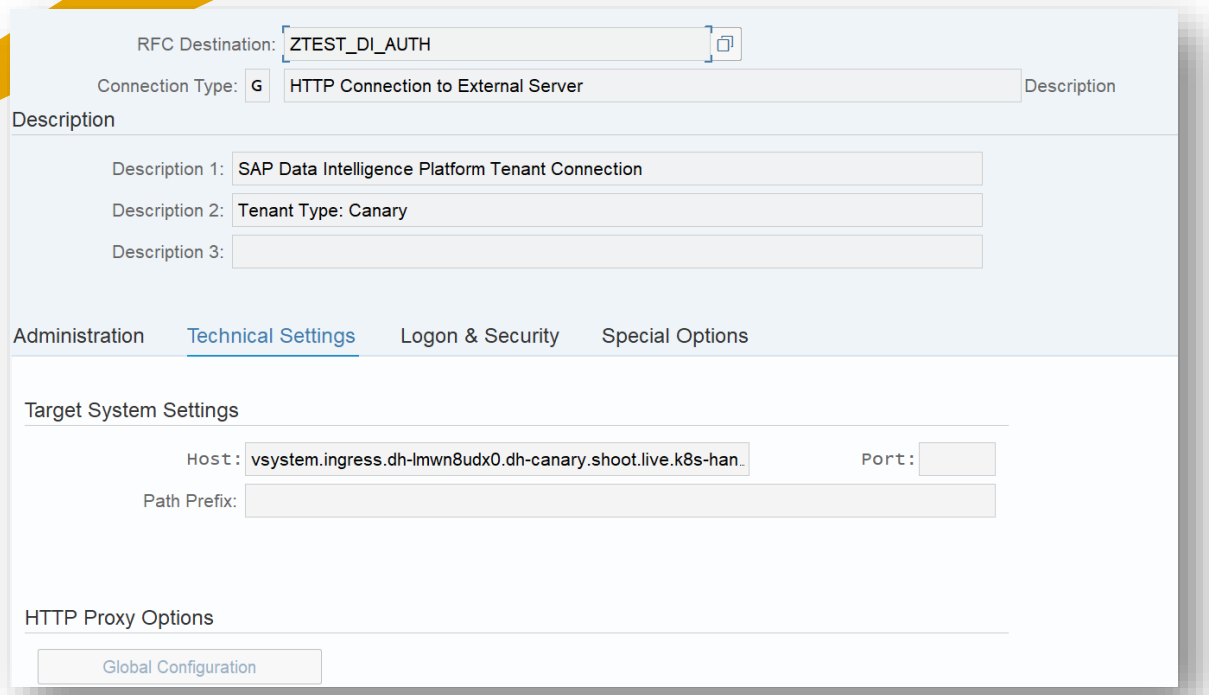
Create new intelligent scenario



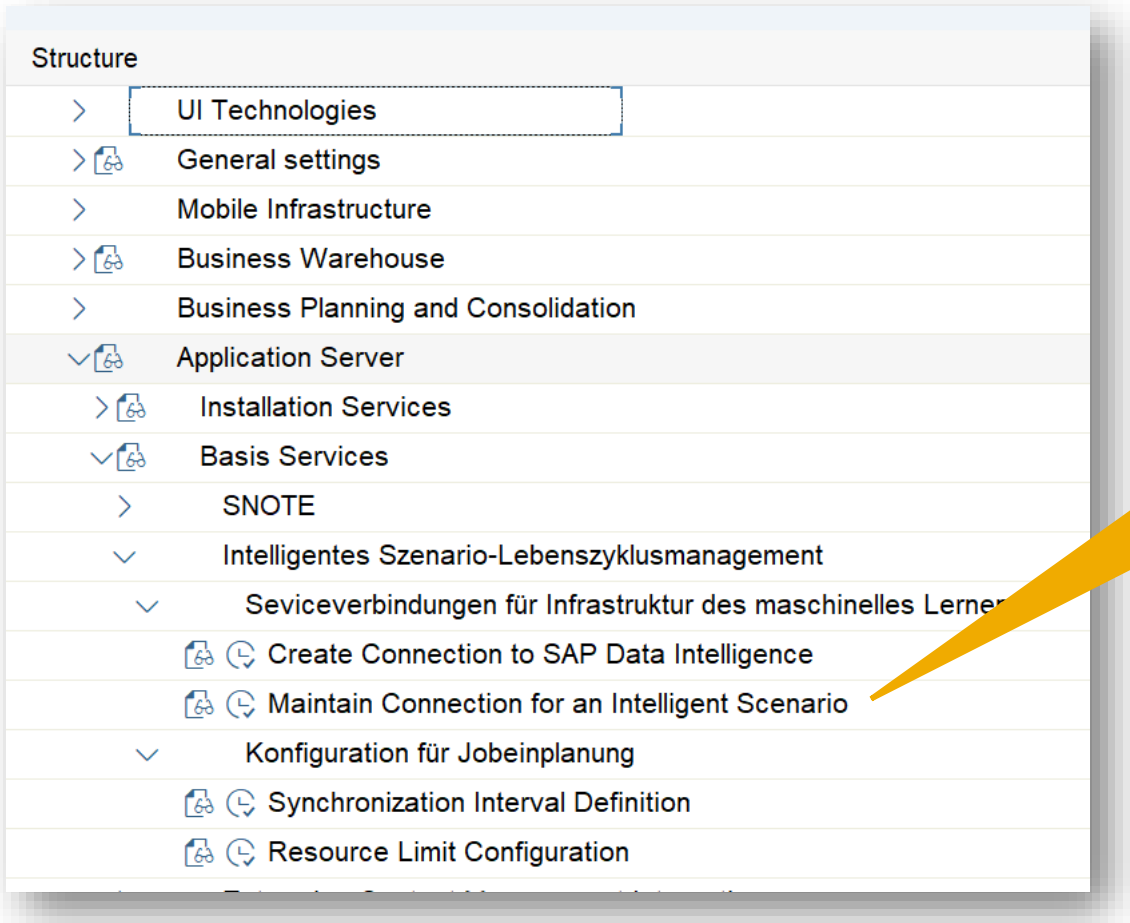
IMG configuration for ISLM: Connection to SAP Data Intelligence



Create a RFC destination to the SAP Data Intelligence tenant

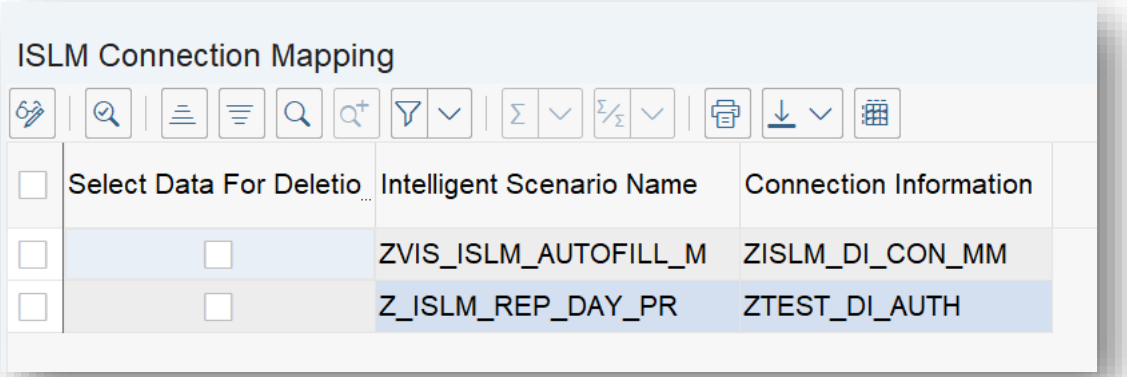


IMG configuration for ISLM: ISLM mapping table

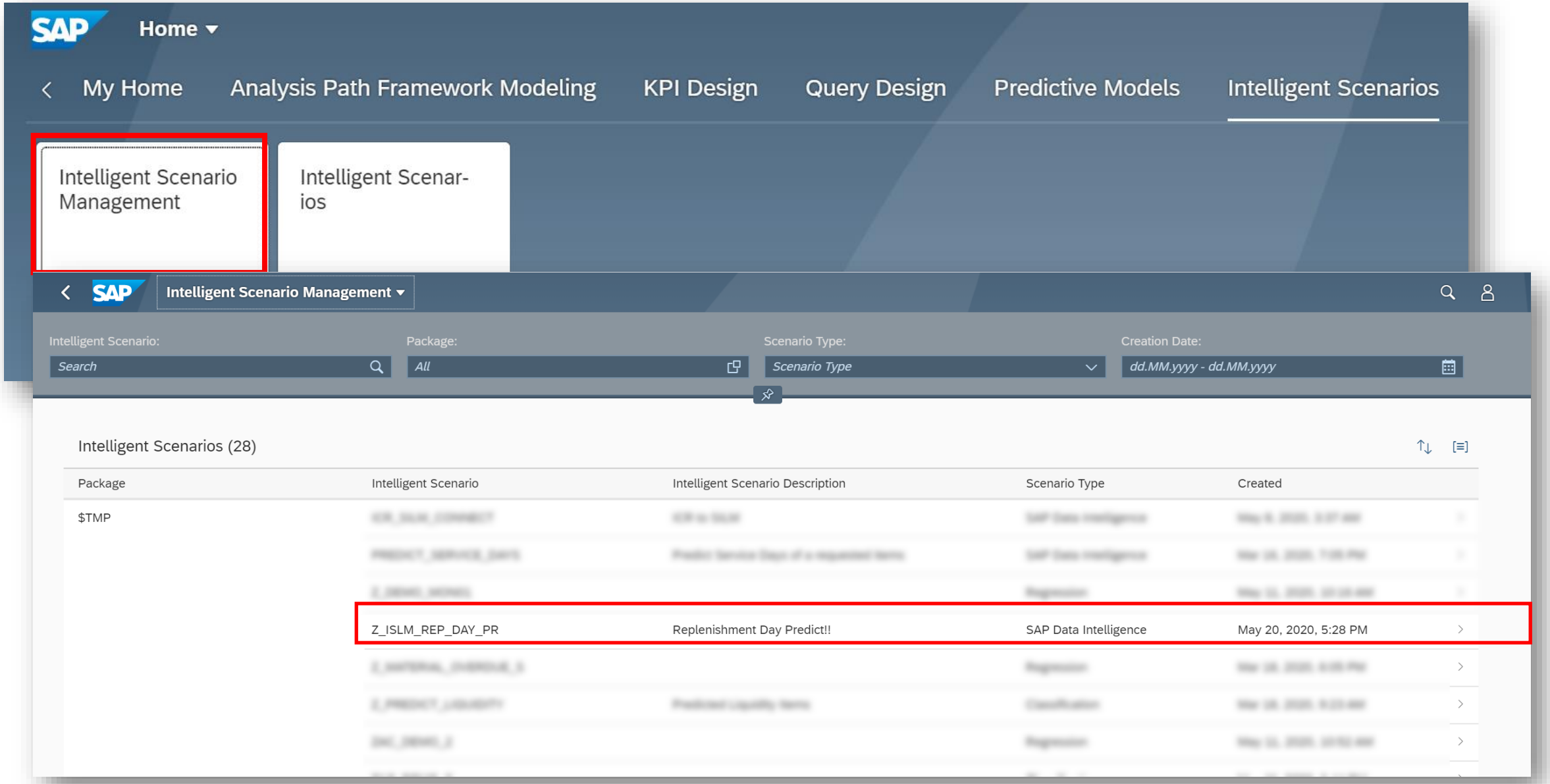


ISLM Connection Mapping:

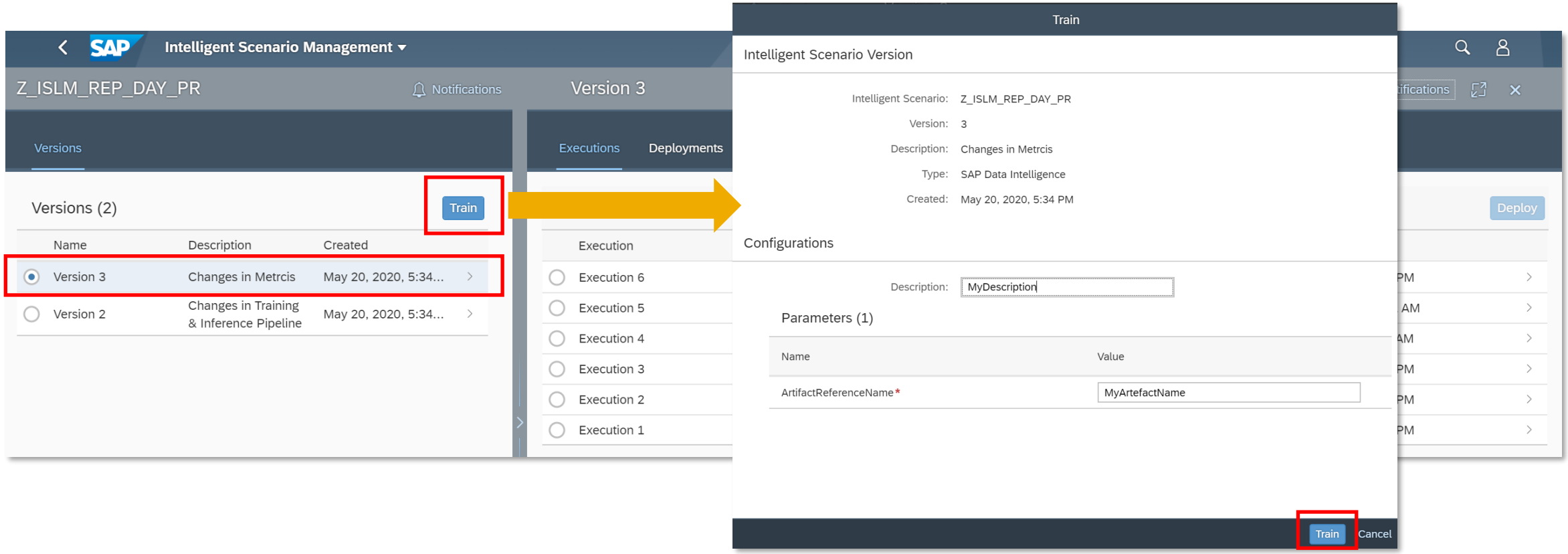
Intelligent scenario same: connection name (SAP Data Intelligence tenant)



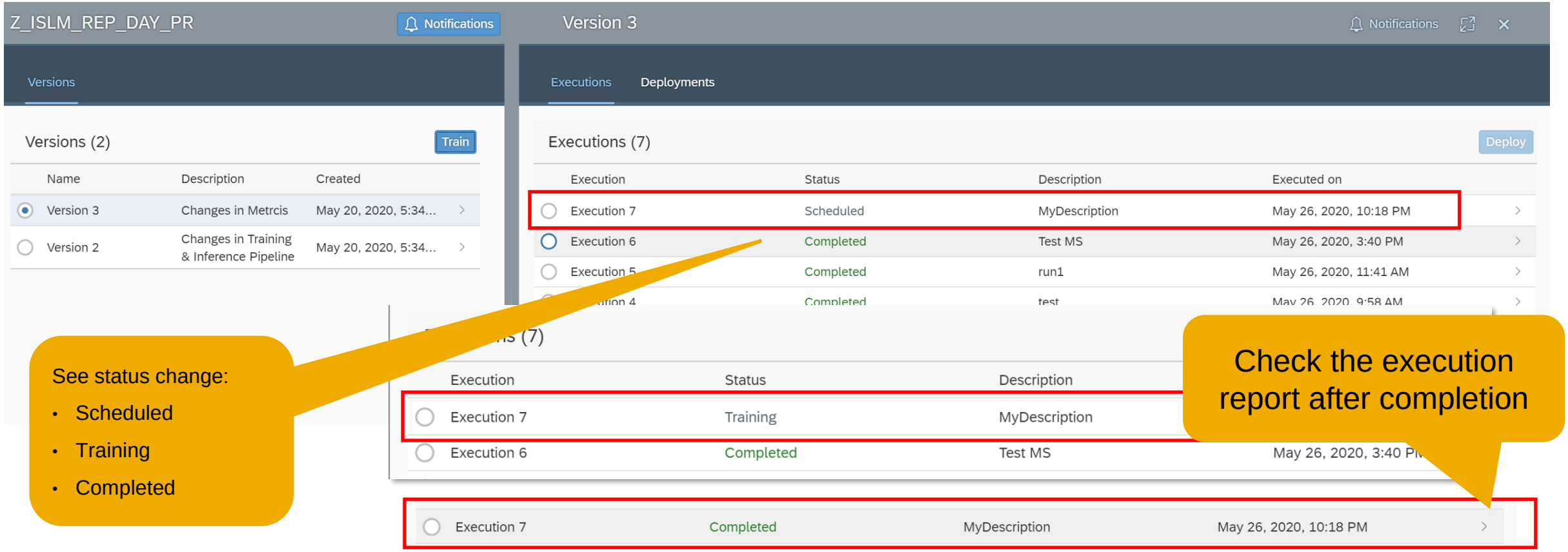
Intelligent Scenario Management app



Intelligent Scenario Management app – Train (1/3)

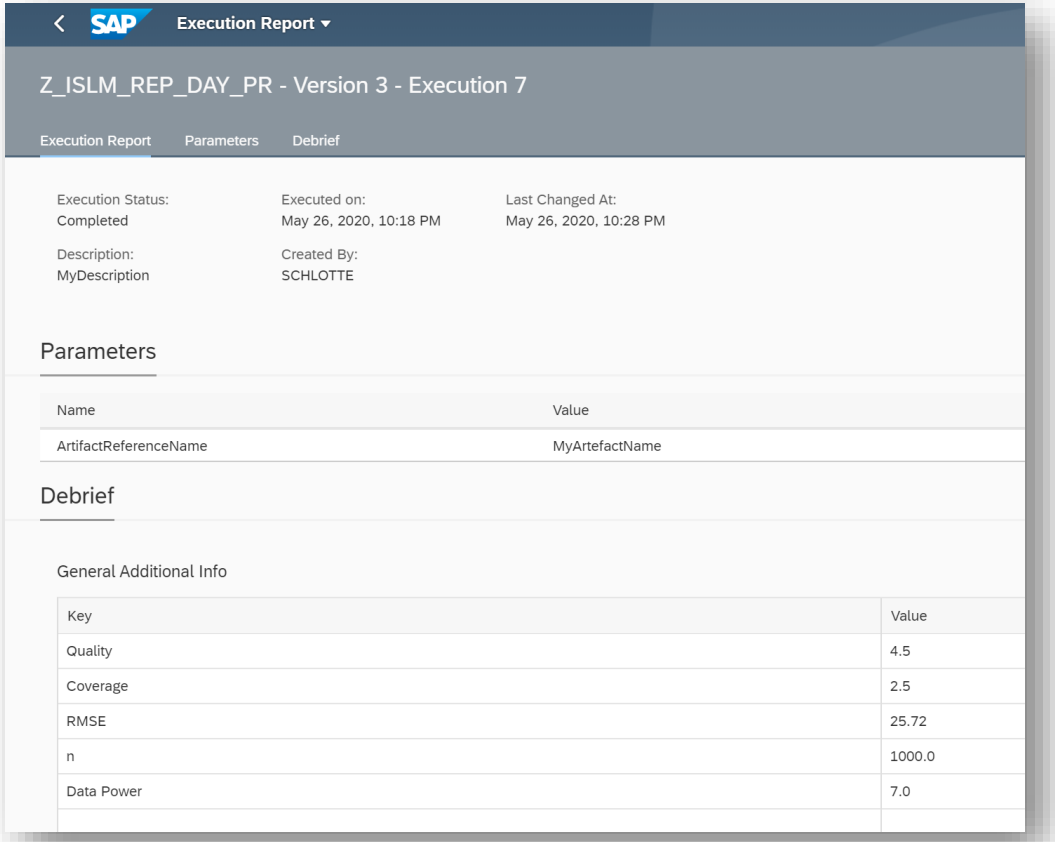


Intelligent Scenario Management app – Train (2/3)



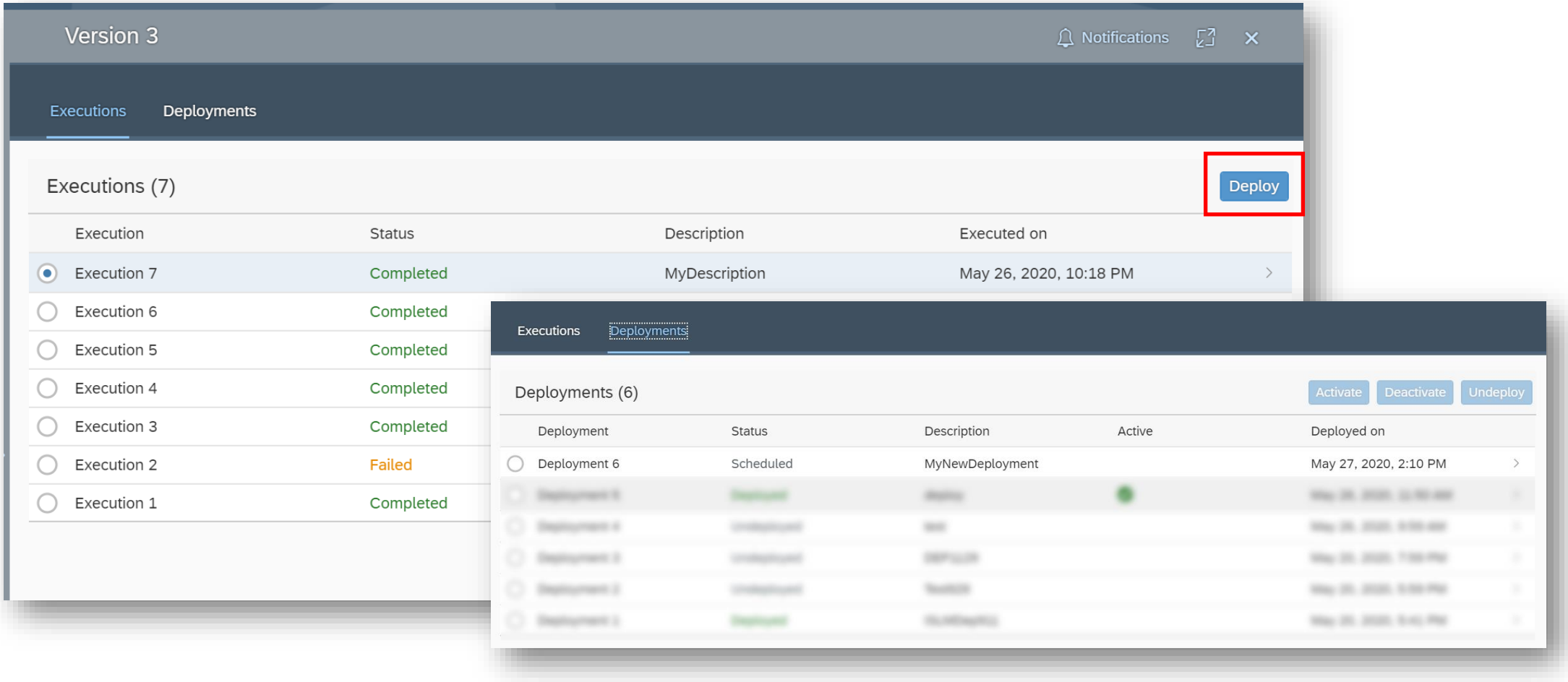
Intelligent Scenario Management app – Train (3/3)

Training Execution Result – Execution Report



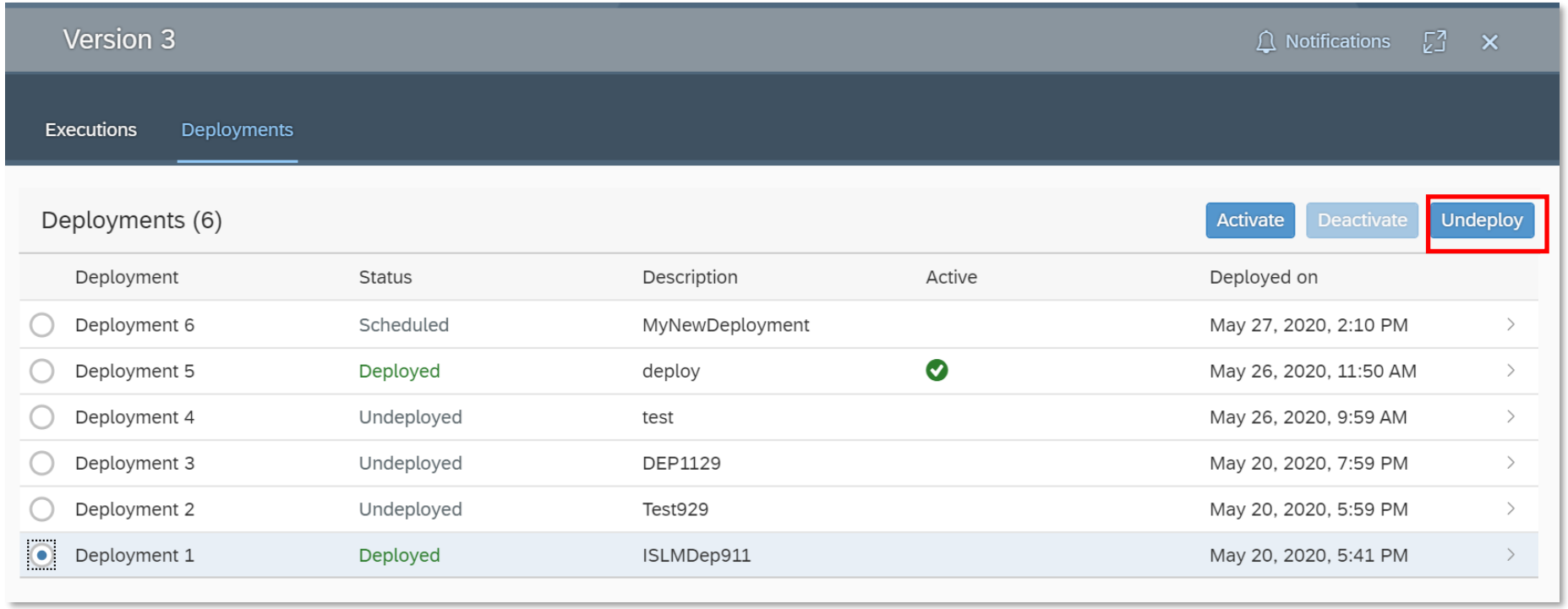
Intelligent Scenario Management app – Deploy

Select an Execution from the list that has the status „Completed“ and select „Deploy“ to trigger the deployment.



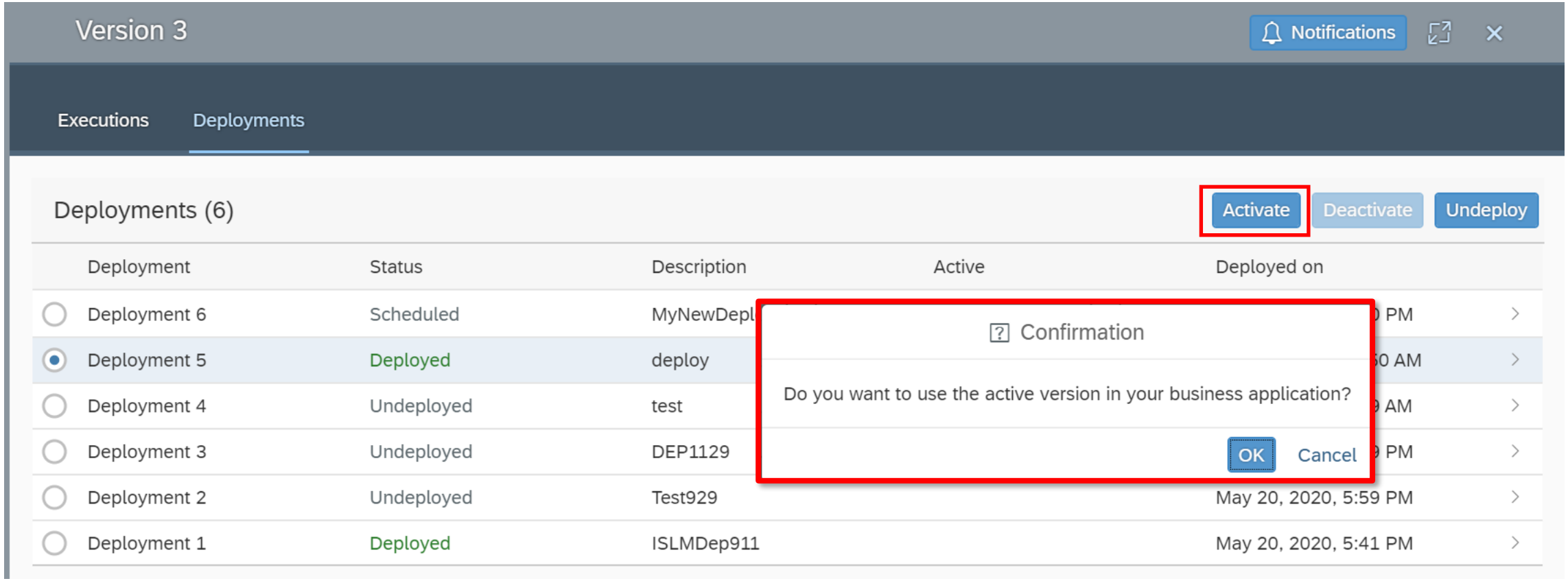
Intelligent Scenario Management app – Undeploy

Only deployments that are not "Active" can be undeployed.



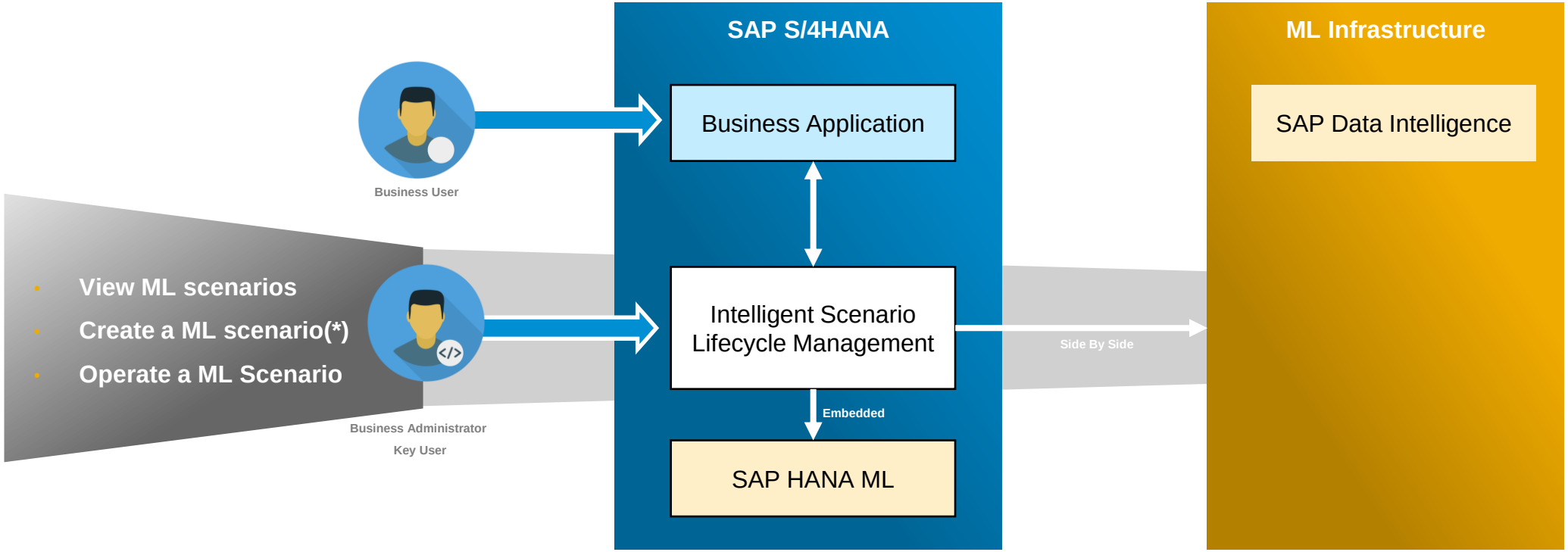
Intelligent Scenario Management app – Activate

The action „Activate“ will select the Deployment version that will be used by the consuming business application. Note: Do this with care as it will change the inference call.



Current Status – Side by Side

- SAP S/4HANA On-Premise 2021
- SAP S/4HANA Cloud 2011



- Supports the ML scenario based on SAP Data Intelligence
- Supports the ML scenarios based on HANA ML (PAL, APL)

SAP Predictive Analytics integrator evolution into ISLM

ISLM offered as part of basis layer delivered with SAP S/4 HANA 2021 FPS0 and 2011 (Cloud)

What is new compared to PAi:

- Support for Intelligent Scenario of type **Side by Side – starting with SAP DI**
- **Customers** can create their own Intelligent Scenarios of all types: APL, PAL and SAP DI

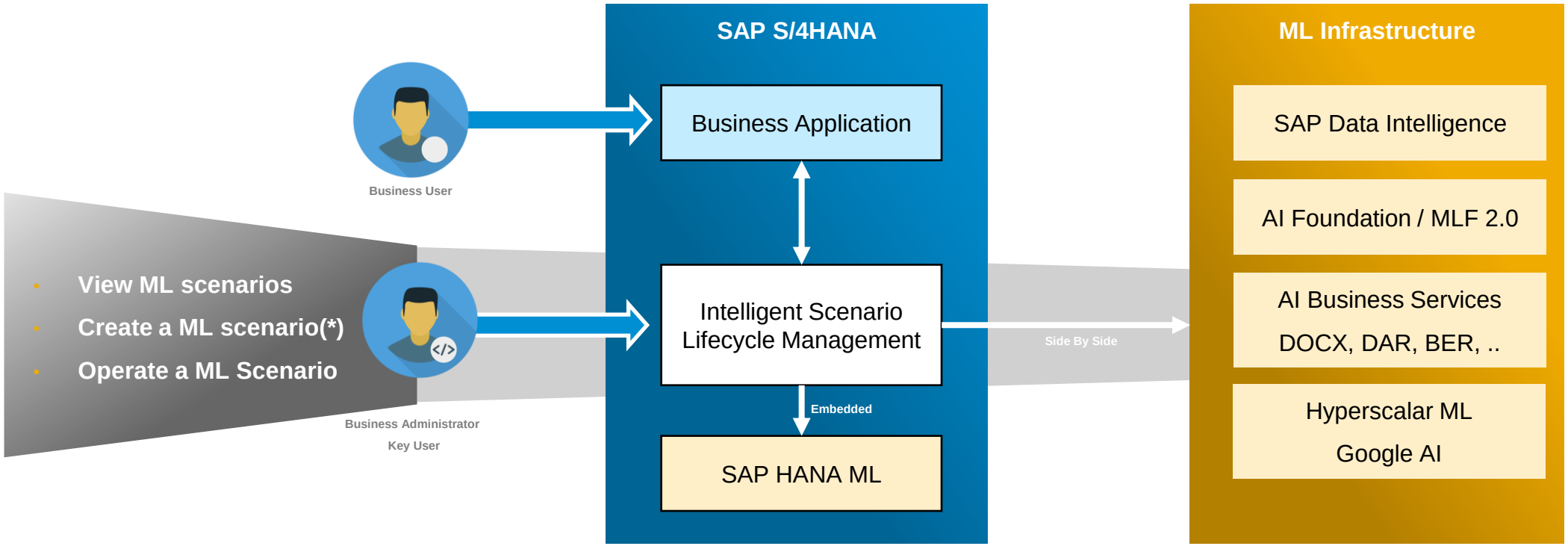
ISLM delivers feature compatibility with SAP Predictive Analytics integrator functionality to support:

- ISLM will be the successor of PAi
- **Smooth migration for existing SAP PAi use cases and artifacts**

For further details check this SAP Community page:
https://community.sap.com/topics/intelligent-scenario-lifecycle-management-s4hana

Roadmap

Future Outlook



- Supports the ML scenario based on SAP Data Intelligence
- Support for ML Foundation 2.0 / AI Foundation infrastructure
- Support for selected AI Business Services (based on scenario).
- Provide an option to build custom ML client specific to application scenarios
- Read only scenarios listed – the ML Management cockpit in S/4HANA

How to get started

Official documentation

- ISLM in SAP S/4HANA Cloud
- ISLM in SAP S/4HANA
- Implementing Machine Learning with SAP S/4HANA

Recent updates

- SAP Teched 2021 Replay: Video
- SAP Community Webinar
- ISLM Blog Series
- Andreas Welsch' Intelligence Briefing VLOG
- Venkata Raghu Banda Resources and journey to machine learning with SAP S/4HANA

Trial options:

- SAP S/4HANA Fully Activated Appliance
  (allows to pilot extended ISLM features)
  - Demo Guide Machine Learning

Social channels

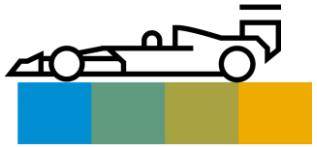
SAP S/4HANA Community

Spotify-Podcast:
Machine Learning with SAP S/4HANA


Essential

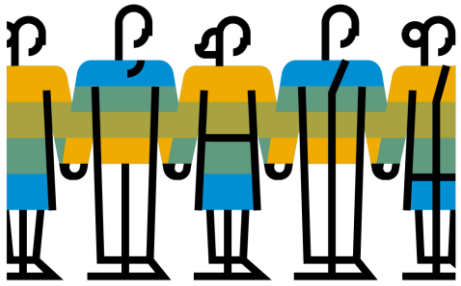

Extended

Key Points



#1 **Machine Learning Can Help Us Solve Problems <u>Better and Faster</u>**

#2 **Answering Business Questions with Machine Learning Requires a Different Way of Thinking**



#3 **S/4 Embedded Machine Learning and the Business Technology Platform Can Help You Get There Faster**

Thank you. Questions?

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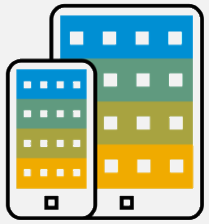
Appendix

Optimize Existing Processes with SAP AI Business Services



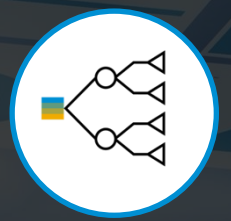
SAP AI Business Services provide strategic machine learning capabilities that help you automate and optimize processes while enriching the customer experience. These reusable services are available on SAP Business Technology Platform.

Business document processing

Business Entity Recognition
Detects and highlights named entities in unstructured text

Document Information Extraction
Automatically extracts information from unstructured documents

Document Classification
Classifies unstructured documents



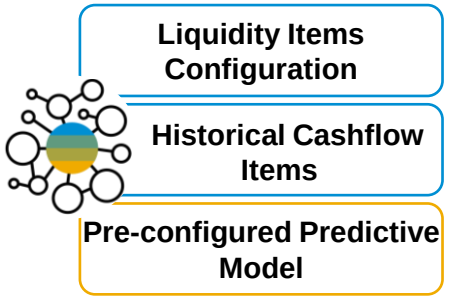
Data Attribute Recommendation
Automates creation, maintenance, and management of structured data

Invoice Object Recommendation
Recommends general ledger accounts and cost centers for invoices without order reference

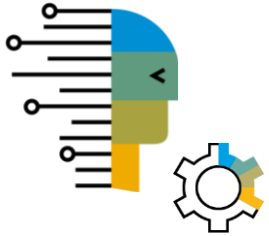
Service Ticket Intelligence
Classifies and recommends tickets automatically

Available via CPEA and SAP Store

Detect Abnormal Liquidity Items



Train predictive model (30K)



Recommend Corresponding Liquidity Item

Detect abnormal and predict corresponding liquidity items

Leverage out-of-the-box predictive model

Reduce manual effort for adjustment of liquidity items

Ensure correct reporting within Advanced Cash Operations

SAP Quantity Contract Consumption

Anticipate contract renegotiations in time

Predict expiration or total consumption to enable effective negotiations with suppliers

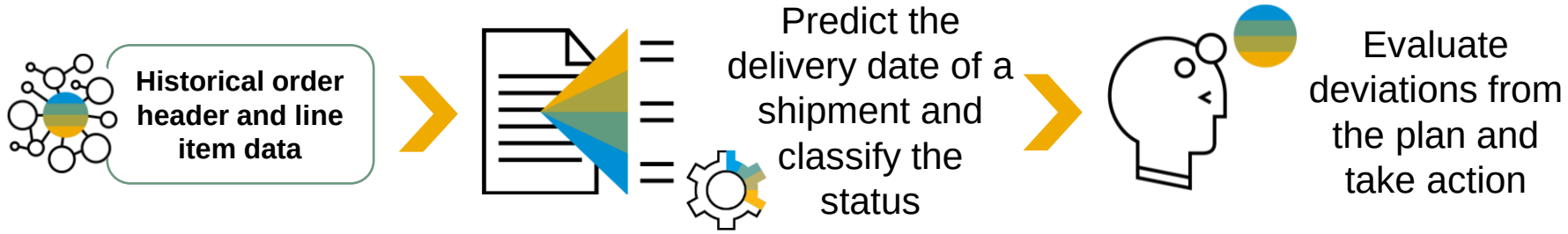
Improve efficiency of supplier renegotiation

Save costs
(better prices from the suppliers)

Enhance purchasing compliance

Supplier Delivery Prediction

Avoid delayed raw material availability or production rescheduling



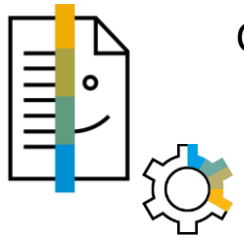
Maximize raw material availability without compromising your production planning

Improved material planning and delivery	Avoid production delays and re-scheduling	Reduce the manual effort for monitoring	Resolve issues earlier

SAP Predict Arrival of Stock in Transit

Predict and manage delivery delays

Historic time spans for stock transport orders



Classify shipments

Identify deviations in delivery dates

Predict forecast delivery date for each stock transport order item

Mitigate production or delivery risks by predicting delays for stock in transit

Higher customer satisfaction

(due to improved planning / scheduling accuracy)

Reduce stock-out of critical parts

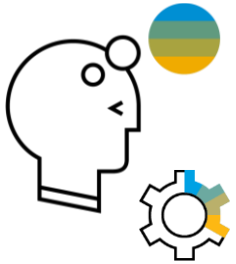
Reduce safety stock inventory

Demand-Driven Replenishment

Dynamic Buffer Level Adjustment

SAP S/4HANA Cloud only

Historic lead times of stock transfer orders and dependent factors, like transportation type, order size, etc.



Predict lead times for stock transfer materials

Adjust buffer levels based on predicted lead times

Learn from the past to optimize buffer levels and further improve the balance between customer service and bound capital

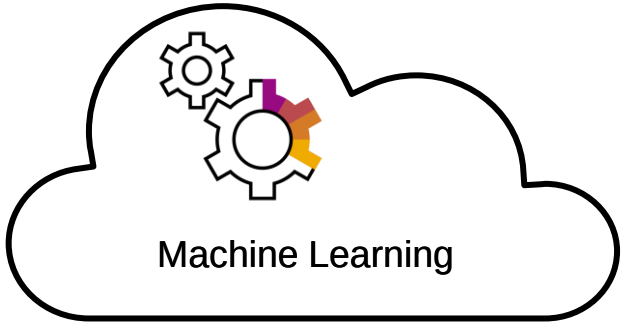
Ensure best customer service levels

Reduce bound capital

Early detection of slow moving stock

Identify and the predict the inventory that will not leave the warehouse

Goods movements
Demand history
Material master
Inventory



Slow goods

Identify and predict the inventory items that is moving slowly, or will move slowly, to help production planning and procurement.

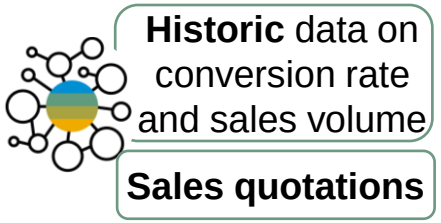
Reduce inventory carrying and warehouse management costs

Avoid/reduce scrap

Increase supply chain efficiency

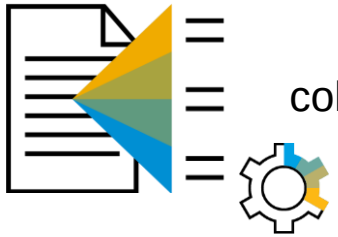
SAP Quotation Conversion Probability Rate

Improve Sales Forecasts



Historic data on conversion rate and sales volume

Sales quotations



Automatically collect and analyze sales data

Predict sales quotation conversion rate

Predict sales volume

Provide predictive insights into quotation conversion rates and accelerate sales actions leading to higher sales volume

Increase sales force efficiency

Improve quotation to order conversion rate

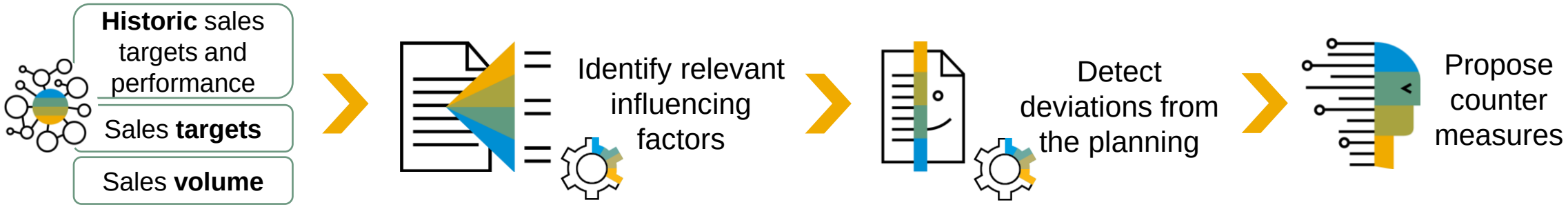
Increase achievable sales volume

Reduce sales administration costs

SAP S/4HANA
Cloud only

Sales Performance

Predict Sales Forecasts

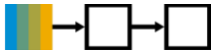


Predict sales forecasts to make faster decisions, increase sales volumes, and create more accurate sales plans

Higher revenue growth
Identify more achievable sales targets

Reduce Sales FTE Effort
on Pipeline Analysis and Reporting

Reduce sales training costs
Better support sales stuff with less work experience

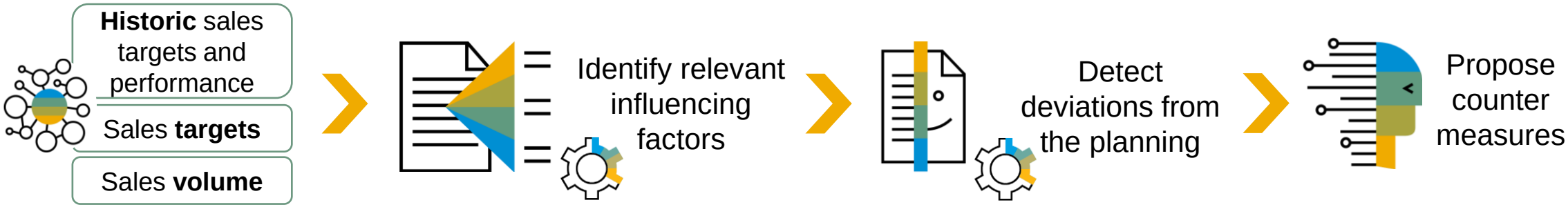


Improve consecutive processes
like Finance and Manufacturing/ Inventory with more reliable planning data

SAP S/4HANA
Cloud only

Delivery Performance

Predict Delivery Delay



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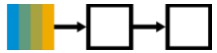


Improve consecutive processes
like Finance and Manufacturing/ Inventory with more reliable planning data

Machine Learning in SAP HANA: PAL and APL

APL: Automated Predictive Library

- Exposes the data mining capabilities of the Automated Analytics engine for developing predictive modelling processes for business analysts

PAL: Predictive Analytics Library

- Advanced analytics algorithms for data scientists

Supported tasks / categories:

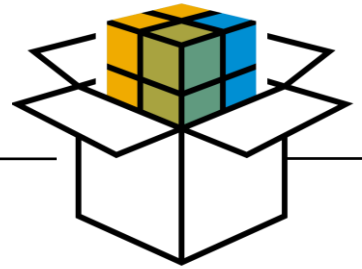
APL

- Clustering
- Classification
- Regression
- Time Series

PAL

- Clustering
- Classification
- Regression
- Time Series
- Statistics
- Data Preparation
- Social Network Analysis
- Miscellaneous
- Recommendation systems

The goal: Build a harmonized solution for both worlds.

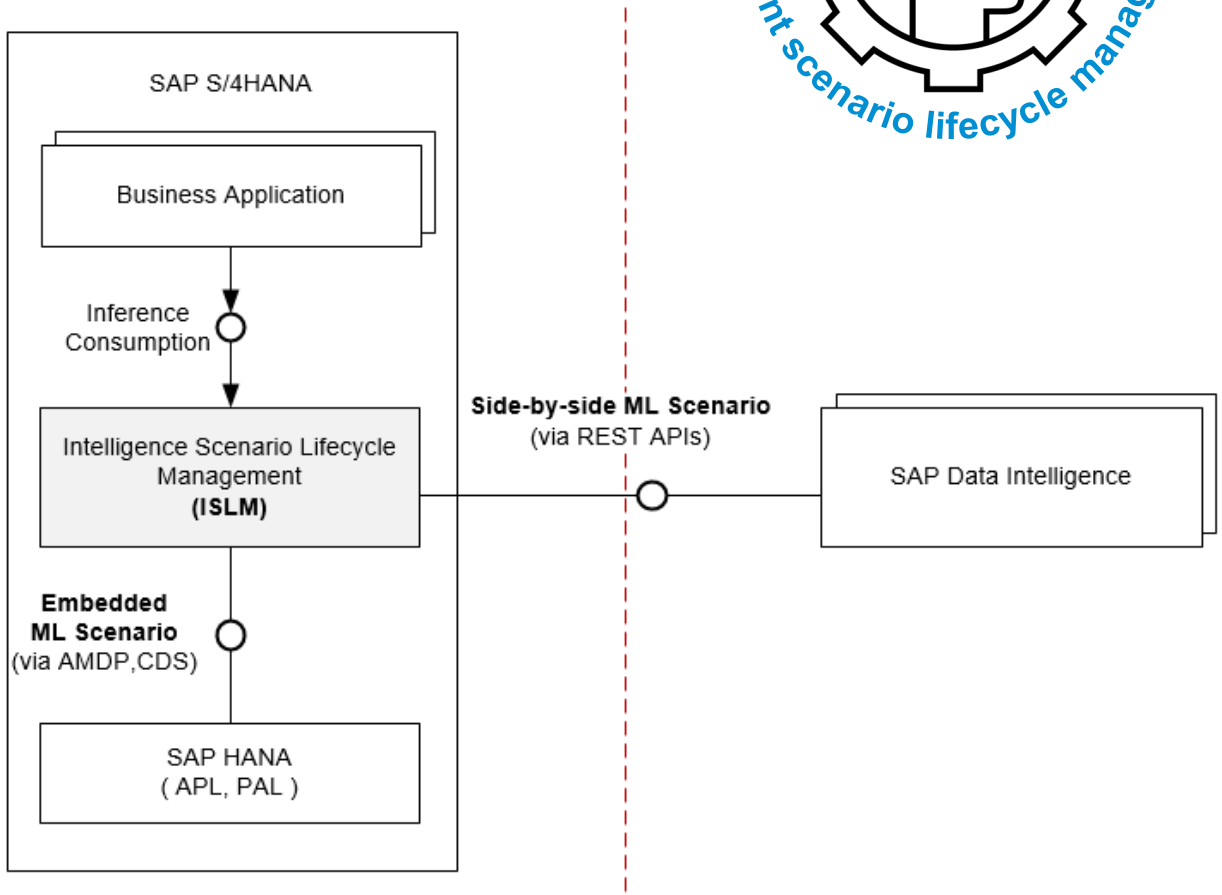


Standardized consumption and operation of machine learning scenarios for both flavors

Embedded scenario:
Machine learning provider (for example, ML with automated predictive library and predictive analysis library in SAP HANA) runs in same stack as business application (SAP S/4HANA).

Side-by-side scenario:
Machine learning provider runs in different stack (for example, the SAP Data Intelligence solution) than the business application (SAP S/4HANA).

ISLM Scope



Intelligent Scenario Lifecycle Management (ISLM) offers a harmonized solution to manage the lifecycle of the machine learning models **in the context of a business application consuming it**.

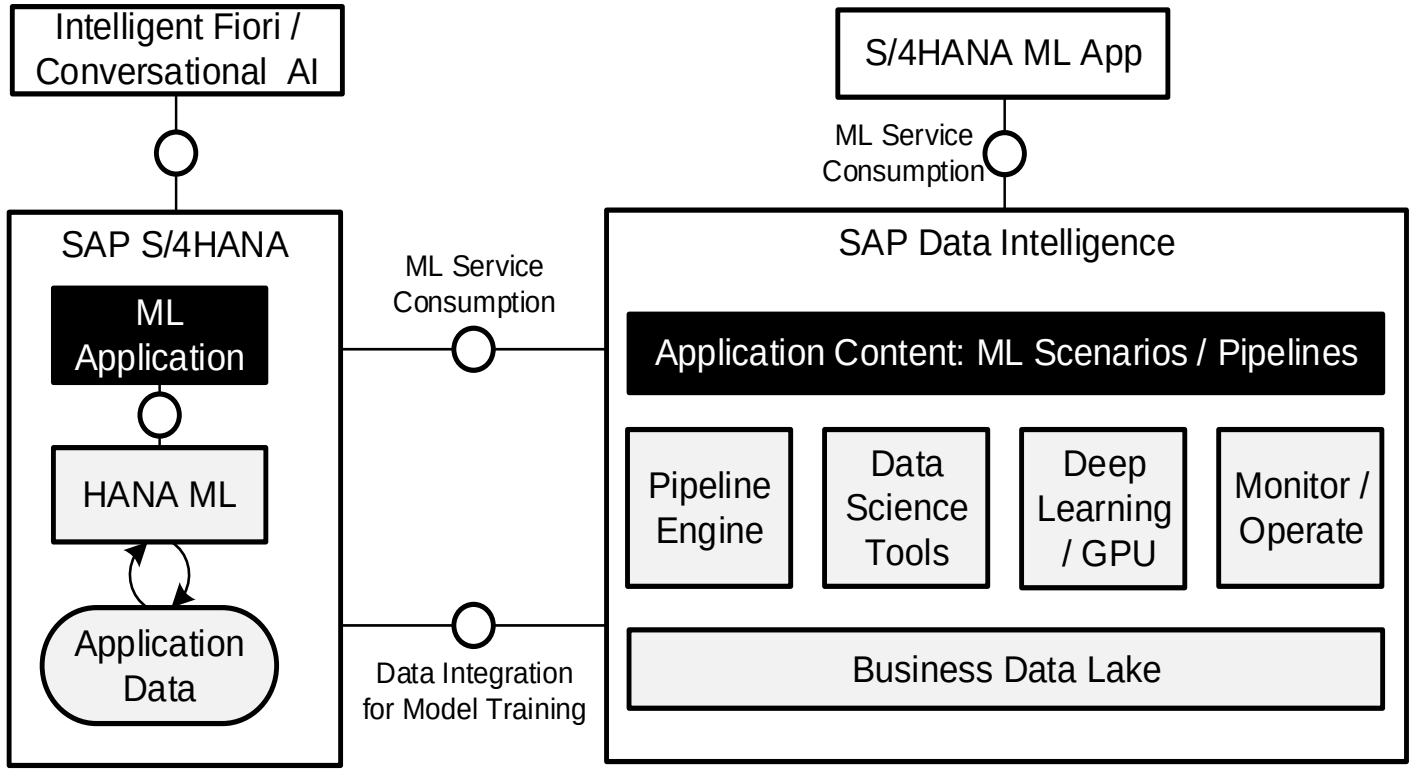
SAP Applications such as **SAP S/4HANA** create, ship (and transport) Intelligent Scenario use cases of type embedded **AND side-by-side.**

Customers can **create their own Intelligent Scenarios** to manage the model training, deployment and activation process for their intelligent business applications directly in ISLM (no SAP Analytics Cloud required).

Key values

- On same stack as consuming app (S/4HANA)
- One standardized framework and cockpit
- Lifecycle & binding consuming app and ML artefact in the context of business app integration and usage

The context: Machine Learning / Predictive Scenarios in SAP S/4HANA



EMBEDDED ML:

SIMPLE CASES LIKE TRENDING OR FORECASTING

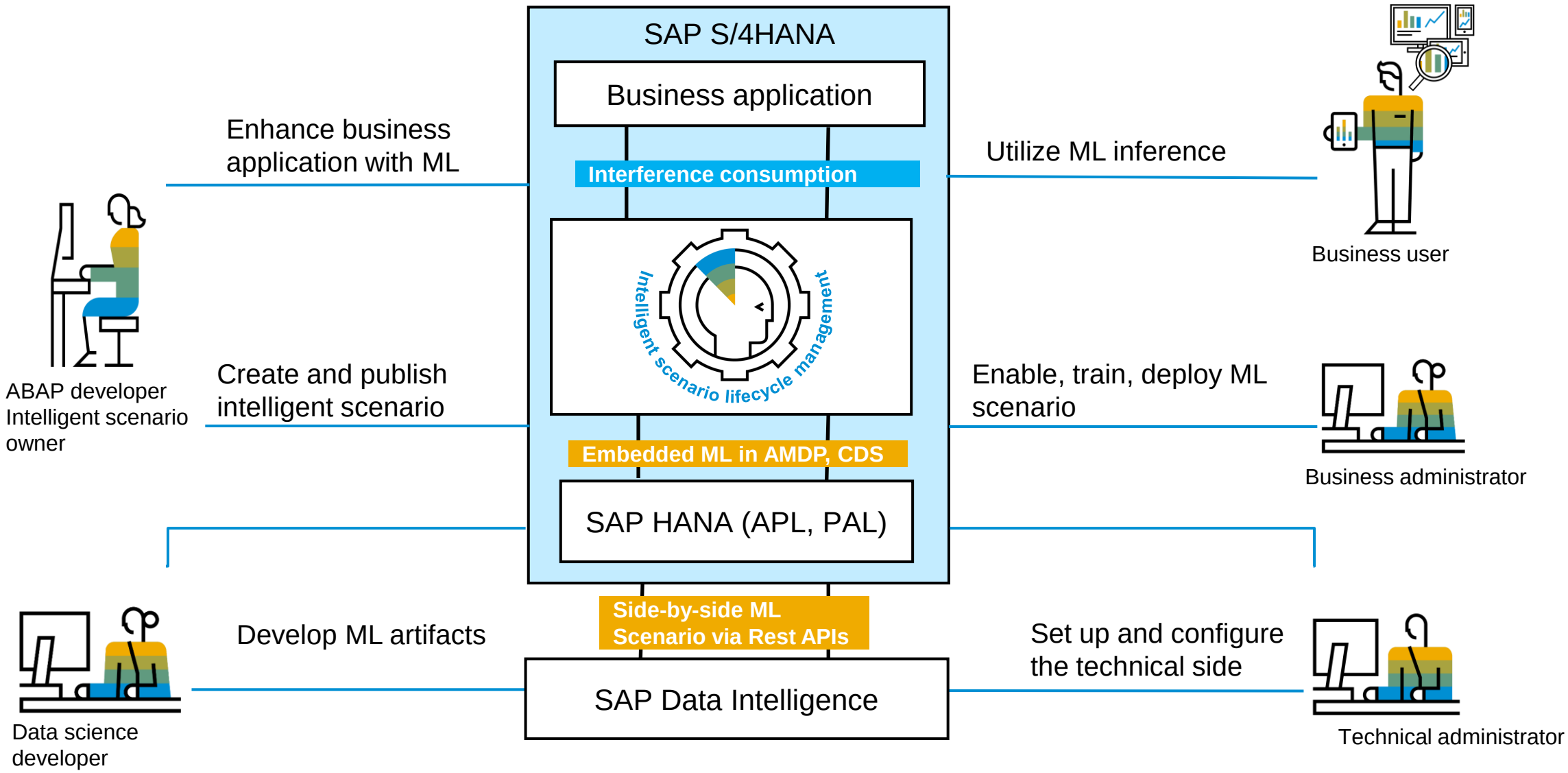
ALGORITHMS WITH LOW CPU/RAM/DATA DEMAND

SIDE-BY-SIDE ML:

DEEP LEARNING CASES LIKE IMAGE OR LANGUAGE PROC.

NEURAL NETWORKS WITH HIGH GPU/RAM/DATA DEMAND

Personas involved in development, consumption, and operation

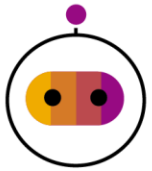


* Additional License -** Additional Installation and license – ᶜ(Partially) Compatibility Scope

Purchase Order Delays Usecase

How Intelligent Technologies Help Account Receivable Accountants YouTube Link

BOT looks for incoming remittance advices and loads them into S/4HANA



Intelligent RPA

1

Payment details are automatically extracted from PDF file and payment advices are created in S/4HANA

Machine Learning

2

Machine Learning automatically matches payments with open receivables and clears payments

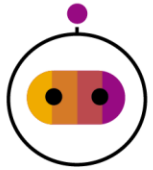
Machine Learning

3

Situation Handling

System ALERTS when invoices due are excluded from the payment advice

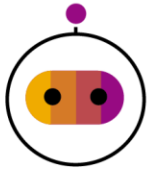
4



Intelligent RPA

After contacting the customer and creating a dispute case, BOT automatically sends out email confirmation with the case number

5



Intelligent RPA

BOT monitors inbox for customer replies and attaches these directly to the dispute case

SAP S/4HANA

Ted, Accounts Receivable Manager

AI Use Cases Used In Demo

Technology | ID	Use Case For AR Accountant
IRPA | 300	Manage Payment Advice
ML | 078	Payment Advice Extraction **(ML service)**
ML | 001	Cash Application **(ML service)**
SIT | 009	Invoice Skipped on Payment Advice
IRPA | 305	Dispute Management – Email Notification to Customer
IRPA | 305	Dispute Management – Manage Customer Email Response

Technology | ID	Use Case For Sales Manager
IRPA | 441	Create Sales Inquiry
ML | 026	Sales Performance Prediction **(Embedded ML)**
ML | 024	Quotation Conversion Probability Rate **(Embedded ML)**
SIT | 067	Sales Quotation Is Close to Expiring
IRPA | 584	Automatic Creation of Sales Orders from Excel
IRPA | 567	Manage Sales Order – Automated Upload Down Payments
ML | 025	Delivery Performance / Delivery in Time **(Embedded ML)**

ML service – additional price tag

Embedded ML – included in S/4 price tag

ML = Machine Learning

IRPA = Intelligent Robotic Process Automation

SIT = Situation Handling

Purchase Order Confirmations

Automated Predictive Under the Hood

Predictive Power and Predictive Robustness

Predictive Power

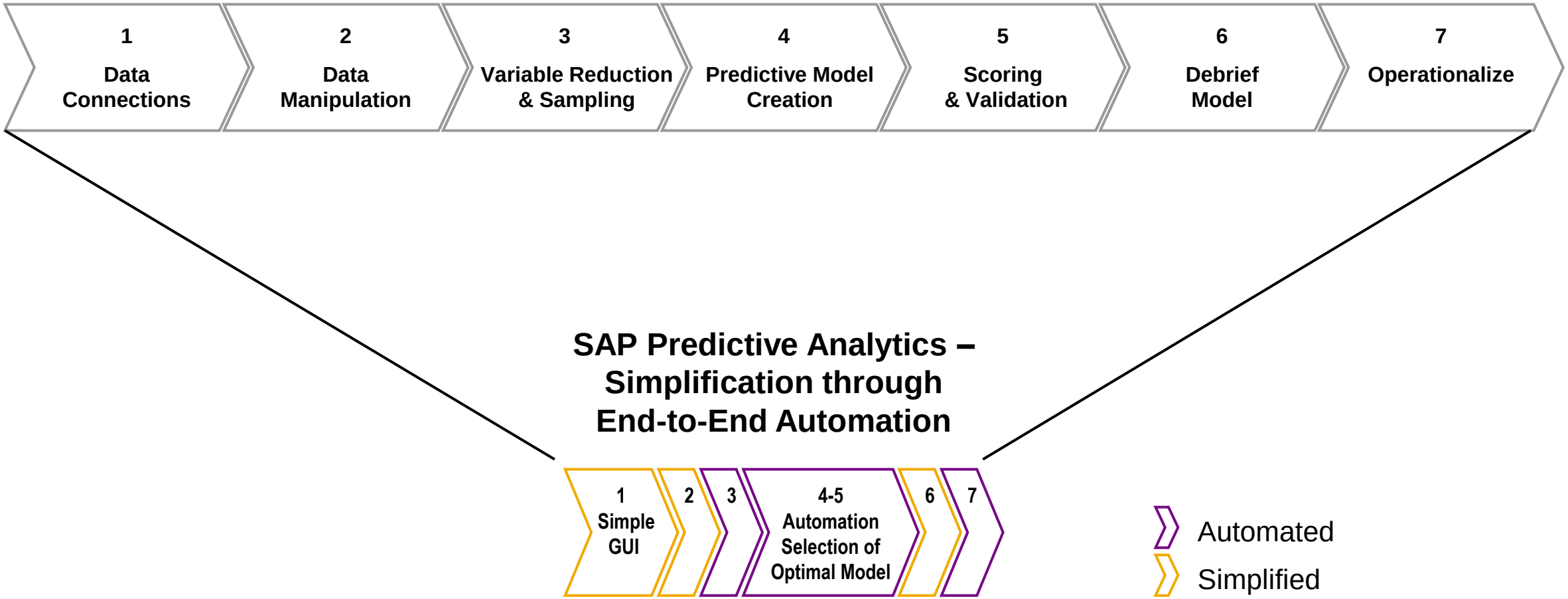
- The KI measure the capacity of the Input Variables (Explanatory Variables) to explain the target.
- KI ranges from 0 (a pure random model) to 1 (a perfect ideal model)
- What's a good KI? It completely depends on the business case and available data

Predictive Robustness

- The KR measures the ability of a model to display the same level of performance on new data sets as training ones.
- The KR ranges from 0 to 1
- What is a good KR? 0.95 and above for models expected to be applied.

Machine Learning automation

Decreases time to deploy by up to 70%



Value of Predictive Automation for non-Data Scientists

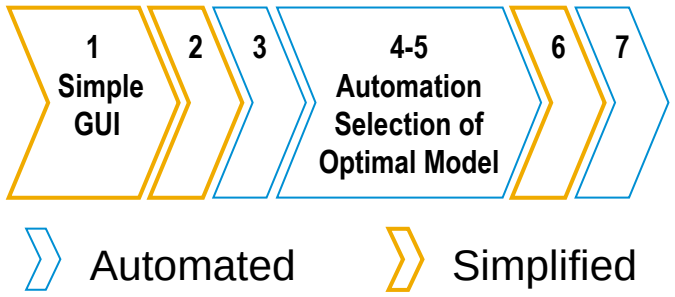
Decreases time to deploy by up to 70%

Strengthen Customer Relationships with Predictive Modeling
SAP Analytics
1,086 views

Live example

Before: 6 people x 8 weeks = 20 models
After: 1 person x 7 days = 400 models

SAP Predictive Analytics – Simplification through End-to-End Automation



For the Non-Data Scientist

No Coding, Just Configuration!

Forecast Model Bursting

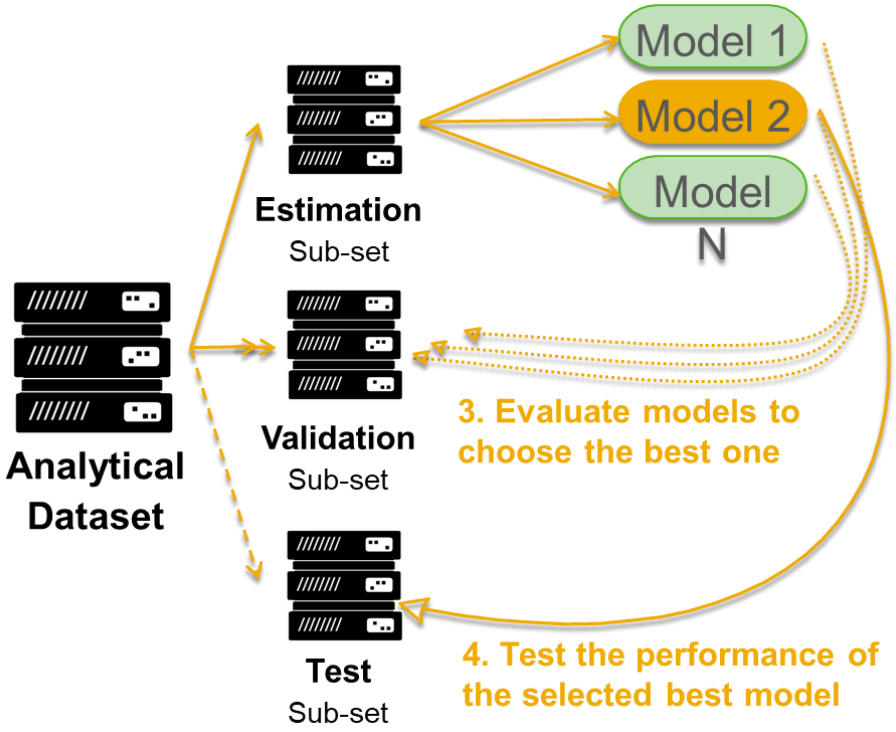
Ability to create 1,000's of individual forecast models from one automated job.

Terminology

Term	Definition
Variable	Logical representation of a data column in a tabular structure It has some basic atritbutes (name, data type, key, value type, …) Value type can be: nominal, ordinal, continuous, …
Nominal variable	Qualitative variable taking discrete values
Ordinal variable	Nominal variable where the order of the values is semantically meaningful (eg: weekday=1,2,3,…)
Continuous variable	Numerical variables on which basic statistics can be computed (min, max, variance, …)
Category	Discrete typed value which a variable may contain The data type can either string, number, date, segment, … For continuous variables, values are binned into equally sized segment [x,y]
KxMissing	PA doesn't perform any data imputation on discrete missing values and considers it as a regular category (namely KxMissing) all along the modeling process
KxOther	For nominal variable , PA has a special category grouping all irrelevant categories w.r.t the target
KI (predictive power)	KI measures the model capacity to explain the target from 0 to 1 (1 as perfect model) KI = 2 *AUC – 1 (AUC: Area Under the Curve)
KR (predictive confidence)	KR measures the model capacity to be generalized on new data from 0 to 1

Behind the scene: SAP automated algorithms

- Automatic data preparation (NULL value Classificaion, etc.)
- No over fitting
- Smallest complexity
- No need to balance the dataset using a stratified sample
- No variables pre-selection
- Correlated variables can be all kept
- Use as many relevant variables as available
- Use as many records as possible



Time Series Forecasting

Automated Time Series Models

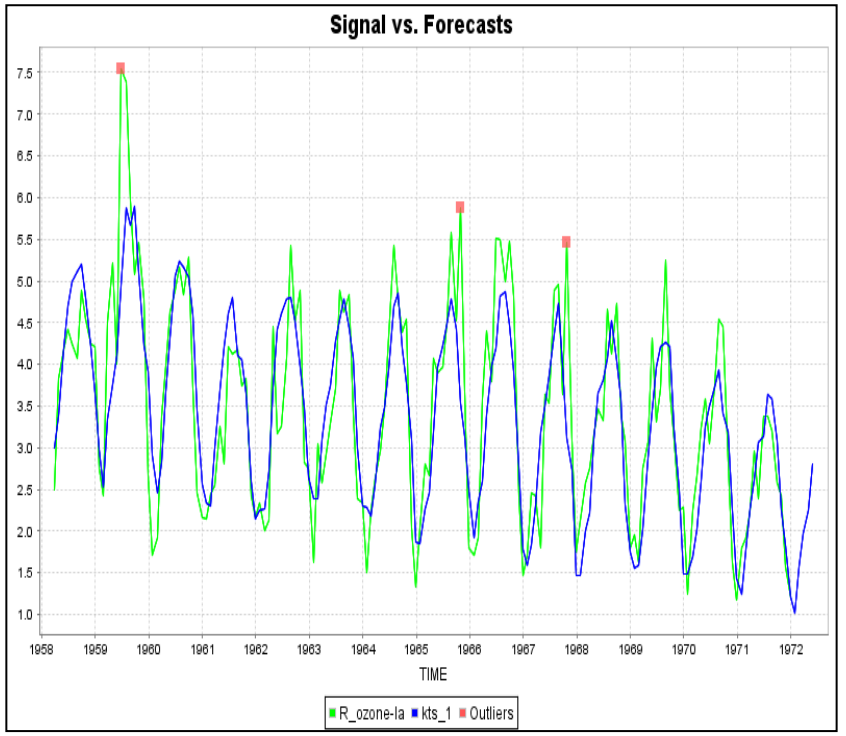
A time series has the following components:

Signal = Trend + Seasonal/Periodic + Fluctuation + *Residual*

There are 3 automated steps to developing a time series model:

1. Separate the signal into its components:
   - Trend
   - Seasonality and/or Periodicity
   - Predictable fluctuations

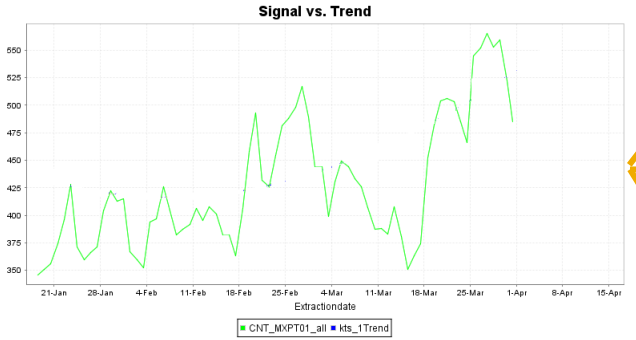
2. Build a model that describes the past data
3. Predict future values for a desired range



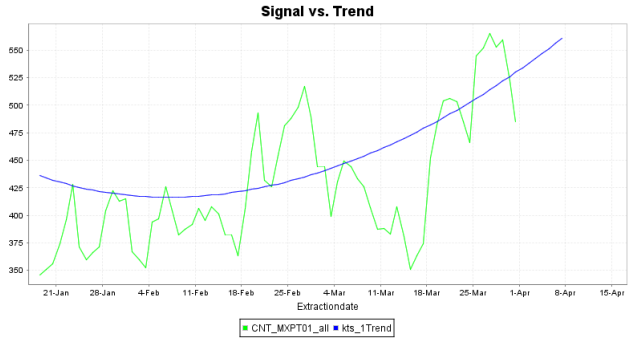
Periodic Component - Seasonal

- The seasonal variables are evaluated if sufficient time span is available in the training data
- The following seasonalities are created and evaluated automatically:
  - Seconds (S)
  - Minute (Mi)
  - Hour (H)
  - Day of Week (DoW)/ of Month (DoM)/ of Year (DoY)
  - Week of Month (WoM)/ of Year (WoY)
  - Month (M) / of Quarter (MoQ)/ of Year (MoY)
  - Quarter of Year (QoY)
  - Year (Y)

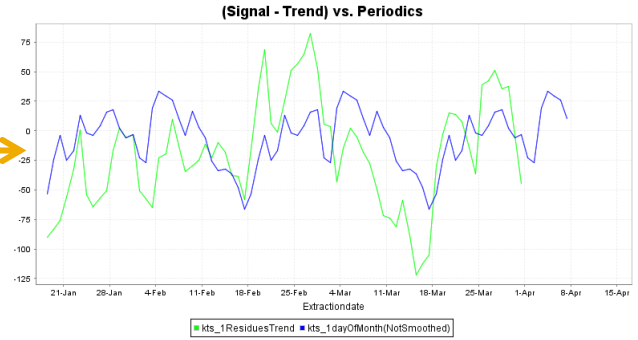
SAP Automated Time Series Models



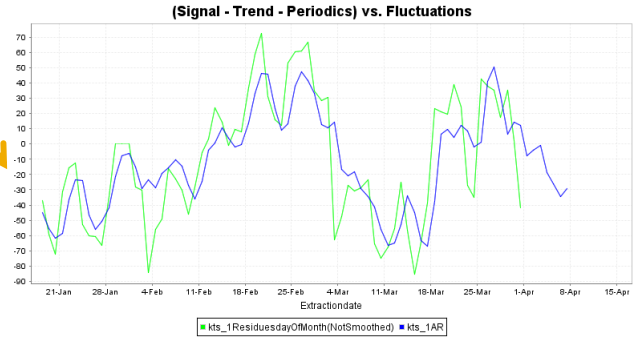
Original signal



Test whether a **trend** can be fitted to the data

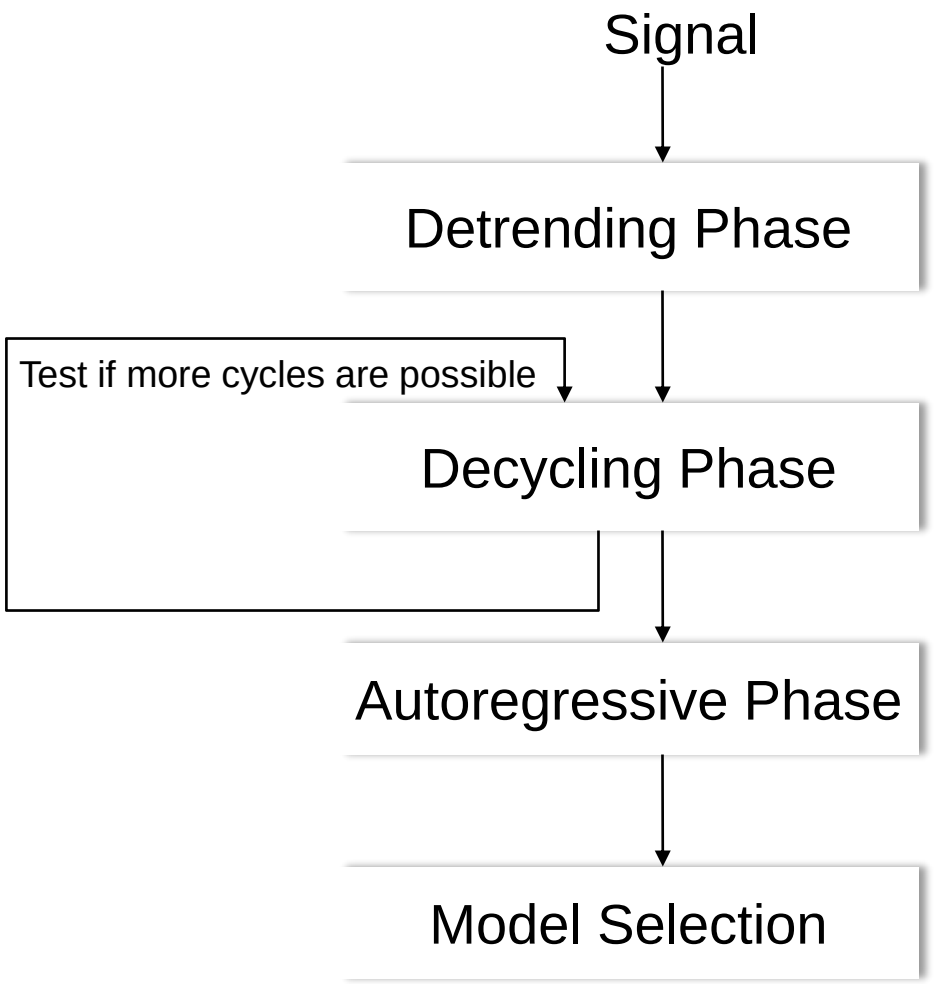


If a trend is detected, it will be subtracted from the signal and **cycles** will be fitted



The trend and cycles are subtracted from the signal and **fluctuations** are fitted

Choosing the Best Model



Compute a set of candidate trends (8)

Detect a cyclic component on each de-trended signal (8)

Add autoregressive models on signal residuals (up to 8)

Select the best Model
(from 8 candidates)

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