



Business Central (BC) Cloud BI4Dynamics Data Transformation incl. Total cost

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Introduction

This document describes the data transformation process from Microsoft Dynamics D365 BC SaaS to visualization tools (Power BI, Excel). It includes also total monthly cost for the project.

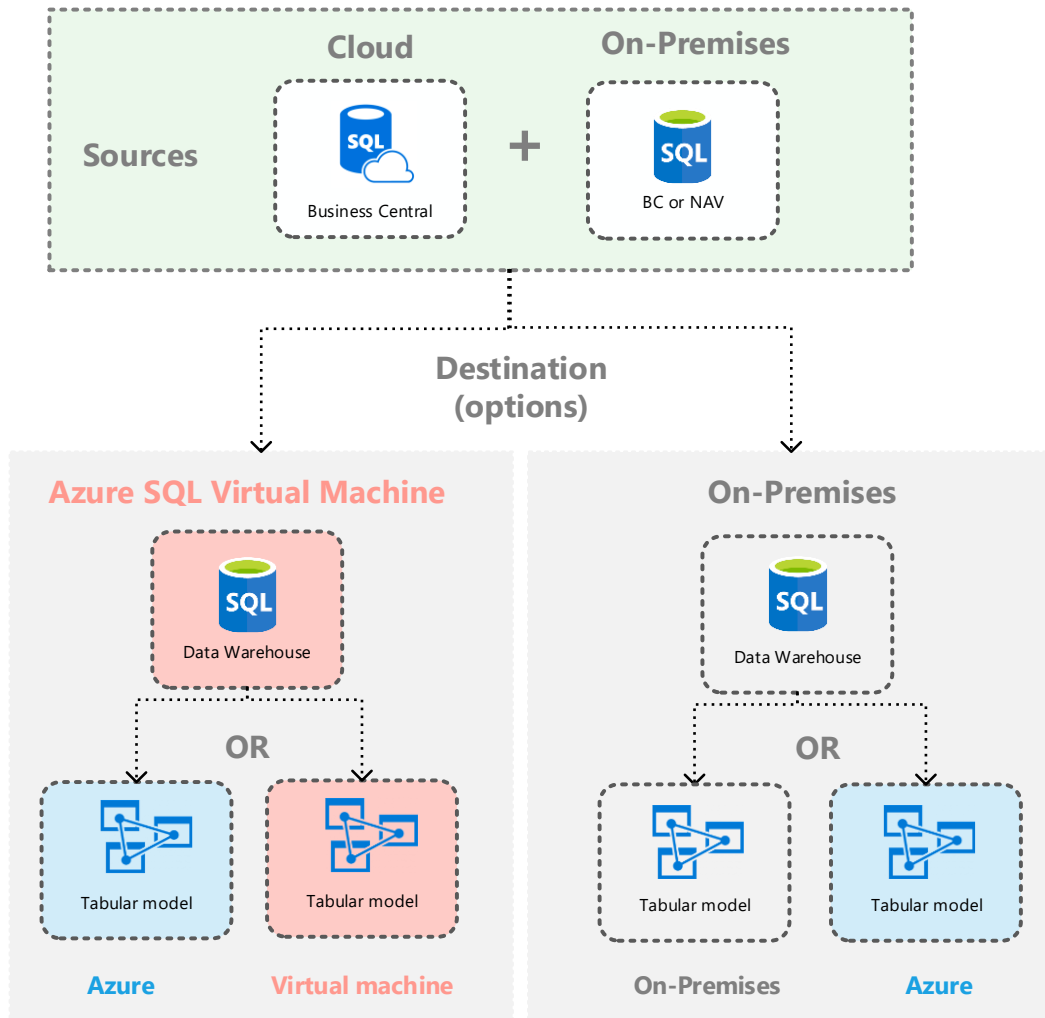
Implementation options

Source

BI4Dynamics can join **BC Cloud** with your legacy **BC or NAV** in one fully integrated BI solution. First selected source in BI4Dynamics must be BC Cloud. That is all. BC or NAV can be added optionally.

Destination

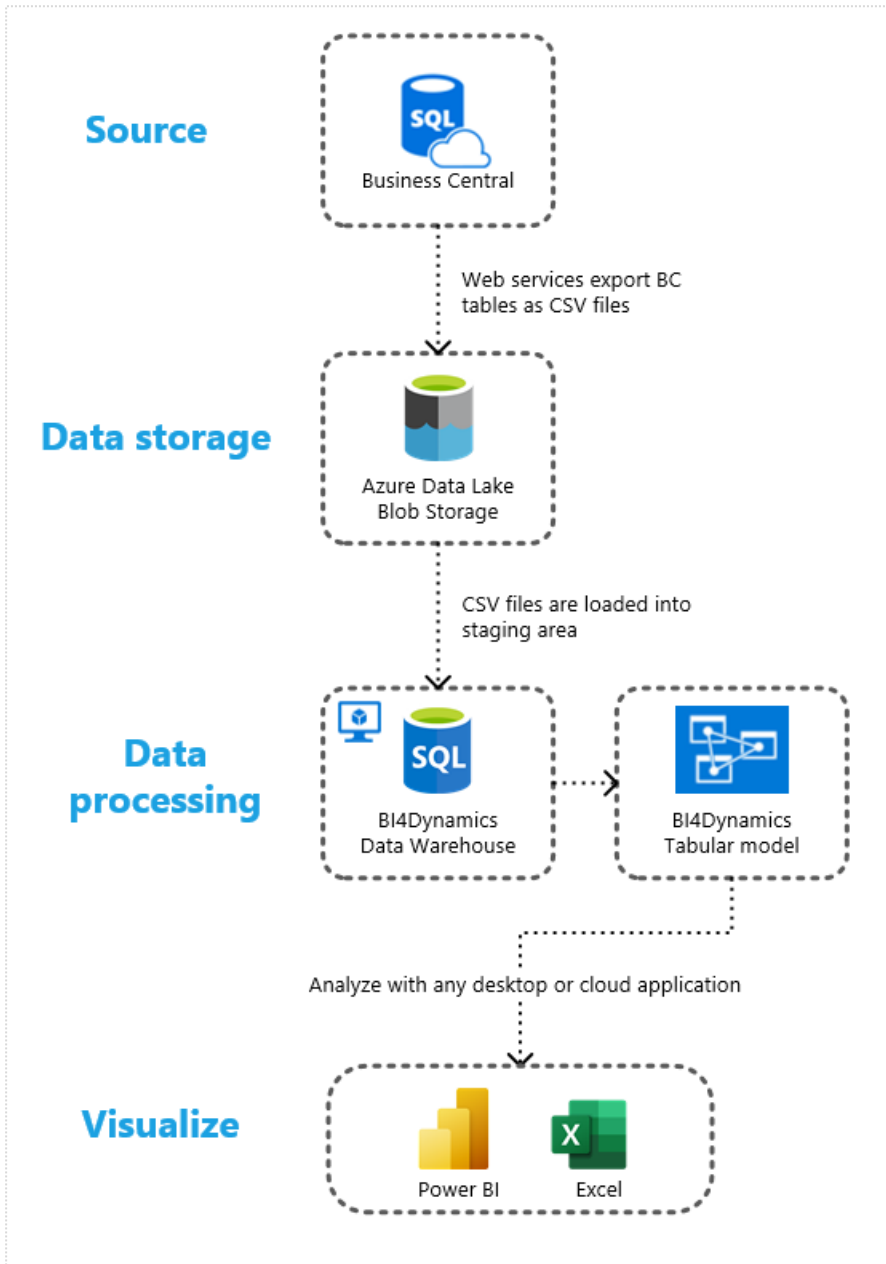
- Data warehouse can be implemented on **Azure SQL Virtual machine** or **On-Premises**.
 - Use VM when company strategy is cloud.
 - Use OP when hardware is available on-premises.
- Analytics can be implemented on the **same PC** (VM or On-Premises) or as **Azure service**.
 - Use same PC when PC is available or costs for PC are low.
 - Use Azure when cloud performance, scalability, and flexibility matter.



4 implementation option for BC Cloud

Data transformation diagram

Data transformation is done in the following steps



1. Export BC data to Azure Data Lake
2. Load data to Data Warehouse staging area
3. Process data within Data Warehouse and Analysis Services
4. Analyze data with visualization tools

Data transformation process

BC database

BI4Dynamics is reading data from BC replica, a synchronized Production database copy. This is not affecting Production operations.

Exporting BC data

Accessing BC database (Production or Replica) with external tools is not possible. BI4Dynamics is exporting data to Azure Data Lake using web services, created by BI4Dynamics extension.



BI4Dynamics extension

BI4Dynamics extension, available from BI4Dynamics is installed to BC tenant. First time setting includes:

- BC tenant information (ID, user)
- Azure Data Lake Storage (subscription)

There are no interactions with IT team (customer or partner) after this step.

The extension will automatically:

- create queries, one query for each exported BC table,
- expose queries as web services,
- read BC metadata (tables, columns, primary keys, table relations, option fields) – that BI4Dynamics will use for customizations.

A standard BI4Dynamics extension will export 150 tables that be used to create the following business areas: Sales, Purchase, Receivables, Payables, Finance, Inventory, Fixed Assets, Jobs and Resources, Production, Service, Bank Accounts, Item Information, and Service.

Running web services

BI4Dynamics creates a docker, that triggers web services. More about docker is in the last chapter of this document.

Web services are using OData protocol. This is a lighter, a little faster protocol than SOAP. BI4Dynamics is controlling and triggering web service execution from outside BC in two ways:

- scheduled (automatically)
- on demand

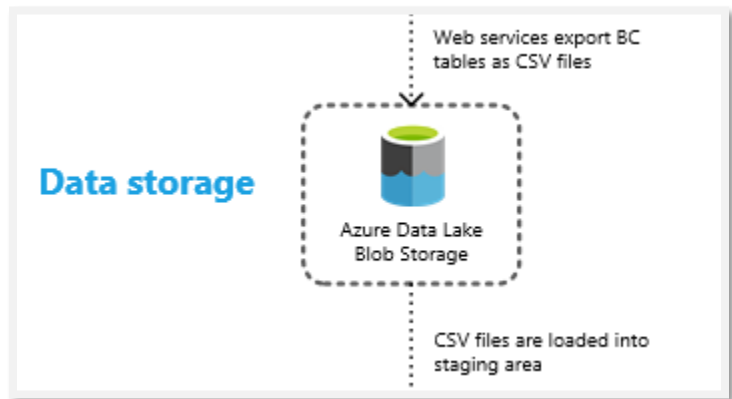
The results are BC tables, exported as CSV files to Azure Data Lake.



Azure Data Lake Storage

BC data are saved in Azure Data Lake storage as CSV files. There are two processes:

- A. import: update new data from BC
- B. read: BI4Dynamics data warehouse reads data and updates or copies it into the data warehouse staging area. This is not export as data are kept in Azure Data Lake.



Import and read process may not necessarily run one after another. Update data can automatically run several times during the day, to load the latest data only, and read process usually runs once a day as a part of data warehouse processing.

Loading data from Azure Data Lake to the data warehouse

Triggering the request

Load data request is executed from BI4Dynamics data warehouse when DW data are processed. This is usually once a day. Loading data from Azure Data Lake to SQL server is done using PolyBase feature of SQL that must be installed. More about PolyBase is in Appendix.

BC table name is kept during all transformations. BC table name equals CSV file name in Azure Data Lake and equals stage table name in data warehouse.

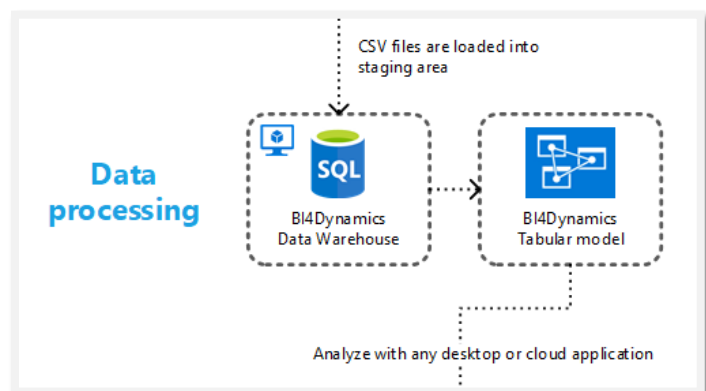
Data Warehouse transformations

BI4Dynamics will load CSV data to SQL server (stage), where DW transformation will be started.

Data warehouse objects (stored procedures, views, dimensions, facts) are created and processed in one data transformation process. (details are available on BI4Dynamics web)

Dimensions and facts

The result of this process are dimensions in the data warehouse.



Analytics

Users would usually not connect to the data warehouse but to the Analysis Services. There are two implementation options where analytics (Tabular model) will be installed. There is no difference in content. Key influencers which option is the right for project are usage and economics. More about this in the next chapter.

Analytics on VM (option 1)

In Option 1 an Analysis Services database (tabular) is installed on SQL server hosted on VM. The same VM is hosting SQL server database engine.

Analytics in Azure Analysis Services (option 2)

In Option 2 an Analysis Services database is installed as Azure Analysis Services.

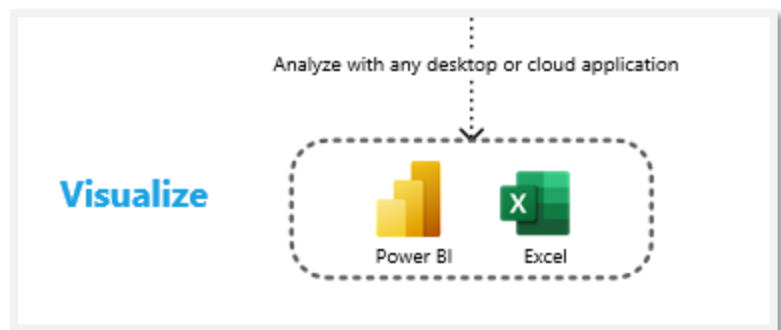
Visualizing and querying

Any BI client that can connect to the Tabular model can be used for querying. BI4Dynamics has standardized ready-made reports for Excel and Power BI.

Both tools can do the job a usage is not exclusive. BI4Dynamics recommends using both tools in the same BI project:

- A free desktop version of Power BI is used for best visualizations and dashboarding,
- An Excel 2013 or higher version is best for ad-hoc reporting and analytics.

Which tool to use depends on the reporting or analysis process – not person or job description.



Implementation options

Daily usage of Azure resource

Usage of data warehouse

SQL Server that hosts data warehouse needs to run to:

- Load data from blob storage
- Process data within data warehouse
- Avail data to Analysis Services while Analysis services is processing

Usage of Analysis services

Analysis services is available during times when users are querying data.

Implementation option

Virtual Machine (VM)

VM hosts SQL Server that is used for DW and analytics. VM can be pause only when data are not being processed or queried.

VM + Azure Analysis Services (Hybrid)

VM hosts SQL server used for DW. Analytics is installed on Azure Analysis Services. VM can be paused after processing (most of the time), Azure Analytics can be paused when users are not querying.

Local Machine (LM)

Solution can be installed and implemented on local server on-premises. Setup is very similar to VM option.

Implementation options	Virtual Machine (VM)	VM + Azure Analysis Services (Hybrid)
Data warehouse	SQL server on VM	SQL server on VM
Analytics	SSAS on VM	Azure SSAS
Daily usage		
Data warehouse	10 h	1 h
Analysis Services	10 h	10 h

Implementation options:

Hybrid (recommended): most common implementation option for production environment, optimal usage of Azure resources, simple managing user access (Azure Active Directory), scalable.

VM: when Azure resources (VM) is already available or available at low price; this can be used also as a development instance.

LM: when local server and SQL license is available on-premises.

Description of Azure services

Azure VM with SQL Server Standard

Azure VM is not expensive and can be easily created. It needs to be set up (IP, users) to operate right.

<https://azure.microsoft.com/en-us/pricing/details/virtual-machines/sql-server-standard/>

Azure Analysis Services

Azure Analysis Services is available in a developer, basic, and standard tiers.

<https://azure.microsoft.com/en-us/pricing/details/analysis-services/>

The Developer tier is recommended for evaluation, development, and test scenarios. It uses shared resources.

INSTANCE	QPUS	MEMORY (GB)
Developer	10	3

The Basic tier is a general-purpose tier and recommended for production solutions with small Tabular models, limited user concurrency, and simple data refresh requirements.

INSTANCE	QPUS	MEMORY (GB)
B1	40	10
B2	80	16

Azure Data Lake Storage

This is a minor cost.

Docker (Container instance)

Docker costs depends on BC database size and update frequency. More about Docker in Appendix.

License Costs (USD)

BI4Dynamics license cost

Option	Essentials	Standard
Application Areas	any 3 from 6 standard modules	6 standard modules
Customizations	Dimension wizard	Full development wizard
Subscription per month	\$ 150	\$ 300
Included users	10	30
Maximum users	10	50
Price for additional user	Not available	\$ 8

Standard areas are Sales, Purchase, Inventory, Finance, Receivables, Payables.

BI4Dynamics & Azure Services license cost

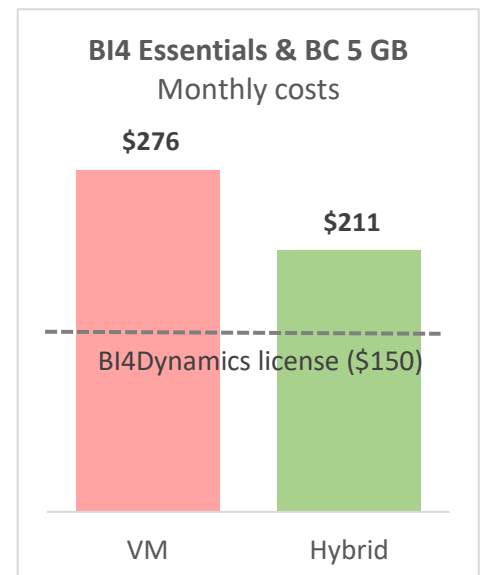
Calculations are based on:

- Data warehouse processing **every workday**, 1 hour daily
- Analysis Services available to users **every day**, 10 hours daily.

Scenario 1:

BI4Dynamics Essentials & BC database size 5 GB

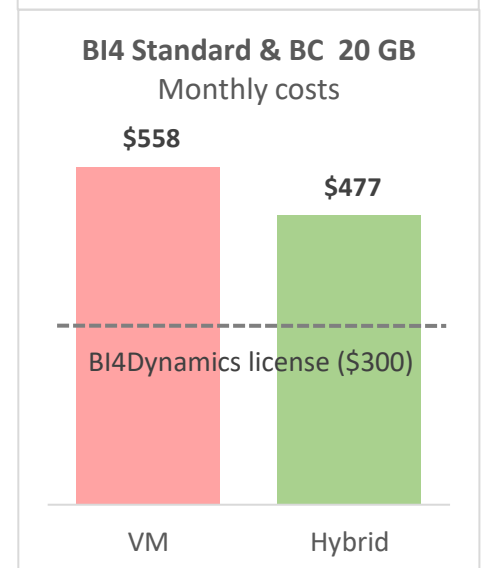
Resource	Azure Service	Cost per hour	Daily usage (h)		Days in use	Monthly Cost	
			VM	Hybrid		VM	Hybrid
Data Warehouse	B4MS	\$ 0,582	10	1	20	\$ 116	\$ 12
Analytics	D1	\$ 0,132	10	10	30	\$ 40	
Storage + Docker						\$ 10	\$ 10
Total Azure - BC database is 5 GB						\$ 126	\$ 61
BI4Dynamics Essential (3 areas, 10 users)						\$ 150	\$ 150
Total costs:						\$ 276	\$ 211



Scenario 2:

BI4Dynamics Standard & BC database 20 GB

Resource	Azure Service	Cost per hour	Daily usage (h)		Days in use	Monthly Cost	
			VM	Hybrid		VM	Hybrid
Data Warehouse	B8MS	\$ 1,165	10	1	20	\$ 233	\$ 23
Analytics	B1	\$ 0,430	10	10	30	\$ 129	
Storage + Docker						\$ 25	\$ 25
Total Azure - BC database is 20 GB						\$ 258	\$ 177
BI4Dynamics Standard (6 areas, 30 users)						\$ 300	\$ 300
Total costs:						\$ 558	\$ 477



Scope and cost of installation, training, and customization services can vary and are not included in this calculation.

License costs (EUR)

BI4Dynamics license cost

Option	Essentials	Standard
Application Areas	any 3 from 6 standard modules	6 standard modules
Customizations feature	Dimension Wizard	Full development Wizard
Subscription per month	125 €	250 €
Included users	10	30
Maximum users	10	50
Price for additional user	Not available	7 €

Standard areas are Sales, Purchase, Inventory, Finance, Receivables, Payables.

BI4Dynamics & Azure Services license cost

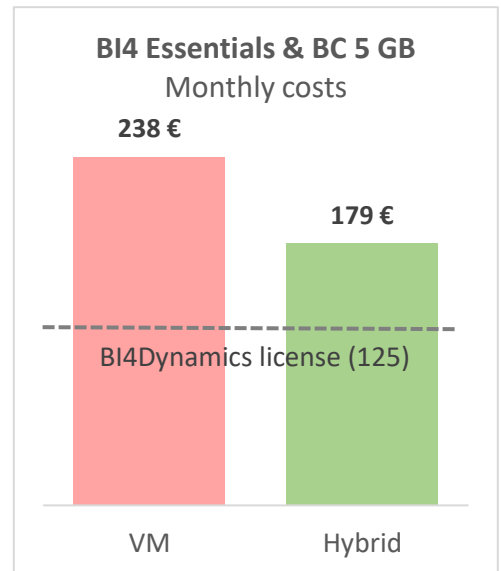
Calculations are based on:

- Data warehouse processing **every workday**, 1 hour daily
- Analysis Services are available to users **every day**, 10 hours daily.

Scenario 1:

BI4Dynamics Essentials & BC database size 5 GB

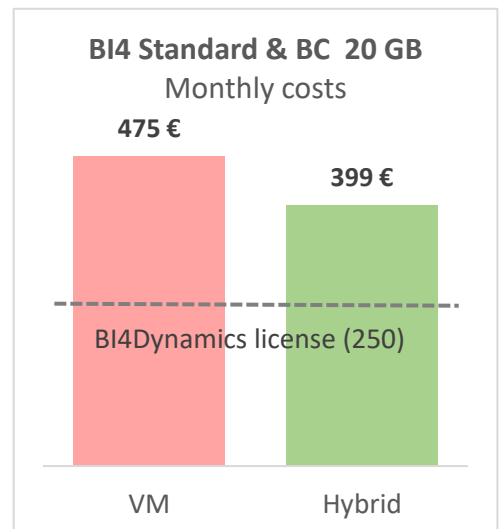
Resource	Azure Service	Cost per hour	Daily usage (h)		Days in use	Monthly Cost	
			VM	Hybrid		VM	Hybrid
Data Warehouse	B4MS	0,513 €	10	1	20	103 €	10 €
Analytics	D1	0,112 €	10	10	30		34 €
Storage + Docker						10 €	10 €
Total Azure - BC database is 5 GB						113 €	54 €
BI4Dynamics Essential (3 areas, 10 users)						125 €	125 €
Total costs:						238 €	179 €



Scenario 2:

BI4Dynamics Standard & BC database 20 GB

Resource	Azure Service	Cost per hour	Daily usage (h)		Days in use	Monthly Cost	
			VM	Hybrid		VM	Hybrid
Data Warehouse	B8MS	1,025 €	10	1	20	205 €	21 €
Analytics	B1	0,363 €	10	10	30		109 €
Storage + Docker						20 €	20 €
Total Azure - BC database is 20 GB						225 €	149 €
BI4Dynamics Standard (6 areas, 30 users)						250 €	250 €
Total costs:						475 €	399 €



Scope and cost of installation, training, and customization services can vary and are not included in this calculation.

Appendix

What is PolyBase?

PolyBase enables SQL Server instance to process T-SQL queries that read data from external data sources. SQL Server 2016 and higher can access external data in Hadoop and Azure Blob Storage. We recommend using SQL2019. PolyBase is feature in standard SQL Edition and must be selected during SQL installations, both on Premise and in Azure.

In BI4Dynamics project, PolyBase feature reads Azure Data Lake files directly, without the need of installing a connector or any other interface. CSV files in Azure Data Lake are processed as external tables (this is a PolyBase feature) and land in the data warehouse as staging tables.

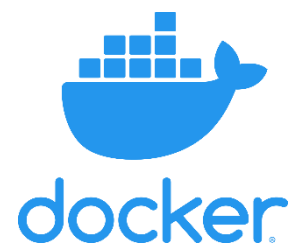
What is Docker?

BI4Dynamics uses docker for running BC web services that export BC data to Azure Data lake.

Cloud virtualization can be made by

- **Virtual machine:** more choices of setup hardware and services
- **Docker:** a lighter version of VM with more focus on how the image is built and what it is used for

Docker is Azure Container Instance that is used for a specific task. It can be compared to a virtual machine that runs a specific process (one or more). The advantage of docker is fast creation from image (1 minute) and orchestration of many dockers with one software (Kubernetes) by a service provider.



Docker (container group) pricing

The price of running docker depends on the number of updates required by Docker. If running more often, more than scoped, the cost will be covered by the customer. In this calculation we estimated that docker is running 2 hours every working day.

System requirements and prerequisites

Permissions

BC Cloud

- BC Cloud credentials: **Dynamics 365 administrator** role and **Application Developer** for app registration
- Same BC Extensions must be installed on Production and on Sandbox.

Azure

- Be local **administrator** on the Azure VM where BI4Dynamics is installed.
- **Azure Storage** info: Subscription, Resource group, Account name, Container name and Blob Key

Hardware and software

Azure SQL Virtual Machine

Use Azure SQL option, that is VM with SQL 2019 Standard edition preinstalled.

Operating system: Azure SQL VM comes with Windows Server 2019.

SQL Server (software)

- SQL Server Database engine
- SQL Server Analysis Services Tabular (when implementing Analysis Services locally)
- Integration services
- PolyBase (PolyBase Query Services and Java connector for HDFS data sources)

PowerShell, NET Framework version 4.7.2 or higher

Azure CLI: set of commands that create and manage Azure resources, available [here](#).

Other resources

Every implementation

Azure Storage Account: Storage Account with Container used for storing BC tables that are exported from BC.

Azure Docker: specialized cloud engine that manages the export of BC tables to Blob Storage.

Implementation option is Azure Analysis Services

Azure Analysis Services: in-memory database available for user queries by any BI client (Excel, Power BI)

On-Premises Gateway: provides bridge data transfer between on-premises data and Microsoft cloud services.

Front-end tools

- Excel 2016 and higher to connect to Azure Analysis Services
- Excel 2013 and higher to connect to On-Premises Analysis Services
- Power BI desktop (always use the latest version) to connect to any model of Analysis Services.