



# BLUEPRINT

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# Advanced Forecasting using Auto Select

*Using a data driven, scientific approach to automatically manage differing forecast methods*



# Agenda

Auto Select

Item Classification

Auto Select Process

Forecasting Methods

Questions



# Agenda

## Auto Select

Item Classification

Auto Select Process

Forecasting Methods

Questions

# Why use Auto Select?

- For any business, SKU offerings have many different demand characteristics
  - Fast/slow movers with intermittent/continuous demand, you may have new items or dormant items, etc.
  - AES, the tried-and-true forecasting method, may not work best for ALL items
  - An ineffective forecasting method can result in inaccurate SS levels, and too little or too much inventory (e.g., missed service/overstocks)
- Auto Select removes the guess work
  - Automatic evaluation of eligible forecasting methods
  - Automatic selection of the method producing the least forecast error
  - Automatic re-evaluation and application
- Eliminate time spent trying to manage/react to every item
- Specialized forecast at all unique Item / Location levels



# Agenda

Auto Select

## Item Classification

Auto Select Process

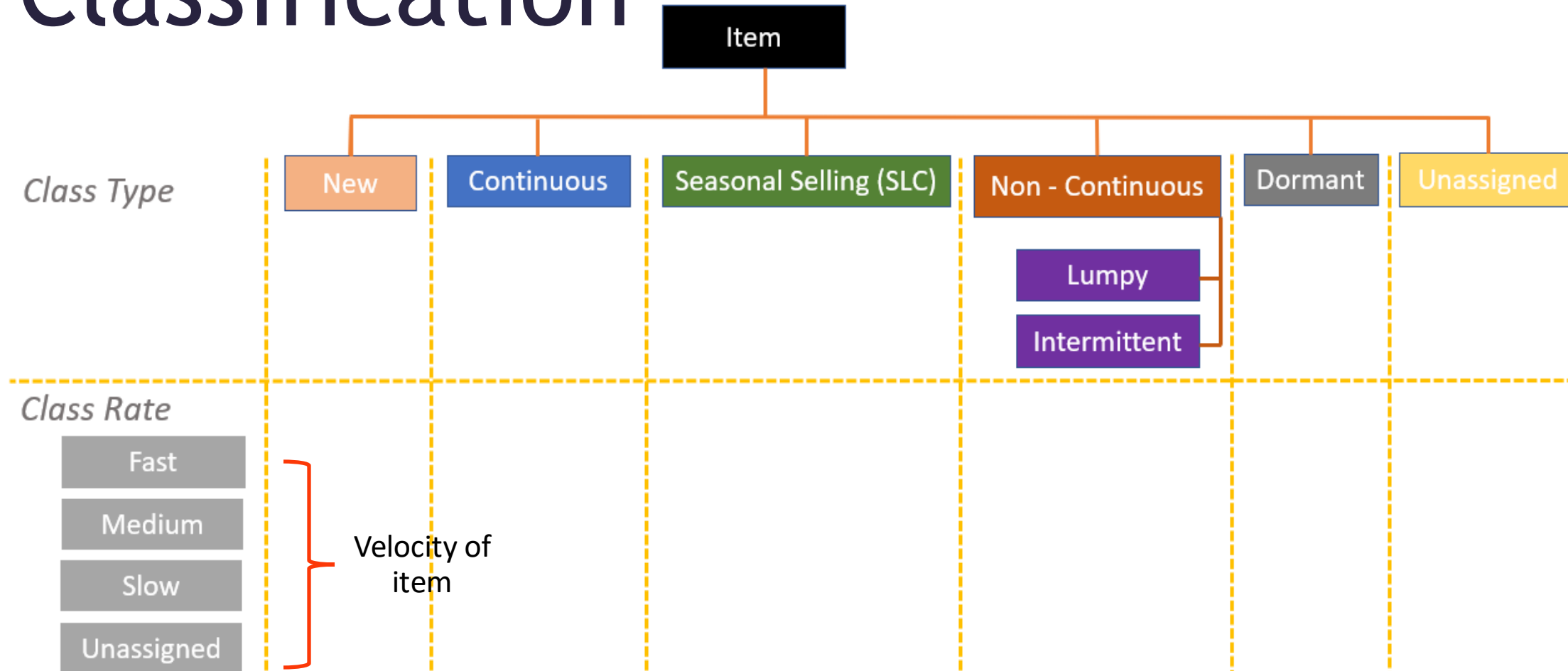
Forecasting Methods

Questions

# Item Classification

- Item Classification is a prerequisite for Auto Select
  - It is the **foundation** for aligning the right forecasting methods
  - Items eligible for classification are determined based off of your Activity Code settings (Activity Codes set to 'Include in Classification')
- Items are assigned a **Classification Type** and **Classification Rate**
  - Items without history and items with activity codes that are not classified will show both a Class Rate and Class Type of "Unassigned."
  - Items with insufficient history will be reviewed for classification each period-end
- Classified items are re-classified after **4 periods**
  - Weekly, 4 weeks
  - 4-Weekly, 16 weeks
  - Monthly, 4 months

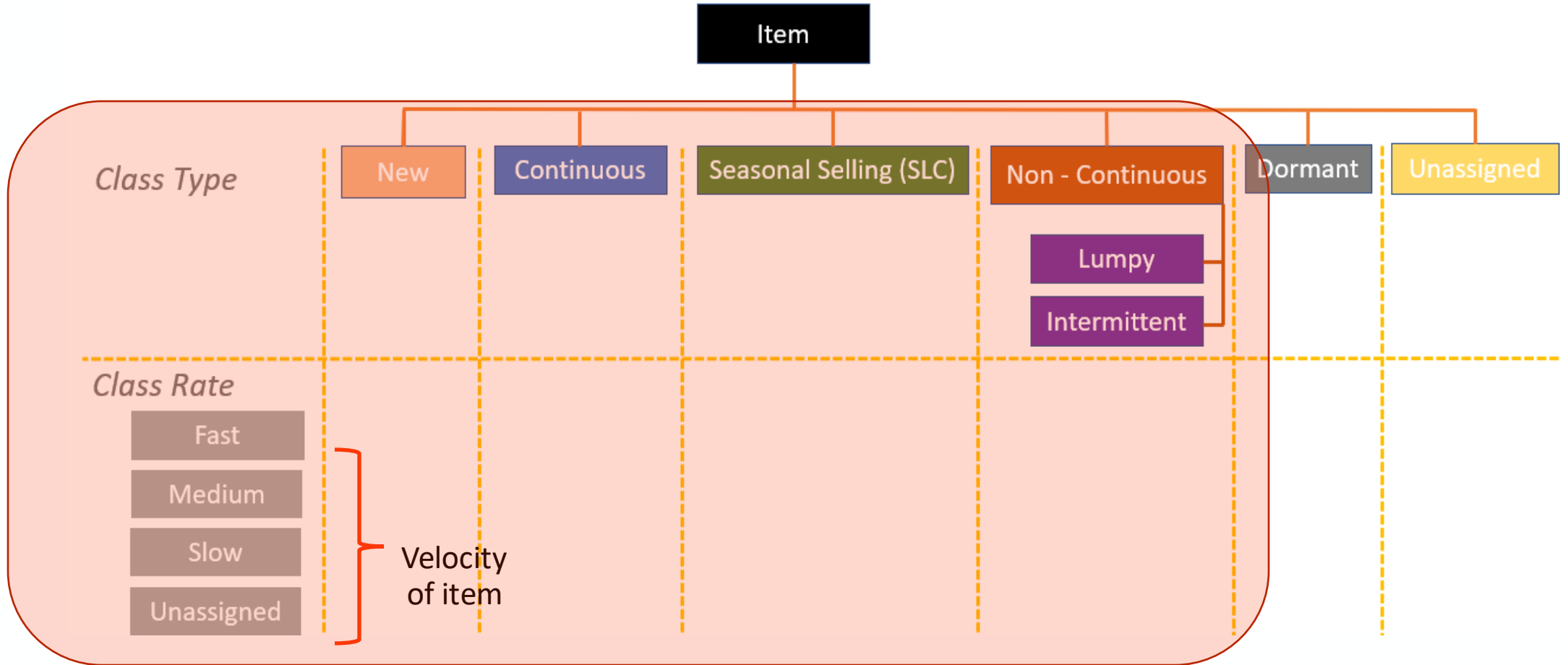
# Item Classification





# Item Classification

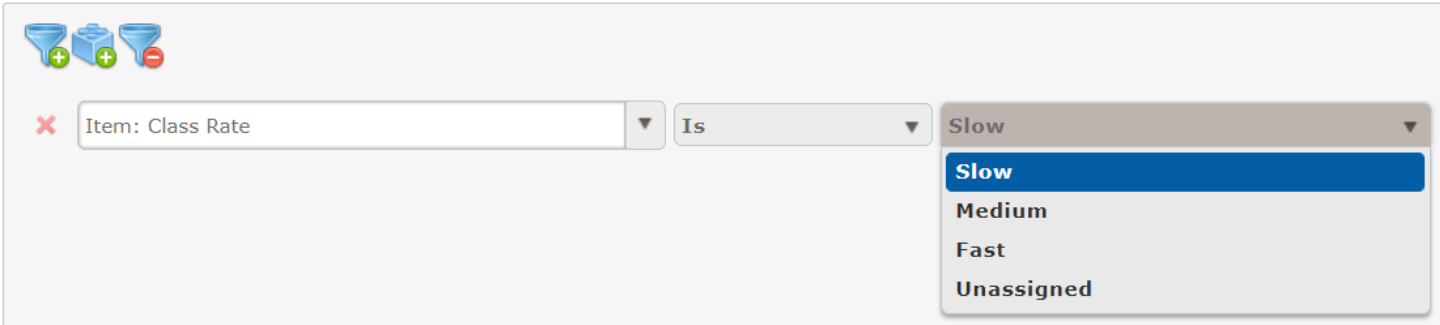
Focus Area



# Additional Options

## Mass Maintenance & Advanced Seasonality filtering

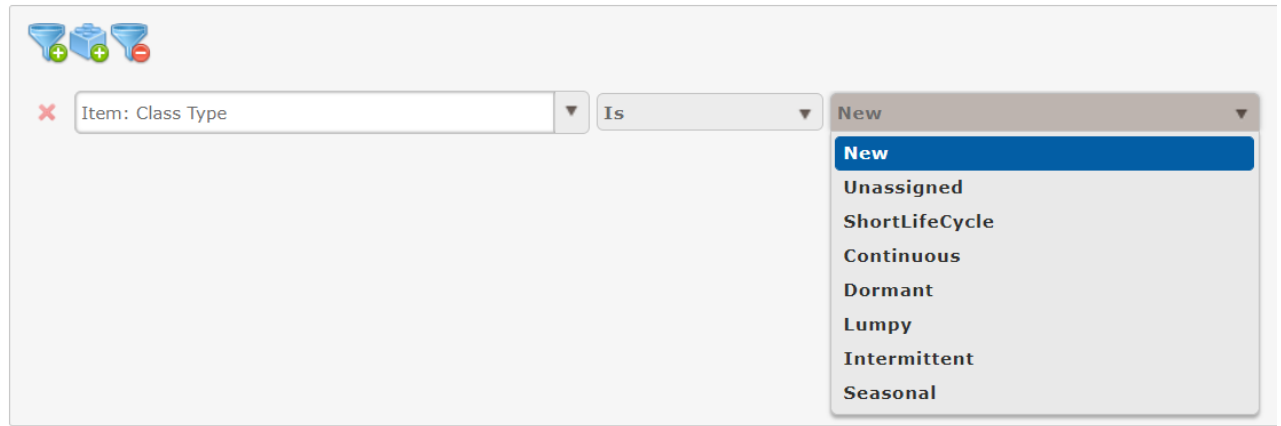
2. Select records to change:



A screenshot of a software interface showing a filter dropdown menu. The dropdown is open, displaying a list of options: Slow, Medium, Fast, and Unassigned. The 'Slow' option is currently selected and highlighted in blue. The text 'Item: Class Rate' is visible in the input field, and the word 'Is' is shown in a separate dropdown to the right.

Class Rate

Class Type



A screenshot of a software interface showing a filter dropdown menu. The dropdown is open, displaying a list of options: New, Unassigned, ShortLifeCycle, Continuous, Dormant, Lumpy, Intermittent, and Seasonal. The 'New' option is currently selected and highlighted in blue. The text 'Item: Class Type' is visible in the input field, and the word 'Is' is shown in a separate dropdown to the right.



# Agenda

Auto Select

Item Classification

**Auto Select Process**

Forecasting Methods

Questions

# Auto Select

## 4 Steps

1. Configure
2. Align
3. Forecast
4. Auto Apply

Configure

Align

Forecast

Auto Apply

# Auto Select

## Step 1 - Configure



- Opt into Auto Select through Blue Ridge Service Desk
  - Can opt into 1 or more Forecast Methods
  - Must opt in for new forecasting methods
    - Autoregressive
    - Neural Network
  - Option to exclude from Auto Select
    - Supplier Manager (Supplier level)
    - Item Manager (Item level)
    - Enabling/Disabling AS takes place next period

**Forecast Model Factors**

- Adaptive Exponential Smoothing
- Auto Select
  - Adaptive Exponential Smoothing*
  - Moving Average*
  - Intermittent Demand Forecasting*
  - Autoregressive*
  - Neural Network*

# Auto Select

Opt out option Supplier Manager and Item Manger

**Supplier Policy**

**Item Defaults**

<input type="text" value="99.70"/>	Item Service Default (%)	Global	Value From
<input type="text" value="17.00"/>	New Item Duration (In Weeks)	Global	Value From
Units	Service Level Type	Global	Value From
Item Level	Forecast Frequency		
Interface	Lost Sales Management	Global	Value From
None	Convert Demand Output	Global	Value From
<input type="checkbox"/>	Round Item EOC to Multiples of Supplier Cycle	Global	Value From
<input type="text" value="0"/>	Days to Limit Item EOC	Global	Value From
<input type="checkbox"/>	Do Not Transfer		
<input type="checkbox"/>	Enable Intelligent Minimum/Maximum		
<input type="checkbox"/>	Calculate Intelligent Minimum/Maximum		
<input type="checkbox"/>	Exclude from Auto Select		

**Item Parameters**

**Forecasting Parameters**

Standard	Forecast Type		
<input type="text" value="0"/>	Weeks to use for special forecast type		
<input type="checkbox"/>	Exclude from Auto Select	Supplier	Value From

# Auto Select

## Step 2 - Align

Configure



Align

Forecast

Auto Apply

- Mapping item based on demand characteristics (Item Classification) to the right set of forecasting methods
  - Activity Code
  - Demand History
  - Demand Frequency
  - Classification
    - 1 or more forecast methods based on the Classification of the item

# Auto Select

Configure

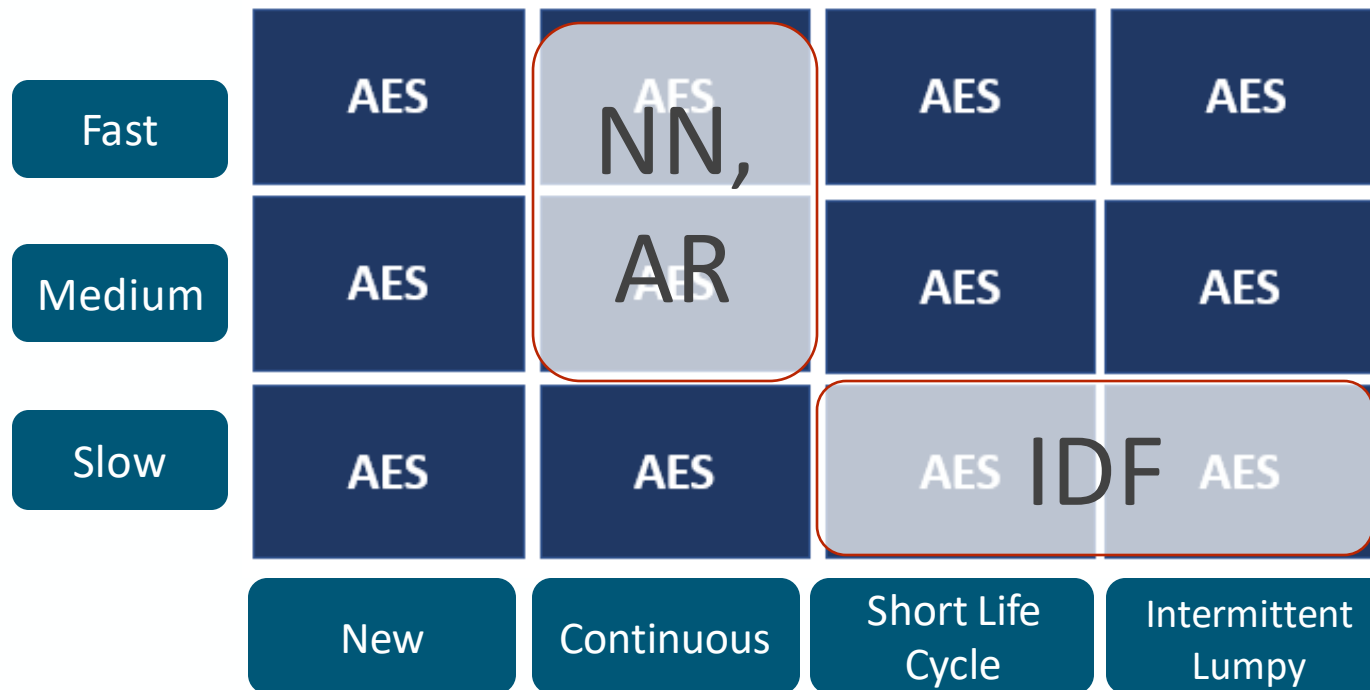


Align

Forecast

Auto Apply

## Step 2 – Align





# Auto Select

## Step 3 - Forecast

Configure

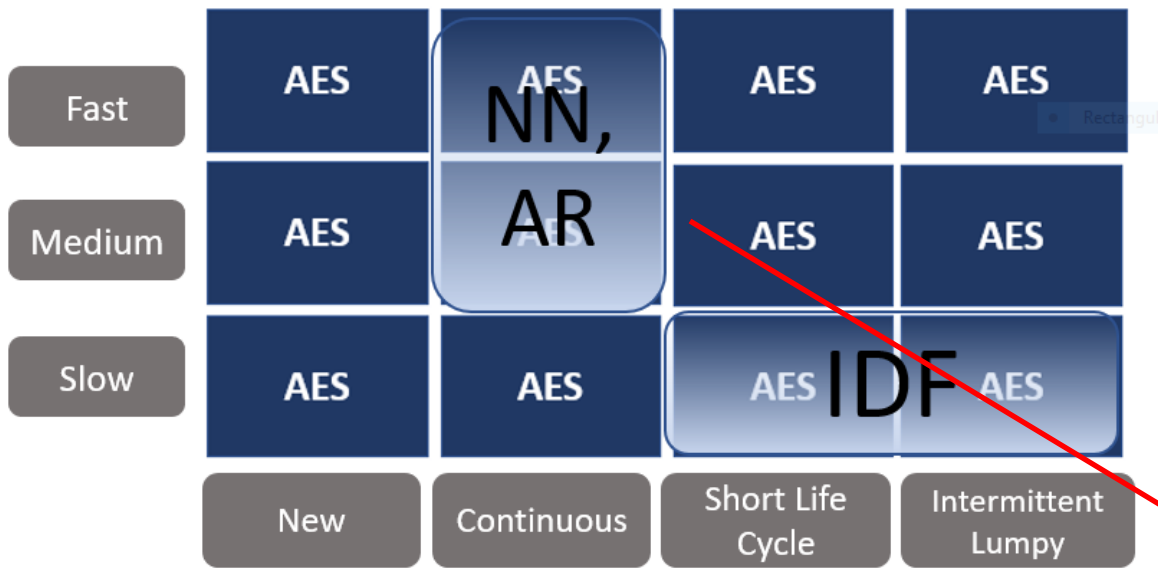
Align



Forecast

Auto Apply

- Forecast competition for eligible Forecast Methods
  - AES forecast is always calculated
  - Forecast calculated for all other eligible forecast methods
- Identification of the forecast method producing the least forecast error % (lowest MAPE)



Configure    Align    ➔ Forecast    Auto Apply

Item is forecasted using the eligible forecast methods to identify the least forecast error method

	Itemid	Period1Date	CreationDate	ForecastModelName	Forecast	MeanAbsolutePercentageError
1	75904	2020-10-11 00:00:00.000	2021-01-15 00:00:00.000	NeuralNetwork	18.4774	18.2354792739762
2	75904	2020-10-11 00:00:00.000	2021-01-15 00:00:00.000	Autoregressive	19.1304	18.1711744537077
3	75904	2020-10-11 00:00:00.000	2021-01-15 00:00:00.000	AdaptiveExponentialSmoothing	23.9755178052427	24.3621621459716
4	75904	2020-10-04 00:00:00.000	2021-01-15 00:00:00.000	NeuralNetwork	19.9067	18.591101984599
5	75904	2020-10-04 00:00:00.000	2021-01-15 00:00:00.000	Autoregressive	19.4457	18.1660479135812
6	75904	2020-10-04 00:00:00.000	2021-01-15 00:00:00.000	AdaptiveExponentialSmoothing	28.5850593508091	23.1597518961203
7	75904	2020-09-27 00:00:00.000	2021-01-15 00:00:00.000	NeuralNetwork	18.8931	16.1544608132703
8	75904	2020-09-27 00:00:00.000	2021-01-15 00:00:00.000	Autoregressive	18.5244	15.1251125988958
9	75904	2020-09-27 00:00:00.000	2021-01-15 00:00:00.000	AdaptiveExponentialSmoothing	20.6168645026971	21.4172875091087
10	75904	2020-09-20 00:00:00.000	2020-12-30 00:00:00.000	NeuralNetwork	20.1957	16.3464754652849
11	75904	2020-09-20 00:00:00.000	2020-12-30 00:00:00.000	Autoregressive	19.676	15.2858085695918
12	75904	2020-09-20 00:00:00.000	2020-12-30 00:00:00.000	AdaptiveExponentialSmoothing	19.7228816756569	23.1198307017444

# Auto Select

## Step 4 – Auto Apply

Configure

Align

Forecast


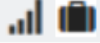
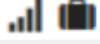
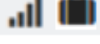

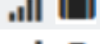

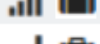

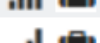

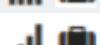








Auto Apply

- Automatic application of
  - Forecast Method
  - Class Type
  - Class Rate
  - Forecast

> [Item List](#)

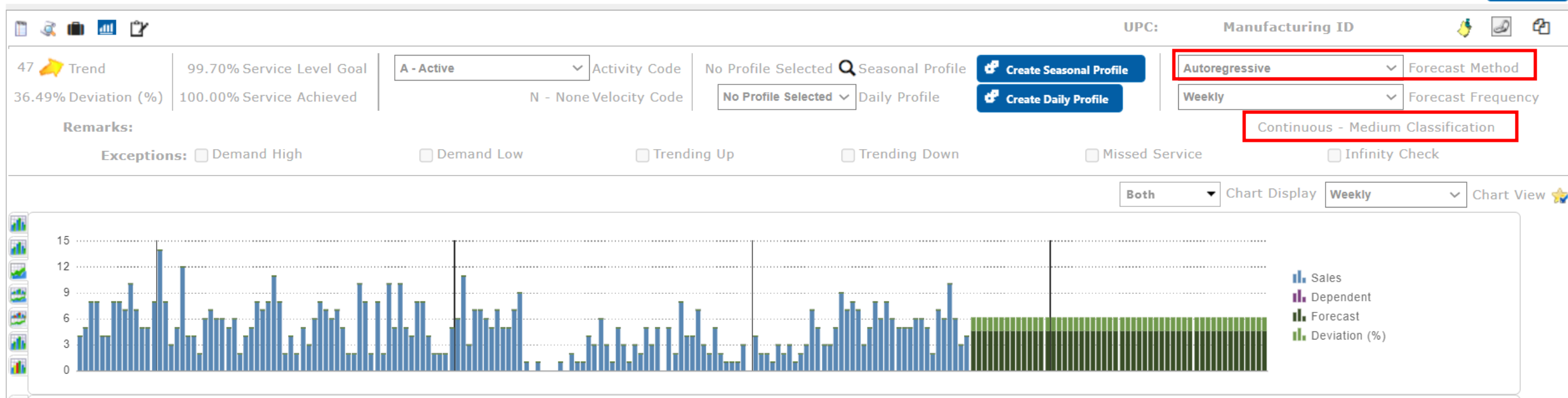
 List Filtered By

	<u>Item ID</u>	<u>Forecast Method</u>	<u>Class Type</u>	<u>Class Rate</u>	<u>Forecast 4 Weekly</u>
	3999111	Adaptive Exponential Smoothing	Continuous	Fast	68.43
	3055561	Adaptive Exponential Smoothing	Continuous	Medium	25.03
	4000391	Neural Network	Continuous	Fast	102.90
	3988851	Neural Network	Continuous	Fast	84.00
	3745101	Autoregressive	Continuous	Fast	96.00
	3279401	Adaptive Exponential Smoothing	Continuous	Fast	22.83
	3082501	Adaptive Exponential Smoothing	Continuous	Medium	6.38
	2649961	Intermittent Demand Forecasting	ShortLifeCycle	Slow	6.27
	3261761	Adaptive Exponential Smoothing	Intermittent	Slow	2.51
	3976351	Neural Network	Continuous	Medium	8.57
	3959371	Adaptive Exponential Smoothing	Intermittent	Slow	2.93
	3115511	Adaptive Exponential Smoothing	ShortLifeCycle	Slow	.57
	3995331	Intermittent Demand Forecasting	ShortLifeCycle	Slow	1.90
	3748601	Adaptive Exponential Smoothing	Intermittent	Slow	1.92
	3998541	Adaptive Exponential Smoothing	Continuous	Medium	10.06
	4001641	Adaptive Exponential Smoothing	Continuous	Fast	44.00
	3975931	Adaptive Exponential Smoothing	ShortLifeCycle	Slow	0.81
	3998571	Adaptive Exponential Smoothing	Continuous	Medium	7.39

# Auto Select

> [Item List](#) > [Item Forecast](#)

Update

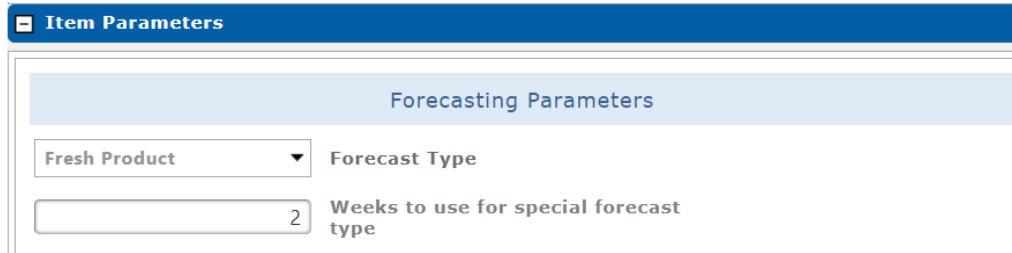


- Forecast Method - Autoregressive
- Class Type – Continuous
- Class Rate – Medium

# Auto Select

## Facts and Details

- Items using 'Fresh Product' Forecast Type are not Auto Select eligible



The screenshot shows a software interface for 'Item Parameters'. A blue header bar contains the text 'Item Parameters'. Below it, a light blue box is titled 'Forecasting Parameters'. Inside this box, there are two fields: a dropdown menu labeled 'Forecast Type' with 'Fresh Product' selected, and a text input field labeled 'Weeks to use for special forecast type' with the value '2' entered.

- **Reforecast** – triggers Auto Select, picks the forecast method with the least forecast error %
- **Seasonal Profile** – adding or removing triggers Auto Select
- **Reforecast with Range**
- **Manual Forecast** change - AES right away or next PE?
- **Freeze Forecast** – no changes, doesn't invalidate – Reverts for period of time? - Tracy

# Auto Select

## Facts and Details

- Revaluation of Auto Select occurs automatically in the regular cadence
- Cadence is 4-periods, stickiness setting
  - Weekly, every 4 weeks
  - 4-Weekly, every 16 weeks
  - Monthly, every 4 months
- Not aligned with Classification cadence. If the item's Classification changes, the forecast method is calculated the next period end. **VISUAL IMPORTANCE!**
- If 25% or better forecast error improvement during the stickiness period, changes the forecast method
- Enabling or disabling Auto Select takes place the next period\*



# Agenda

Auto Select

Item Classification

Auto Select Process

**Forecasting Methods**

Questions

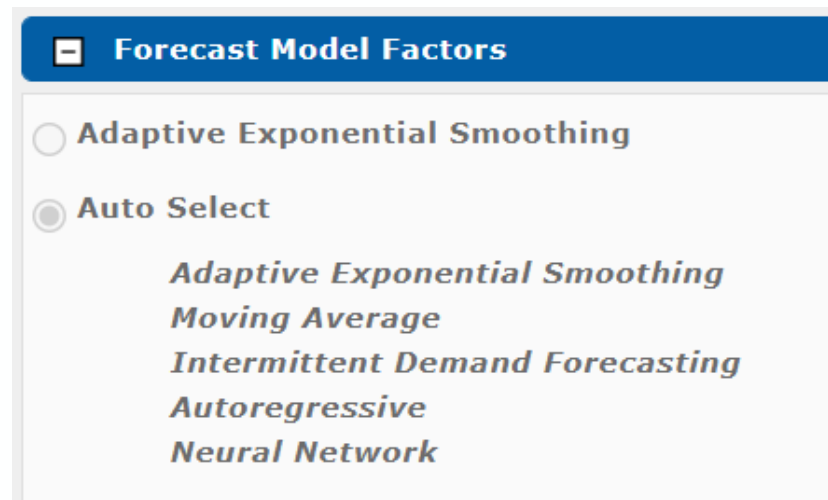


# Forecasting Methods

## Adaptive Exponential Smoothing (AES)

A statistical forecasting technique that **adapts** to changes in demand history (through a **smoothing** parameter) to calculate a forecast. The most recent demand is weighted more heavily than past periods of demand.

- Every item calculates AES
- New items default to AES

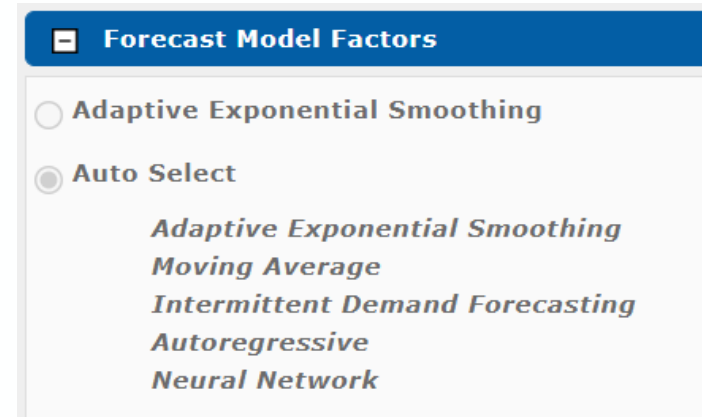


# Forecasting Methods

## Intermittent Demand Forecasting (IDF)

A statistical forecasting technique based on exponential smoothing to forecast items with **slow** and **intermittent** demand. Evaluates both the **magnitude of demand** and the number of **periods between occurrences** of non-zero demand to calculate a forecast.

- Competes with AES
- Demand Values of 0.50+
- Revised only in non-zero demand periods only
- No Demand Low Exceptions!

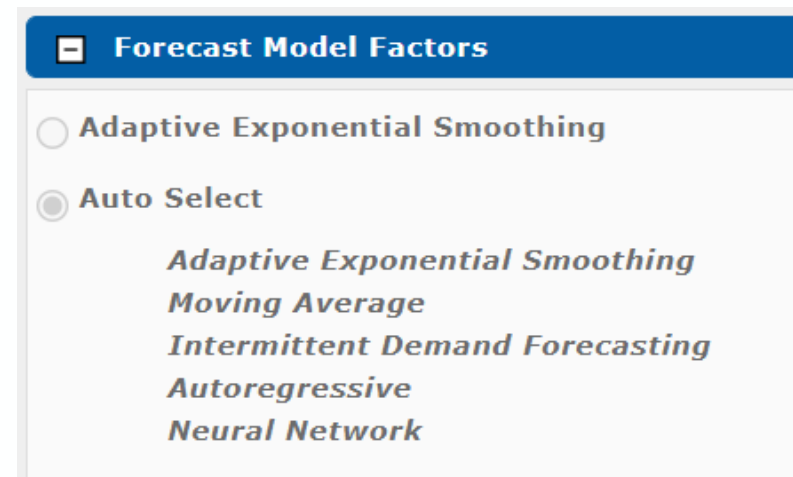


# Forecasting Methods

## Auto Regression (AR)

A statistical forecasting technique that generates a forecast using a linear combination of **past demand values**. The **weights** associated with the previous demand values are optimally computed.

- Competes with AES & NN
- Continuous Classification
- Fast and Medium Class Rate (velocity)

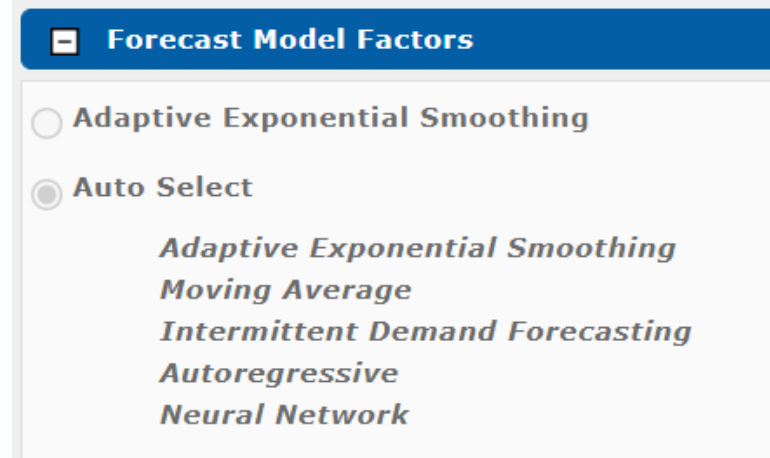


# Forecasting Methods

## Neural Network (NN)

An advanced **machine learning algorithm** that generates a forecast by **learning the linear and non-linear relationships** from the past demand values. The weights associated with the previous demand values are **optimally computed**.

- Competes with AES & AR
- Continuous Classification
- Fast and Medium Class Rate (velocity)



# Forecasting Methods

## Neural Network (NN) & Autoregressive VS Adaptive Exponential Smoothing (AES)

### How are they Similar?

- Looks at history to generate forecasts
- Generates similar forecast components
  - Avg period forecast
  - Standard Dev%
  - Trend
  - Demand Exceptions
- Weekly, 4-Weekly, Monthly
- Supports Reforecast (triggers Auto Select)
- Supports Seasonal Profiles

### How are they Different?

- Machine Learning where AES & IDF are formula
- Minimum History requirements
- Specific Classifications
- Automatically Optimizing Weights on a cadence
- Previous forecast is not considered in new forecast, Trend value is not a factor in update
- Manual Forecast change makes AR & NN ineligible for X periods
- NN & AR is optimized where AES is adaptive
- Reforecast with Range reverts to AES

# Questions?