Demand Forecasting

for Microsoft Dynamics 365 Business Central

USER GUIDE

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This installation document is valid for the Demand Forecasting *version 1.0* for Microsoft Dynamics 365 Business Central.

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1. Introduction

Demand Forecasting is a highly scalable demand prediction solution on the cloud that uses artificial intelligence systems and algorithms to generate data forecasts of future business behavior.

Demand Forecasting uses various data sources as input parameters, including among other historical data of business operations.

Although the system works across any ERP and can integrate with different platforms, in this guide we will focus on your administration on Microsoft Dynamics 365 Business Central.

1.1 Architecture

The general architecture is based on the Microsoft Azure cloud, allowing a real-time scaling of the process capabilities needed, from a few hundred to millions of cases, without the need to invest in infrastructure and being able to consume said services only when necessary.

1.2 Activation of Demand Forecasting

Under contract from Prodware, the service will be provided to the customer according to their current and future needs with the appropriate dimensions in place.

Once set up, Prodware will provide the customer with access to the Demand Forecasting cloud console where you will be able to finish the set up of the solution on your Dynamics 365 Business Central system.

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2. Integration with Microsoft Dynamics 365 Business Central

Demand Forecasting integrates natively with Microsoft Dynamics 365 Business Central. Demand Forecasting connects to your existing Business Central system and synchronizes data automatically so that you can use your real business data to run predictions.

2.1 Demand Forecasting installation

Demand Forecasting for Dynamics 365 Business Central has two parts:

- A cloud SaaS platform that manages the import/export of data and runs predictions
- A Business central extension that serves as a data endpoint to allow the cloud platform to get and enter data from/to Business Central

The extension needs to be installed on your Business Central system. The steps involved depend on whether you're working with a cloud version or an on-premises version of Business Central:
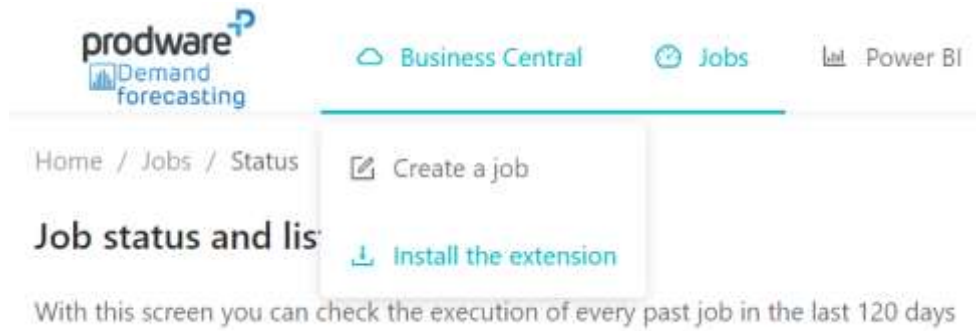
Cloud version

Prerequisites:

- A user with API access
- Available space in the 50.000 to 99.000 object range for 2 pages, 1 code unit and 6 queries

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Installation steps:

1. Open the Demand Forecasting console. In the main navigation menu, go to
   Business Central > Install the extension:

2. Click on the "Download the extension" button and store the .app file locally

3. Log into your customer's Dynamics 365 Business Central tenant

4. Open the Extension Management page and select the Upload Extension action:
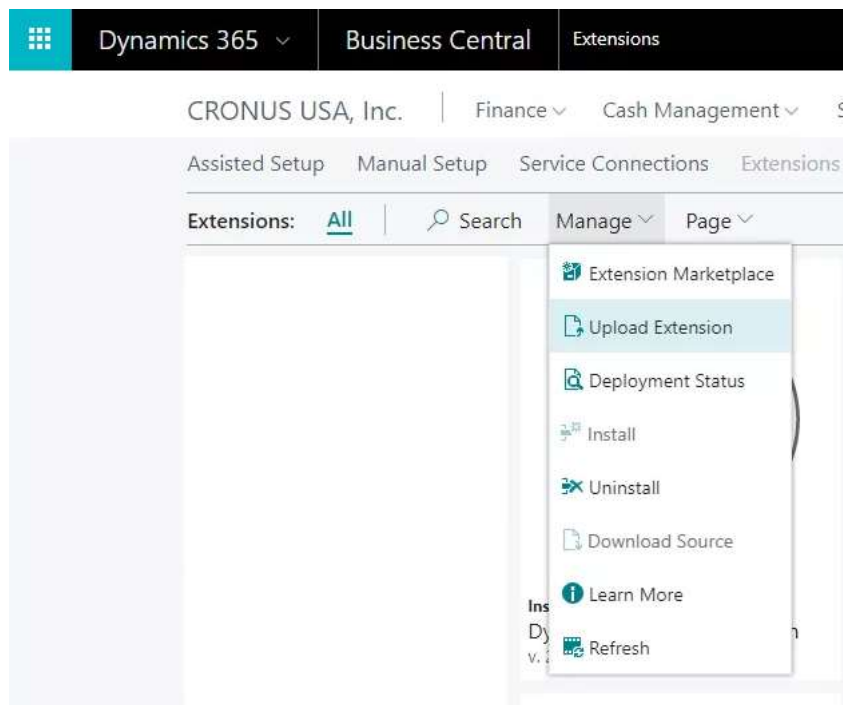
5. Select the browse button to select the .app file obtained in step 3 to upload

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6. Select if you want to deploy for the current version (most common) or next version. Select the language for the deployment

7. Choose the Deploy button

8. The extension will be deployed in the background

9. To check the status of the deployment, choose Deployment Status and then view the status of the extension deployment. Select the row to see additional details

10. When the extension has been successfully deployed, choose the Refresh button to see the new extension in the list of installed extensions. From now on you can manage the extension like any other Business Central cloud extension

You can check the official Microsoft Business Central documentation for additional details.

On-premises version

Prerequisites:

- A user with permission to install extensions

- 20 free objects available for installation. You may need to expand your Business Central license to make these objects available

Installation steps:

1. In Business Central, identify and reserve an object range for the installation of the Demand Forecasting extension. You need 20 free object spaces. Write down the starting position of this range

2. Open the Demand Forecasting console. In the main navigation menu, go to Business Central > Install the extension:

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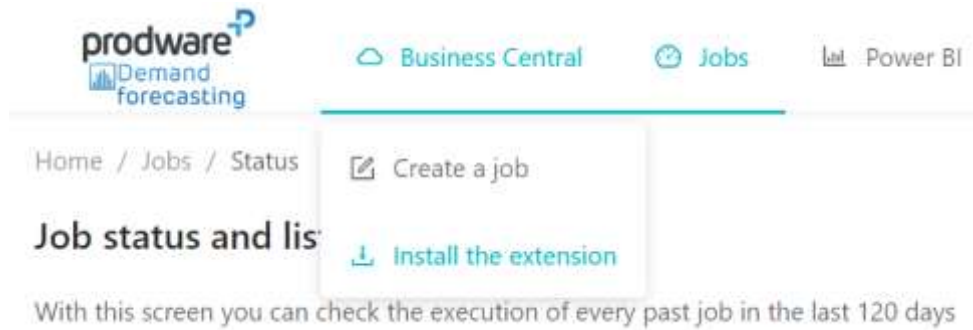
3. Enter the range start position you wrote down in step 1 and click on the "Download the extension" button.

This will generate an .app file for you to install on your Business Central instance.

4. Once you have the .app file, follow the standard extension installation procedure to complete the setup

3. Parameters

The following extra parameters can be input into the system to configure other behaviors:

TEST_SET_SIZE_PERCENT

Numeric from 0 to 100 indicates what percentage of the sample will be used as a test
percentage in the first training round, so that 100-testpct will be used as training for all
the
algorithms and compared with the remaining testpct to check its validity for the data
sample.
Default: 20

COMPAREMODE

Indicates how the predictors will be compared with each other.
The MAE value must be indicated if you want to use the average error as a means of
comparison between algorithms.
Or MASE if you want to use the square of the error as a means of comparison.
The first penalizes all errors equally, the second penalizes more those errors that deviate
more from reality.
Default: MAE

CONFIDENCE_LEVEL

% of estimated confidence level.
For example, if it is set at 95% the forecast result can be 128: (40-206) indicating that the
average predicted value is 128 but there is a 95% chance that the real value will be between
40 and 206.
Default: 95

MIN_CROSTON_PERCENT

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The number of 0 or minimum voids that must exist in the time series for Croston to be considered as a valid algorithm and used in the benchmarking for this time series.

Default: 20

DATAAREA_POSITION

Position within the order of the forecast's granularity attributes, with 1 being the first, where the data area is located. If not specified, heuristics will be used on the first 1000 attributes of granularity to find it.

-1 means not defined and is equivalent to not reporting the parameter.

-2 means that dataarea is not used for this work.

Default: Not defined

ITEMID_POSITION

Position within the order of the forecast's granularity attributes, with 1 being the first, where the itemid is located. If not spedicied, heuristics will be used on the first 1000 granularity attributes to find it.

-1 means not defined and is equivalent to not reporting the parameter.

-2 means that itemid is not used for this task.

Default: Not defined

WAREHOUSE_POSITION

Position within the order of the forecast's granularity attributes, with 1 being the first, where the warehouse is located. If not specified, heuristics will be used on the first 1000 granularity attributes to find it.

-1 means not defined, and is equivalent to not reporting the parameter.

-2 means that no warehouse is used for this task.

Default: Not defined

DEFAULT_COUNTRY

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Country by default (ISO code) for data whose geographical position is unknown and cannot be found via the warehouse. The position is necessary so that external regressors such as local holidays can be used.

Default: ES

TIME_SERIES_MODEL

It allows you to choose which models will be applied to the data series. It should contain the word ALL for all models, or a collection separated by commas or semicolons of the following values:

FBP_LOG,FBP_LIN,THETA,ARIMA,ARFIMA,STLF,CROSTON,NNET,ETS,TBATS,MEAN

It can also be used to exclude a method, for example:

ALL;-TBATS

This would allow the use of all the algorithms *except* TBATS.

Note: MEAN cannot be excluded; it remains as a fallback method in case the others do not work or cannot be used.

Default: ALL

XREG

Chooses which external regressors will be applied to the data series, it must contain the word ALL for all or else a collection separated by commas or semicolons of the following values:

HOLIDAY
(Currently, the festivities regressor HOLIDAY is the only one available)

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It can also be used - to exclude a method, for example:

ALL;- HOLIDAY

Would allow the use of all the regressors *except* HOLIDAY.

Default: ALL

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4. Power BI reports

Prodware Demand Forecasting includes a range of Power BI reports where additional data can be extracted from the past predictions so that the generated data can be explored further.

The Power BI report is integrated with the Demand Forecasting web interface, and the data from the predictions already ran is added automatically.

To use the online version of these reports, you need a Power BI Pro license. When **accessing the "Power BI" tab in Demand** Forecasting, you will be asked to log in with your Power BI user.

Example: "General Prediction Forecast Summary":
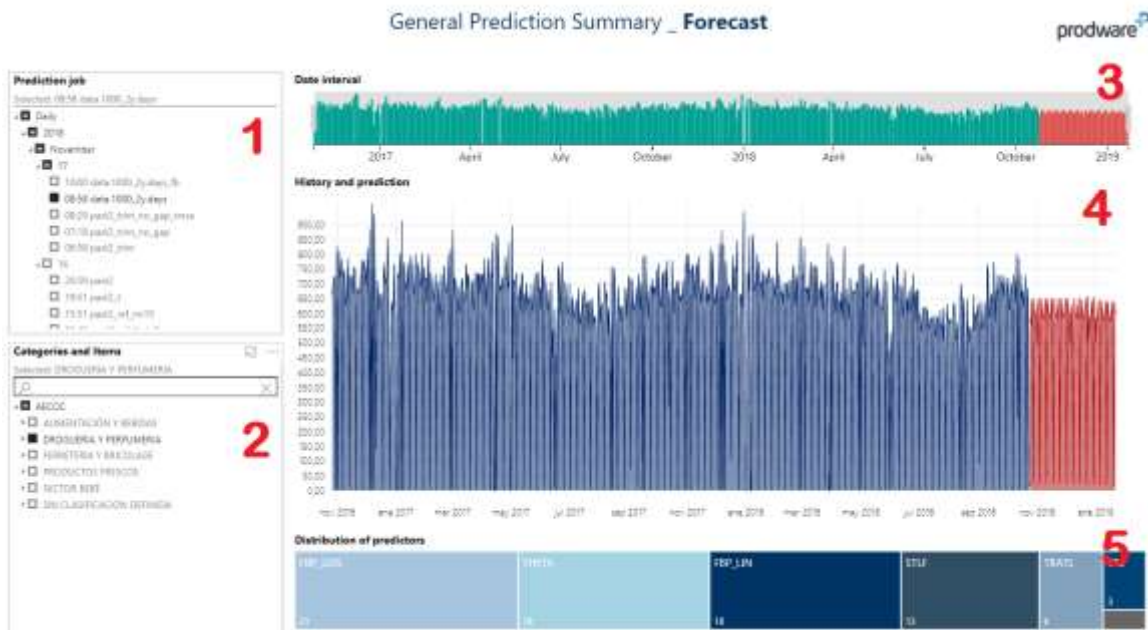
Annex 1. Glossary

1.1   Demand forecasting

It is an application of the prediction of time series that tries to predict what future need there will be of certain items in a supply chain or sales

1.2   Time series

A time series is a set of data collected periodically over time, of quantifiable data.

1.3   Prediction

Prediction is the ability to independently know the values that a time series will have from past data.

1.4   Period / frequency

Each time range in which the time series is collected; typically, days, weeks, months or years.

1.5   Seasonality

A time series characteristic that indicates within a certain period the data behavior is cyclical. E.g. "at Christmas consumers always buy more than in January".

1.6   Model / Algorithm

A model or algorithm is a series of processes and formulae that make a prediction.

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1.7   Confidence range

Every prediction has a level of uncertainty. Some algorithms have a maximum and minimum value within a configurable % of success, in addition to delivering the average value as the prediction.

1.8   Confidence level

The % value requested from the prediction system for confidence ranges.

1.9   Training / fit

Every model needs to use past data to configure itself before being able to predict future values. In most models it is a computationally expensive process.

1.10 External regressor

This is data collected in parallel to the time series, and whose future values are known or are independently predictable and different from the time series; but are related in some way to it.

1.11 Hyperparameters

Models contain certain values that are configurable and that allow adjustments of their behavior, thus improving their prediction. These are called hyperparameters.

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1.12 MAE

Medium Average Error is the average of the absolute value of the difference between the predicted values and reality, it is a measure of how well the prediction has been adjusted to the reality period to period.

1.13 MASE

Medium Average Squared Error is the average of the square of the difference between predicted values and reality, it is a measure of how well the prediction has been adjusted to the reality period to period, especially penalizing the periods in which that difference was greater.

1.14 RMSE

Rooted Medium Squared Error is the square root of the MASE and is used to obtain a smaller and more manageable value than the MASE, with the same characteristics.

1.15 Horizon

In a prediction: the date for which we want to start predicting, must be higher than the last value of the time series.

1.16 Cluster

A cluster is a set of virtual machines created on demand in the cloud especially for a prediction task.

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1.17 Cross validation

It is a model evaluation technique in which the training data is divided into two sets in an iterative way. The model is trained with a set and the prediction is compared with the second.

1.18 Overfitting

Ii is a defect in a prediction system where a model has been too adjusted to the historical data in a counterproductive way for prediction purposes.

1.19 Deep Learning

Is one of the branches of AI and ML that is based on establishing a series of layers of neurons and training them with positive or negative reinforcements as well as reconfiguring them iteratively until they deliver the desired values.

1.20 Granularity attribute

There is a column in the data model that serves to add different time series, all rows with the same value are considered the same prediction unit.

1.21 Item

The physical material that we are trying to predict in demand forecasting.

1.22 Prediction unit

Each of the time series and its predictions. As a general rule, if an independent prediction value needs to be obtained, it is considered an independent prediction unit. E.g. if you

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want to predict 10 items, for 10 stores and 10 different colors it is about 1000 prediction units.