

Current Status and Roadmap Demand and Replenishment Planning

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Questions

Roadmap of SAP F&R in relation to UDF in SAP CAR:

How to position F&R now and in the future? Currently Forecast is embedded in CAR (UDF), but how to exchange the forecast results to S4 (no standard available at this moment). To use the forecast results from UDF for replenishment (MRP in ECC) a tailor made interface must be developed.

Thoughts of SAP on Replenishment with regards to F&R now
Forecast is executed in CAR (UDF) and F&R only applies for Replenishment.

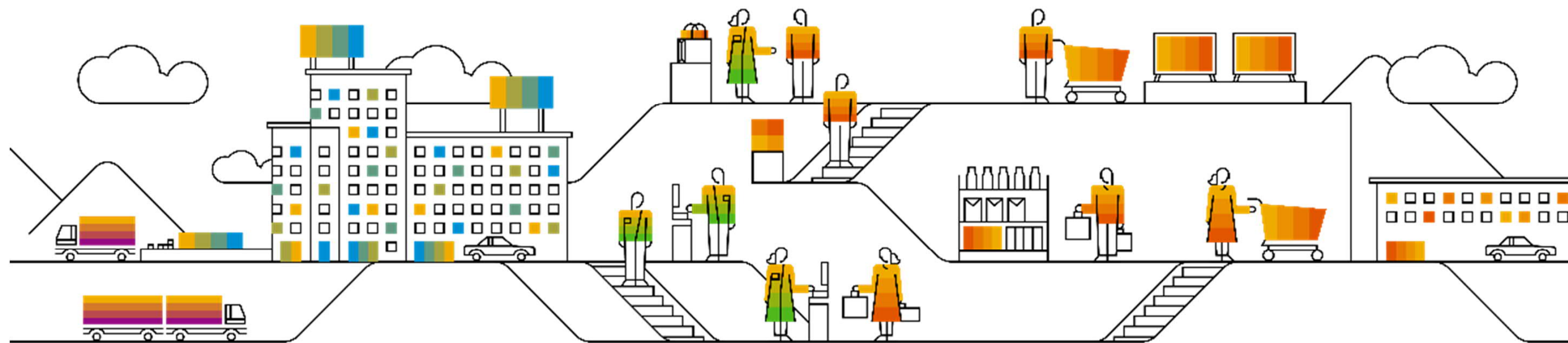
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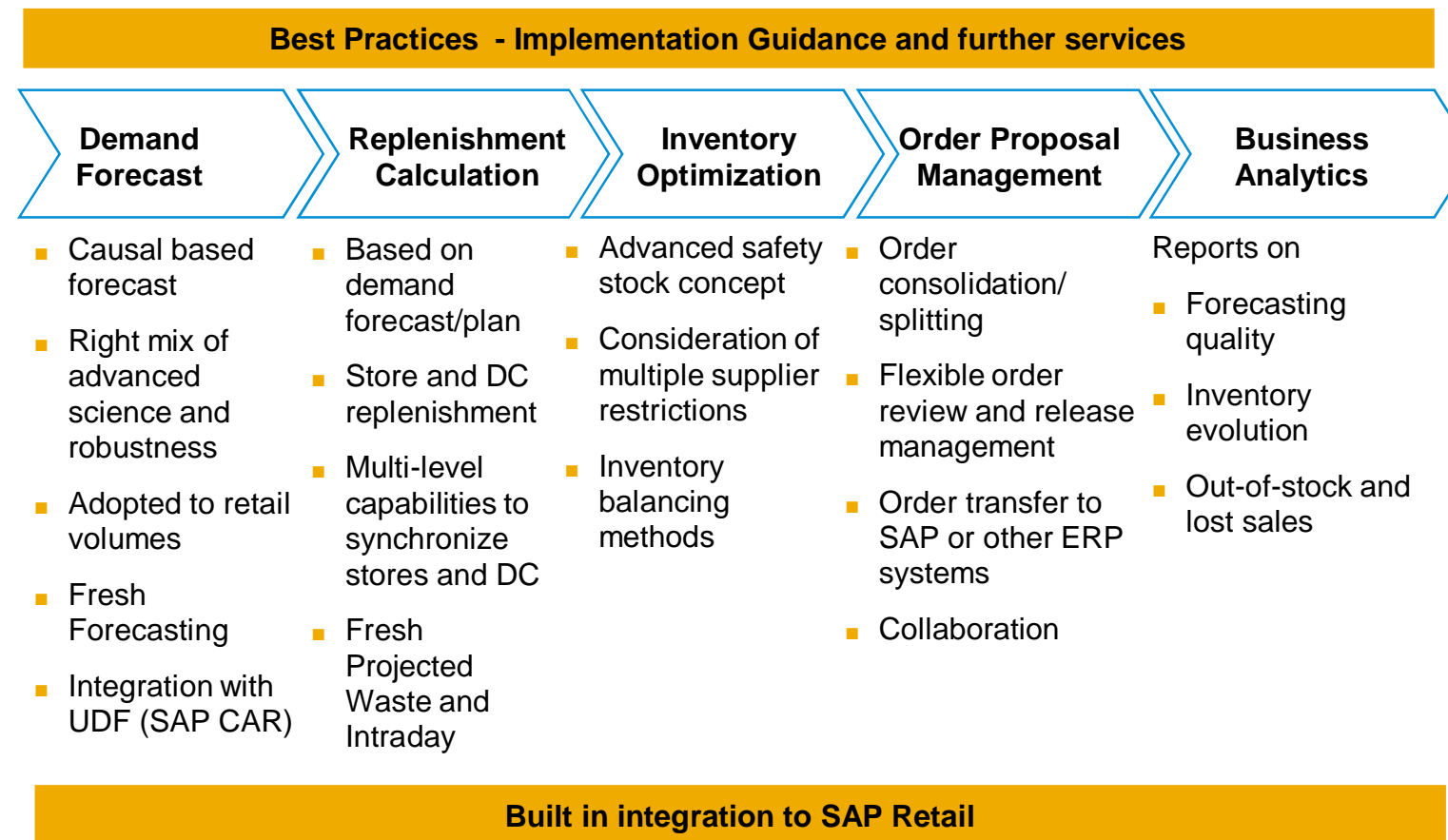
SAP Forecasting & Replenishment Recent Innovationen



SAP F&R recent innovation – Overview

SAP F&R 5.2 on SAP HANA /HEC

Respond quickly to changes in consumer demand through multi-level consumer demand driven replenishment plans



Recent Innovations

- **Add-on for fresh products: Intraday replenishment**
- **SAP Fiori-based store order review on a mobile device by store associates (in conjunction with SAP ERP)**
- **Integration between UDF (forecasting engine in SAP CAR) and F&R**
- Main and supplementary order and delivery days
- MER enhancements (Bi-channel Demand Calculation)
- Daily Variance from UDF
- Fresh Add-on improvements SP02 (e.g. exceptions, zero stock, collinearity)
- Automated Reference Product Detection (Engineered Service)

Planned Innovations

- Add-On for Fresh Products improvements such as enhanced intraday visibility (SP03 planned May 2019)
- **Ongoing smaller support improvements**, e.g. improved forecast distribution for holidays (see note [2335048](#))

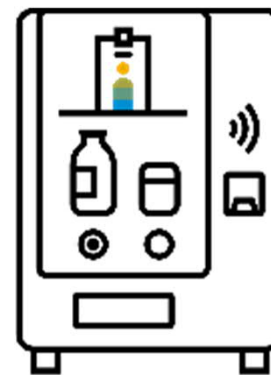
SAP F&R recent innovation: Add-On for Fresh Products

Functional capabilities – Intraday solution



A special fresh forecast

to reduce write-offs, especially for products with short sales periods or products which have a strong weekly sales pattern. Fast reaction to account for current sales trends



Calculation of projected waste

estimation of future waste and consideration as write-offs in replenishment calculations in order to achieve a better replenishment quality



Intraday availability

demand and replenishment calculation can be based on sub-daily availability times instead of full days. Sub-daily delivery possible

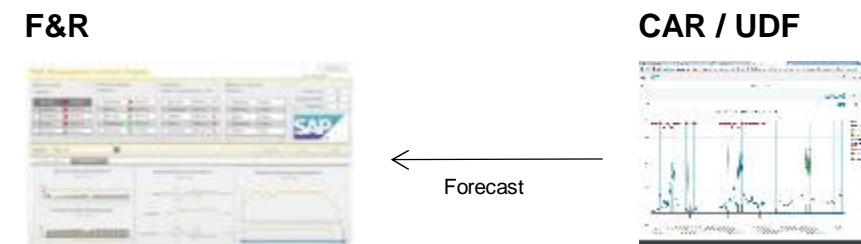
SAP F&R recent innovation: Advanced forecast capabilities

Integration of CAR Unified Demand Forecast (UDF)

Integration of CAR Unified Demand Forecast with F&R

- **Unified Demand Forecast** from CAR (UDF) combines strengths of various forecasting methods to supply **predictive information to all Retail applications**
- **SAP HANA** gives the appropriate technology base to run ad-hoc simulations on a granular level with in-memory performance
- The **Unified Demand Forecast** can be used by F&R as an **alternative forecast** to calculate the SAP F&R replenishment order proposals (**including safety amounts**)
- UDF forecast can be used for selected categories (definition by forecasting profile)

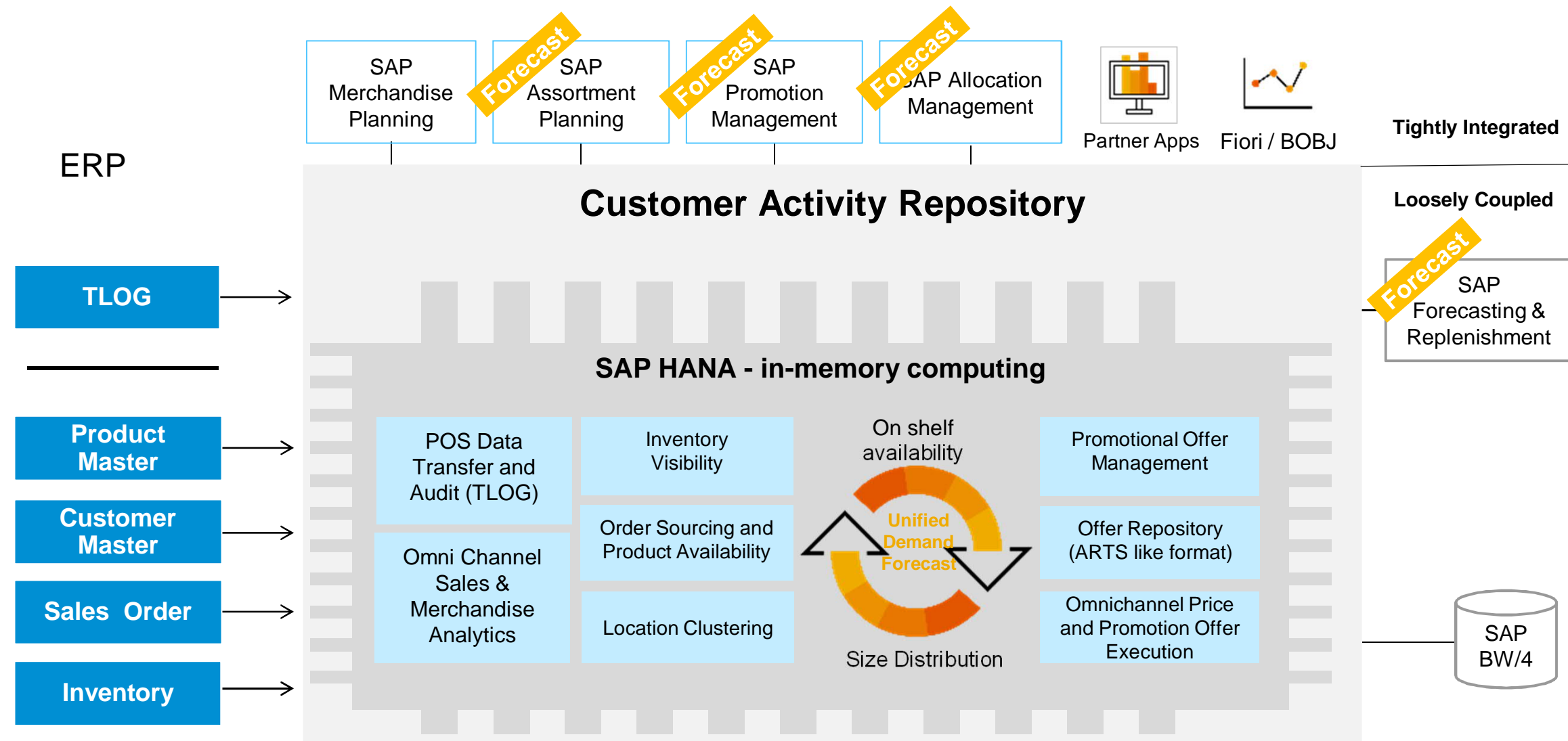
Integration Guide see note [2367172](#)



UDF's advanced forecasting capabilities can be used for SAP F&R's replenishment

UDF can be leveraged without disrupting the established replenishment processes

SAP Customer Activity Repository (CAR) – Unified Commerce with UDF



SAP UDF- Machine Learning for Retail Demand Forecasting

Preprocessing

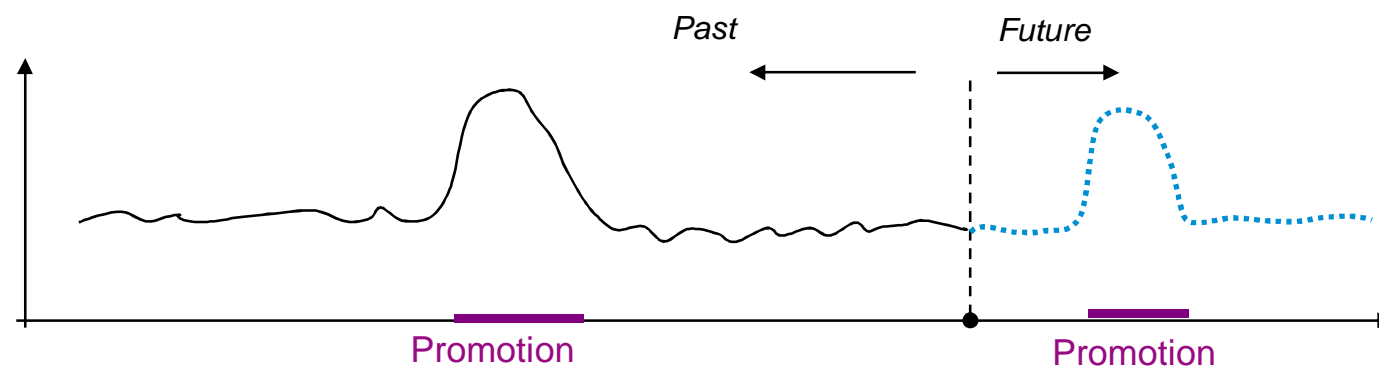
- Data cleansing to ensure a proper data foundation

Training

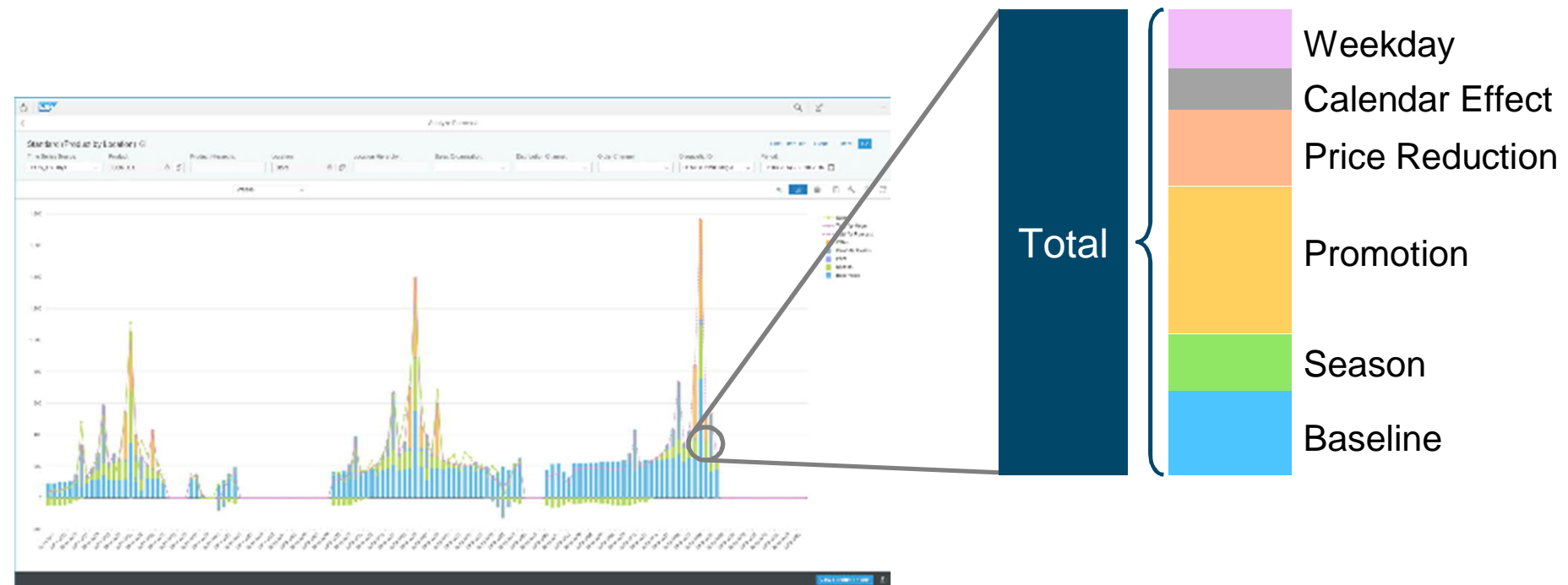
- A machine learning model is trained for the demand of each product-location.
- Influencing factors, such as promotions, calendar events, seasonality, price and weather are considered, and weighted, based on historic observations following supervised learning.

Prediction

- The trained model is scored to produce forecasts taking into account future values of influencing factors.
- What-if-forecasts are supported as a production forecast driving automated processes, e.g. replenishment.



Which influencing factors drive the sales?



Automatically considered factors from internal data

- Offer types and tactics from SAP Promotion Management
- Seasonality
- Day of week
- Holiday effects
- Price reduction
- Trend
- Listing and closing days

External factors that can be considered as well automatically

- Events, concerts
- School holidays
- Weather
- Hotel bookings
- Beginning of month
- Construction work
- Etc.

Bayesian Machine Learning in UDF

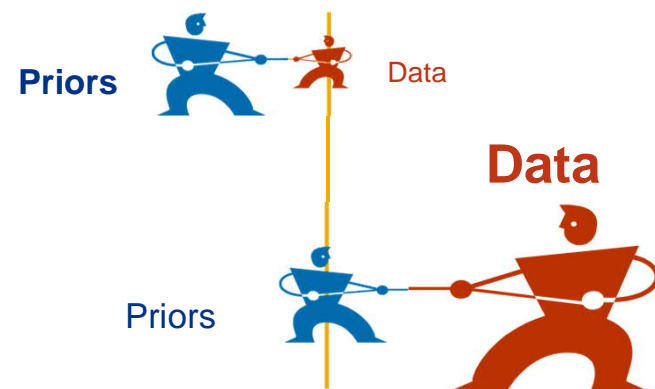
UDF uses a Bayesian paradigm with so-called “priors”, which are “general best guesses”

Advantages:

We can forecast things we haven’t seen before

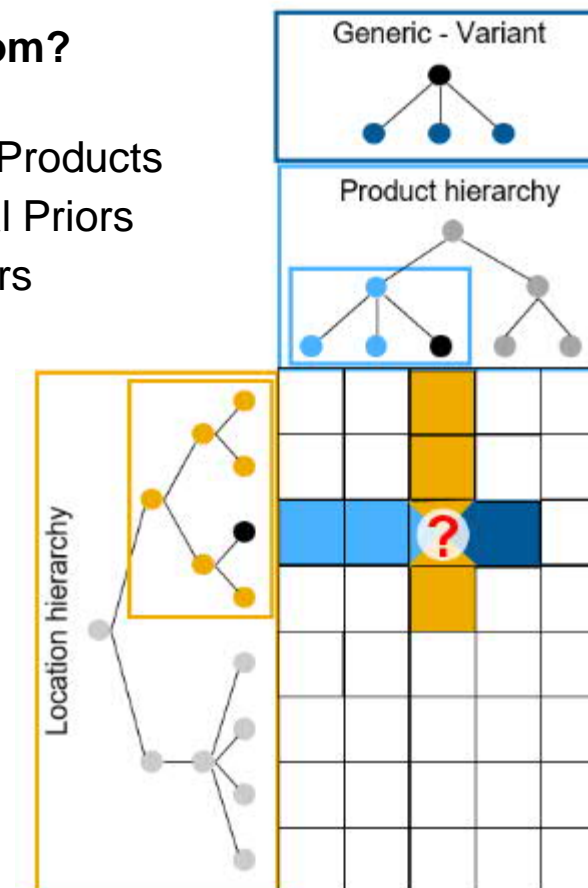
- New promotions
- Calendar events
- Price changes
- Seasonality even before a year is over

The “Bayesian Tug of War”



Where do priors come from?

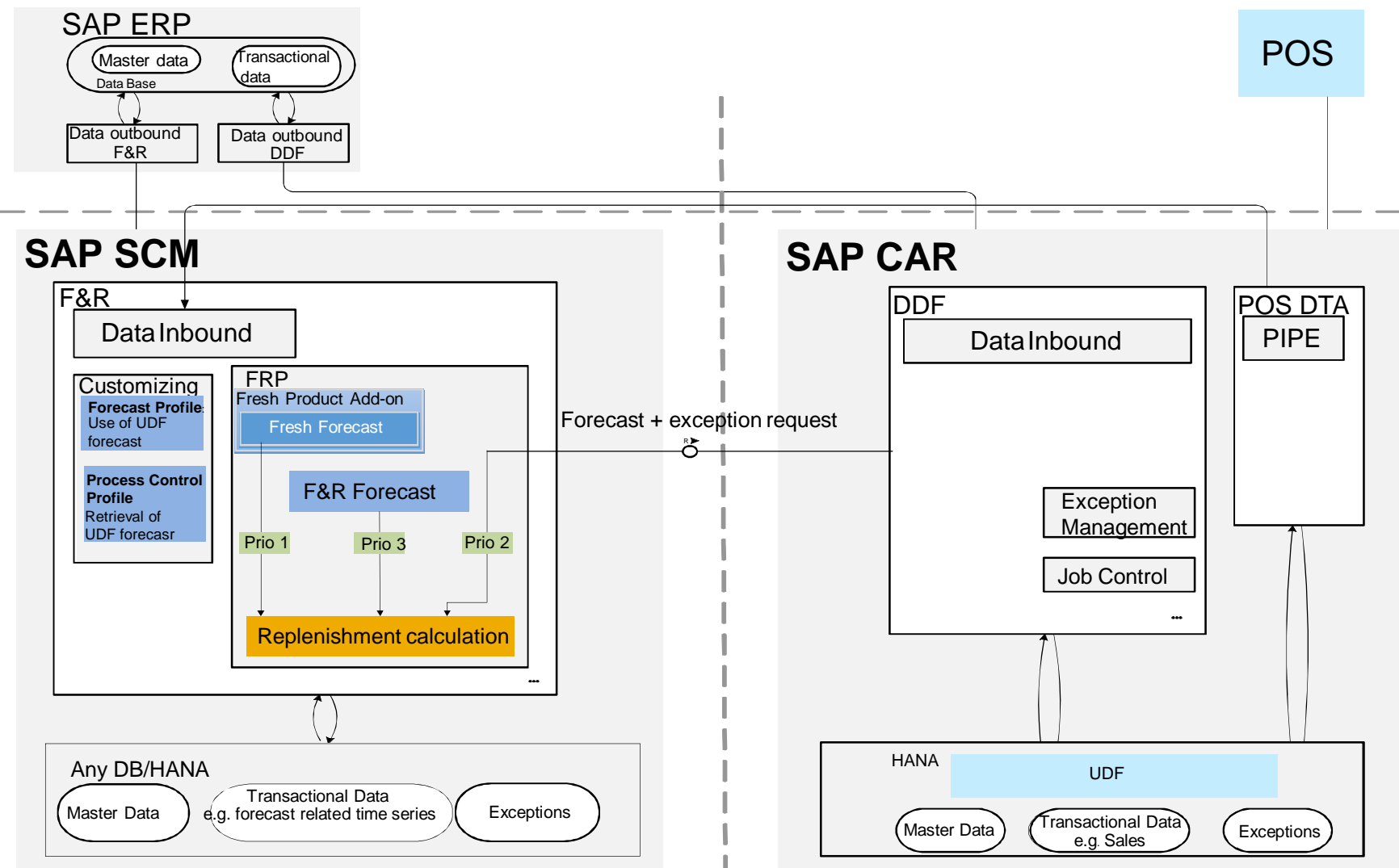
- Level 1 – Reference Products
- Level 2 – Hierarchical Priors
- Level 3 – Global Priors



SAP F&R recent innovation: Advanced forecast capabilities

Integration of CAR Unified Demand Forecast (UDF) – system landscape

For Integration Guide see note 2367172



Forecast priorities

product based selection of forecast input in the demand calculation of the replenishment:

- Priority 1 = Fresh Forecast (Add-On)
- Priority 2 = UDF Forecast
- Priority 3 = F&R Forecast

Can I use UDF and Replenishment in S/4 instead of SAP F&R?

Differentiating features of SAP F&R compared to ERP/S/4

Forecasting related

- Causal-based forecast (promotions, events and other demand influencing factors) with dynamically adjusted day weights
- Auto adaptive forecast based on profiles for slow/fast moving products, automatic data cleansing (outliers, out of stock)
- Standard integration to UDF (including variances for safety stock determination)

Replenishment related

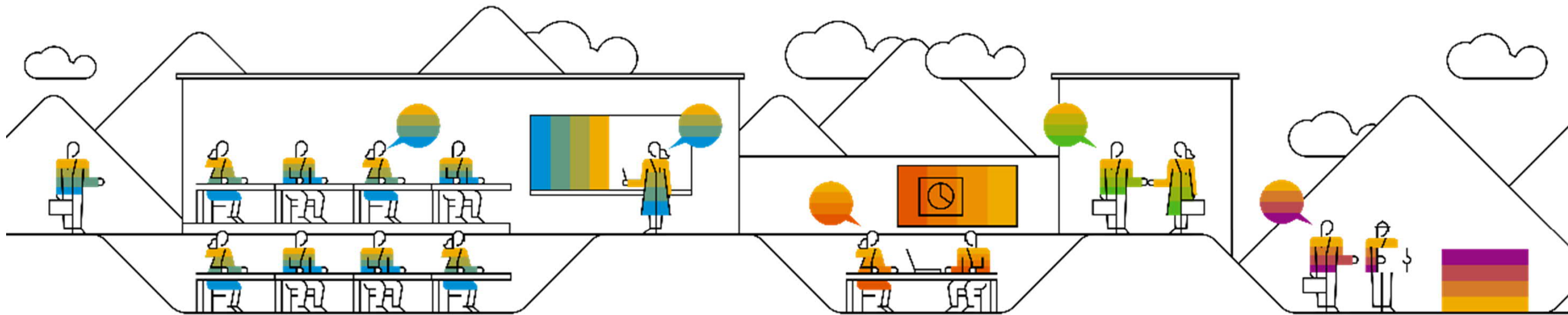
- Simple identification and management by exception of critical products and release strategies, different workbenches for review
- Time-dependent minimum/presentation stock
- Logic to handle special restrictions/situation such as maximum stock, shelf life, end of listing, main and supplementary order days
- Advanced safety stock logic
- Demand driven determination of target stocks, based on schedules (main and suppl. days)
- Order forecast and aggregated store order forecast for DC Multi Echelon Replenishment scenarios
- Optimization features such as pre-allocation, order balancing and load building
- Article substitution (Follow-on and replacement)
- Fresh add-on with projected waste and intraday (plus fresh forecast in case no UDF would be used)



F&R does not equal S/4 RPL + UDF!

**It has many differentiating features in the area of replenishment
It is proven to bring strong business benefits and can be implemented quickly with best practice services**

Roadmap Demand and Replenishment Planning



New Co-innovation with COOP CH

Early Adopter

- One of the first customers of F&R – productive since 2005
- Co-innovation with SAP for fresh item daily forecast – in use since 2013

Usage of F&R today

- Fully automated store replenishment for grocery, hardgoods, DIY.
- F&R orders the full assortment including fresh items
- Established processes and smooth operation
- Significant achievement with regards to inventory and process costs reduction, service level and sales increase as well as waste reduction

Strategic push to go to the next level desired

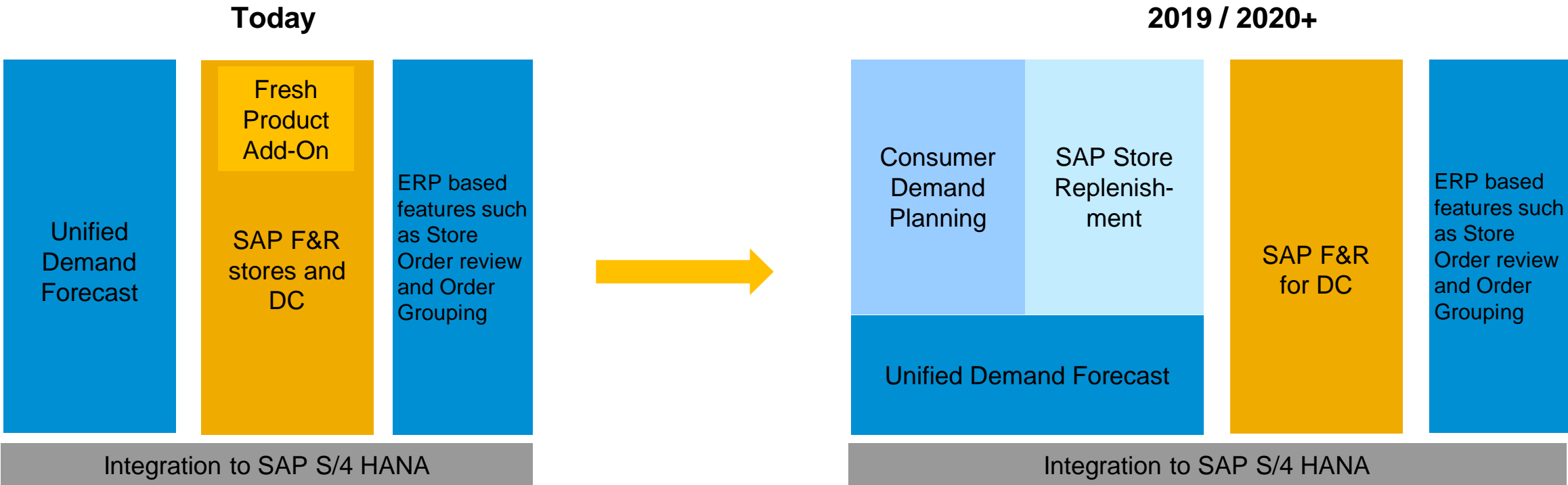
Next generation replenishment development as co-innovation together with SAP

- Promotion planning and ordering based on machine learning enabled forecasts by UDF
- Seamless integration between promotion and replenishment is a key element as promotion planning has a huge impact on the supply chain.
- Planners only monitor the flow and provide the system with target values and demand influencing factors if needed. Simulation tools allow the replenishment planner to understand the impact of measures in advance and to compare different scenarios
- Replenishment should be based on cost optimal ordering which considers shelf life, lost sales, storage and handling cost to calculate optimal order quantities.



Next Step of the evolution in demand and replenishment planning

- For the topic **Consumer Demand Planning** applications are planned to visualize, validate and adjust past and future demand as well as the demand influencing factors for UDF
- **SAP Store Replenishment** will provide fully automated cost optimal ordering for brick-and-mortar and e-commerce stores. It includes advanced simulation and special capabilities for fresh items. It will be based on SAP CAR.
- **SAP F&R** remains a key part of Retail Replenishment. Customers can transition step-by-step, starting with consumer demand planning and continuing with store replenishment. Replenishment of distribution centers remains on F&R in this step of the evolution.



* SAP F&R is part of the SAP Business Suite – standard maintenance until end of 2025, see [PAM](#)

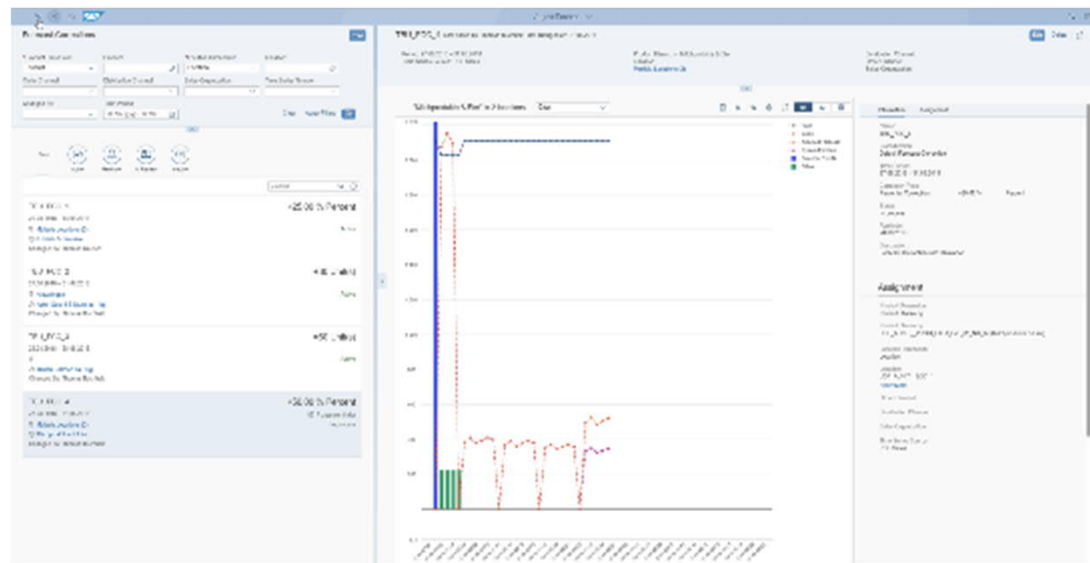
First Applications in the context of UDF/Consumer Demand Planning

Delivered with
CARAB 4.0 Oct 18

2018

Adjust Forecast

- Forecast correction on **different levels**
- Cross linked from existing UDF **Analyze Forecast app**
- Provide **demand plan** (final forecast) service for other processes like Replenishment

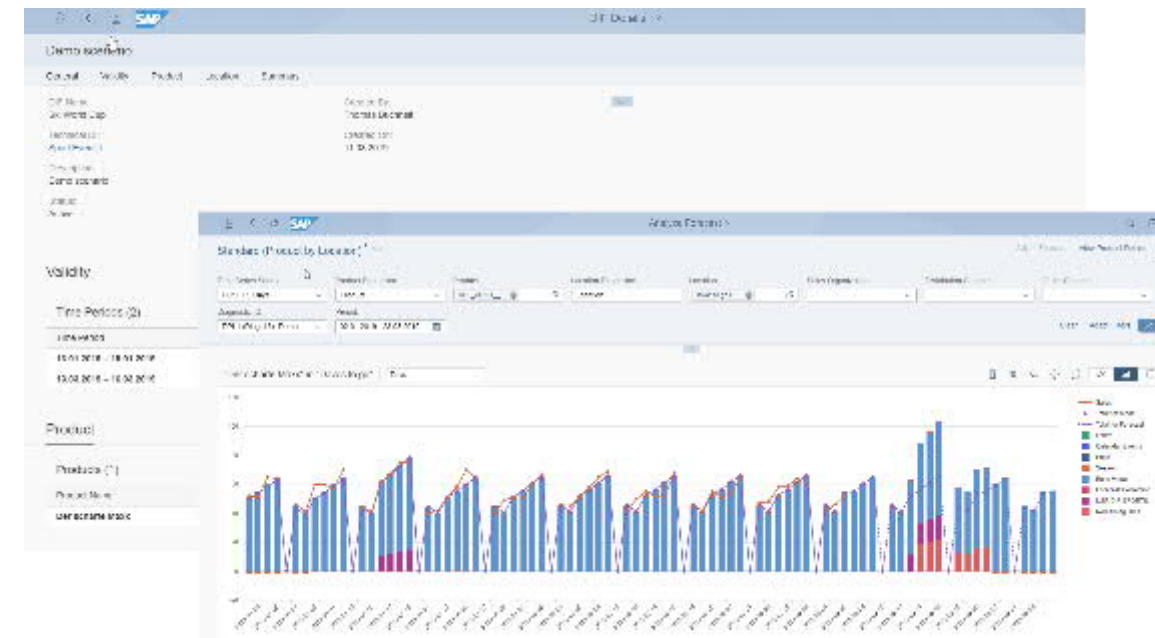


SAP Labs preview
CARAB 4.0 FPS 01

2019

Manage Demand Influencing Factors

- User interface to maintain manual DIFs for example to explain **store reconstruction, local event etc.**
- Automated mass data feed for DIFs **weather forecast, hotel booking etc.**

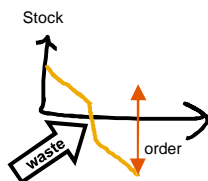


Overview SAP Store Replenishment



Cost optimal ordering

- Determine order amount that leads to lowest expected costs (e.g. consideration of avoiding waste vs. costs of out of stock, shelf capacity)



Prediction and consideration of expected waste

- Predict expected waste due to shelf life restrictions
- Avoid wrong stock assumptions and generate better orders



Visualize impact of changing orders to store employees in Order Product App

- Estimate impact of order changes to expected lost sales and waste



Intra-day and real time replenishment

- Order multiple times per day
- Use real time inventory (incl. time stamp)
- Consider store opening hours and intra-day sales distribution



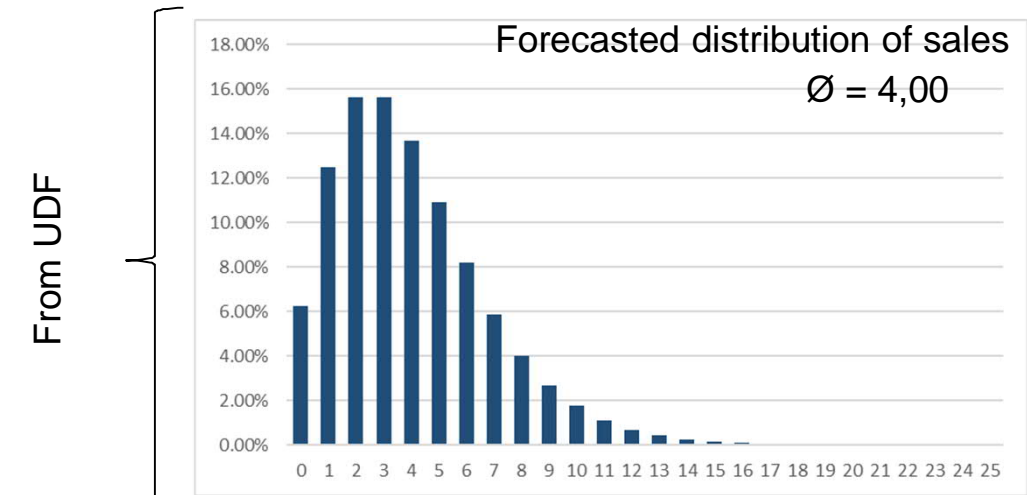
Monitoring, control and simulation

- Central cockpit for monitoring of demand planning and replenishment, alerting on different aggregation levels
- Aggregated views on current and forecasted orders, stock
- Simulate impact of changed parameters

Cost-optimal ordering – a simplified example

SAP Labs preview

Input



Product specific data

- Shelf space
- Shelf life
- Margin

Cost functions

- Costs per lost sales = 1.5 * Margin
- Costs per wasted product = 0.9 * Purchase price
- Costs per product above shelf capacity = 0.1 * Purchase price

Cost comparison



Cost optimal order

- Reduced order for ultra fresh before closing days
- Higher orders if shelf capacity is sufficient and there is no risk of waste

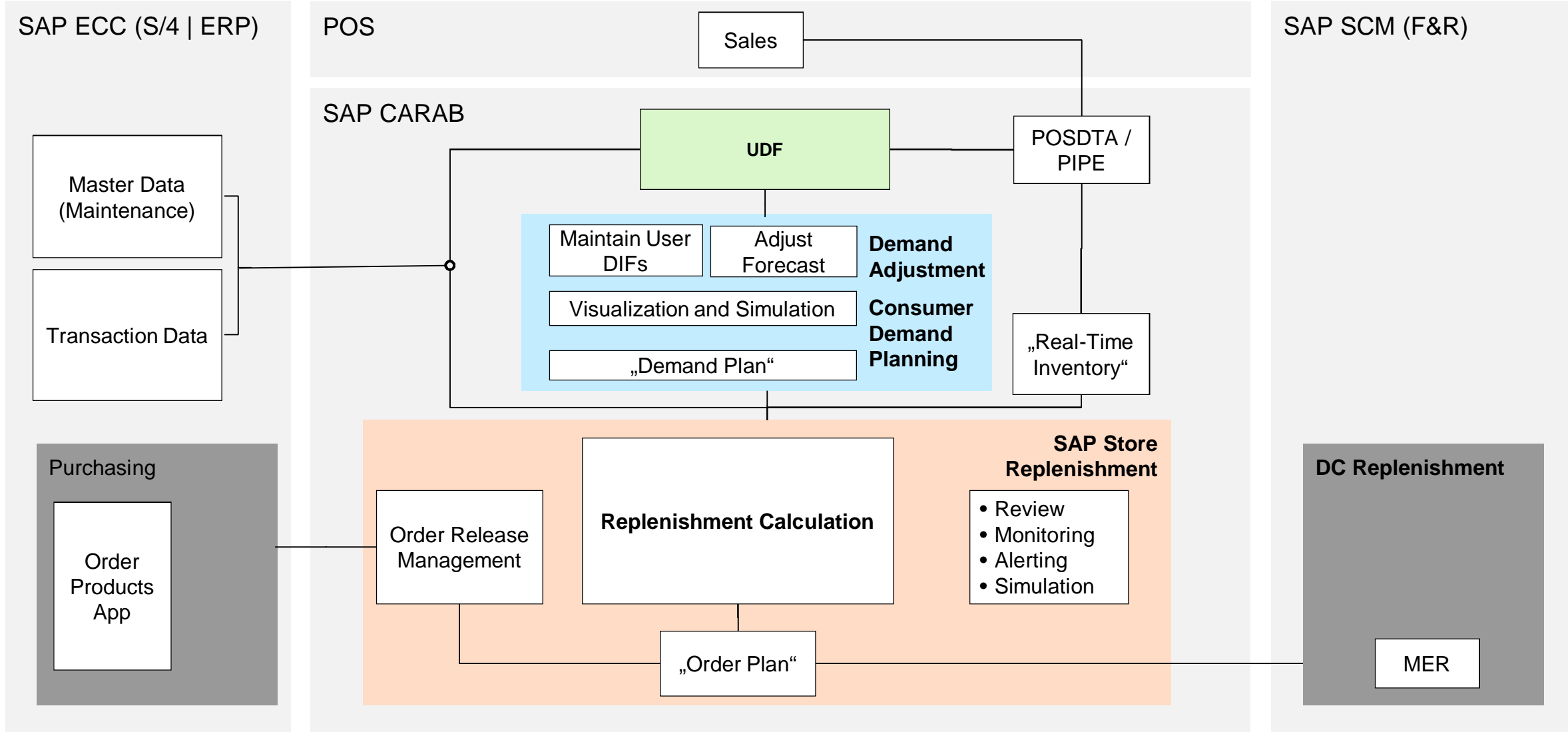
Monitoring, Simulation and Control

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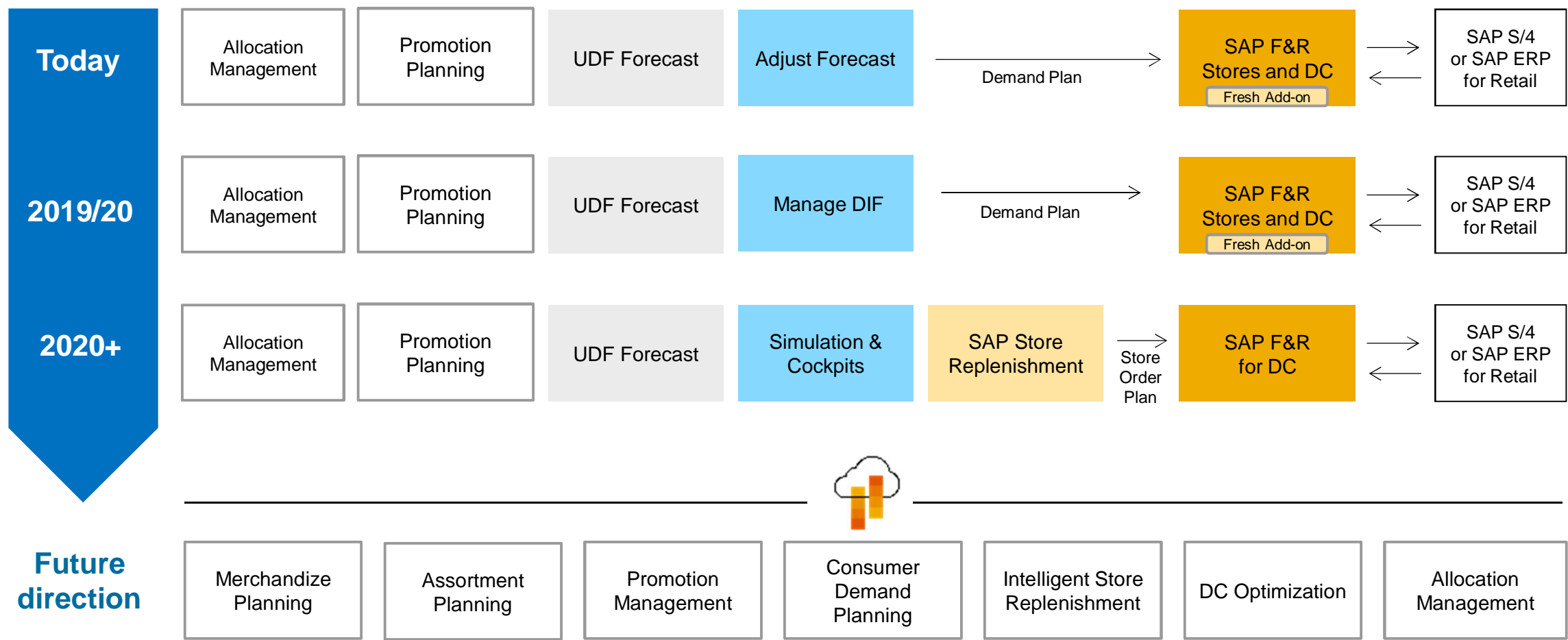
Solution Components

SAP Labs preview



Stepwise transition

**Current Roadmap,
Subject to change**



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Questions?

Check out the SAP Community and the
F&R [Wiki](#)



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