FORCE EDGE CONNECT

System Requirements

Version 240112

Content

Disclaimer

The data in this document is based on standardized scenarios. This scenario assumes 50 machines per node and approx. 30 signals per machine. Other requirements may be necessary for customer-specific scenarios and IT landscapes. In this case, our consultants will discuss these with the relevant IT departments in order to plan a possible hardware environment.

Some features like the "Machine Repository" mentioned below are not included in the standard EDGE package and must be purchased separately.

Docker Technology

- **For productive use of FORCE EDGE CONNECT, we recommend a Linux operating system with Docker runtime environment for performance reasons.**

- Alternatively, we assume Windows Server 2019
  (Hyper-V + Ubuntu VM + Docker)

- The provision, installation and maintenance of the Docker runtime environment is the responsibility of the customer.

⚠ FORCAM does not assume any warranty regarding stability and performance for the Docker runtime environment!

⚠ Windows desktop operating systems are not supported.

System Requirements (Customer Responsibility)

EDGE Configuration (1 Instance) Minimal Hosting Requirements

The minimal hosting requirements for the different operating systems are as follows.

Ubuntu
– Ubuntu >= Ubuntu 20.04.3 LTS or a newer Version of Ubuntu 20.04.
– Docker Engine >= 20.10.22
– Docker Compose version >= V2.14.1
– OpenSSL version: >= OpenSSL 1.1.0l
– AdoptOpenJDK 11 64 Bit Version >= 11.0.11

Infrastructure:
– >= 8 GB RAM
– Quad-Core processor >2Ghz
– Minimum 30 GB free SSD disc space

Windows with Ubuntu VM
– Windows Server 2019 (>= Version 1809)
– Hyper-V must be enabled in Windows
– Ubuntu 20.04.03 VM in Hyper-V:
    – Docker Engine = 20.10.22
    – Docker Compose Version = V2.14.1
    – OpenSSL version: >= OpenSSL 1.1.0l
    – AdoptOpenJDK 11 64 Bit Version >= 11.0.11

Infrastructure of the Ubuntu VM:
– >=8 GB RAM (must be assigned to the VM)
– 4 vCPUs > 2Ghz (must be assigned to the VM)
– Minimum 50 GB free SSD disc space (must be assigned to the VM)

Client Requirements

For the Browser: Google Chrome or Microsoft Edge with Chromium engine.

Additional Information

FORCE EDGE CONNECT Configuration has no direct impact on the machine connection. Therefore, it can be installed on the "FORCE EDGE NODE" server if there is only one single node required.

There are two options for installing the EDGE in one plant. We recommend option 1, which is to install the EDGE Configuration and the EDGE Node on separate servers. Option 2 would be to install both on the same server.

Option 1:
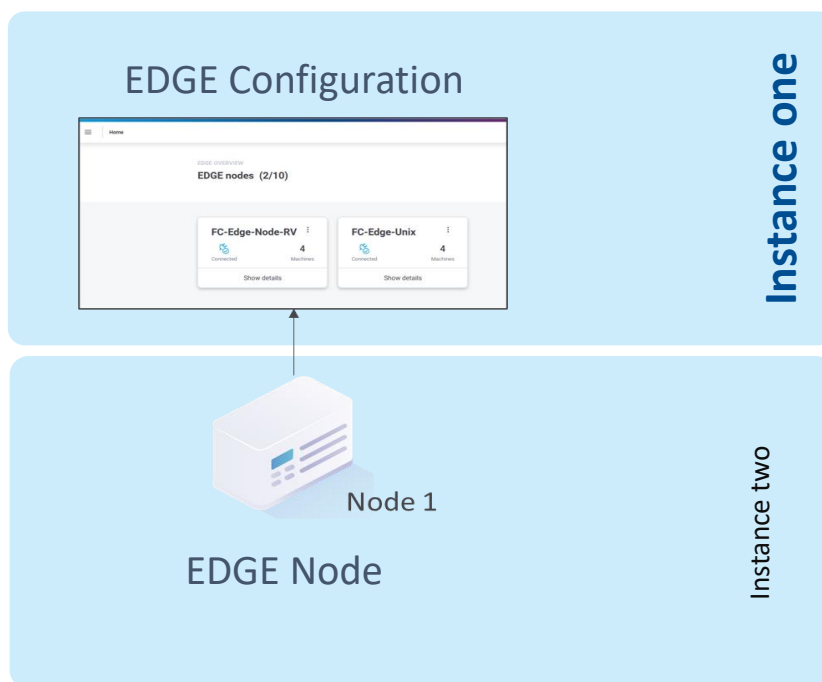
Fig. 1: Installing the EDGE Configuration and the EDGE Node on separate servers

Instances can be virtual machines.

Option 2:

One Instance

EDGE nodes (2/10)

FC-Edge-Node-RV	FC-Edge-Unix
Connected 4 Machines	Connected 4 Machines
Show details	Show details

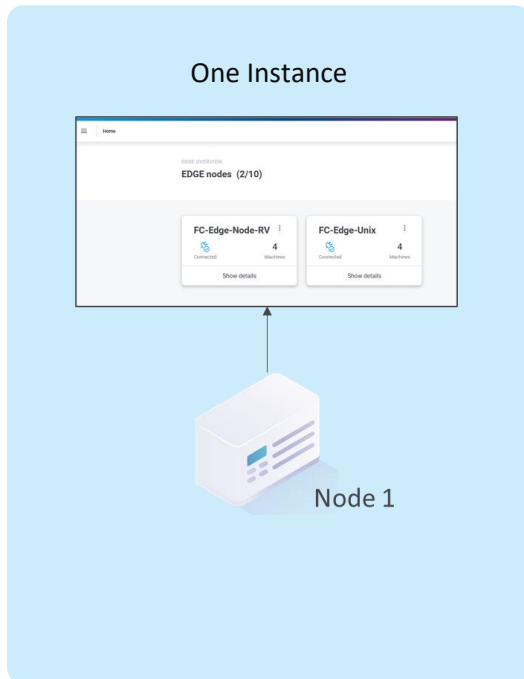Node 1

Fig. 2: Installing the EDGE Configuration and the EDGE Node on the same server

Instances can be virtual machines.

⚠ If option 2 (EDGE Configuration and EDGE Node on the same server) is used, the system requirements of <u>both</u>, EDGE Configuration and EDGE Node, must be considered and added up.

EDGE Node (1 Instance) Minimal Hosting Requirements

Ubuntu

- Ubuntu 20.04.3 LTS or a newer Version of Ubuntu 20.04.
- Docker Engine >= 20.10.22
- Docker Compose version >= V2.14.1
- OpenSSL version: >= OpenSSL 1.1.0l
- AdoptOpenJDK 11 64 Bit version >= 11.0.11

Infrastructure:

- >= 8 GB RAM
- Quad-Core processor > 2 Ghz
- Minimum 60 GB free SSD disc space
  - *60 GB is the bare minimum to run the EDGE – in case Data Lake is used, we recommend more disc space.*

Windows with Ubuntu VM

- Windows Server 2019 (>= Version 1809)
- Hyper-V must be enabled in Windows
- Ubuntu 20.04.03 VM in Hyper-V:
  - Docker Engine = 20.10.8
  - Docker Compose Version = 1.29.2
  - OpenSSL version: >= OpenSSL 1.1.0l
  - AdoptOpenJDK 11 64 Bit Version >= 11.0.11

Infrastructure of the UBUNTU VM:

- >=8 GB RAM (must be assigned to the VM)
- 4 vCPUs > 2Ghz (must be assigned to the VM)
- Minimum 80 GB free SSD disc space (must be assigned to the VM)
  - *80 GB is the bare minimum to run the EDGE – in case Data Lake is used, we recommend more disc space.*

Additional Information

The <u>requirements and number of nodes</u> needed depends on:

- The number of connected machines
- The number of configured signals
- The number of configured communication interfaces (DNC/ MDC plugins)
- The frequency of outgoing events

The <u>number of assets that can be connected to a node</u> largely depends on:

- the types of controllers to be connected
- the number and change frequency of signals per asset

Based on the standard machine MDC/OEE defined by FORCAM, 50 machines can be connected to one node.
Definition of a standard machine MDC/OEE:

- Controller: Siemens S7
- Signals per machine: 30
- Signal change rate: 1.6 Hz (1 signal change / 0.6 seconds)
- Northbound event frequency: 0,1 Hz (1 event / 10 seconds)
- No process data acquisition

User Rights for Installation

It is mandatory to create a non-root user.

The rights must be assigned to the user to be able to install correctly.

User

- Must be a non -root user (name doesn't matter)
- This user must have the right to run the docker + docker compose command
- User id while installing must be the id of the current user (number):
  - o *"id"* (command)
- Add the current user into the docker group:
  - o *"sudo usermod -aG docker $USER"* (command)

EDGE Architectural Concept
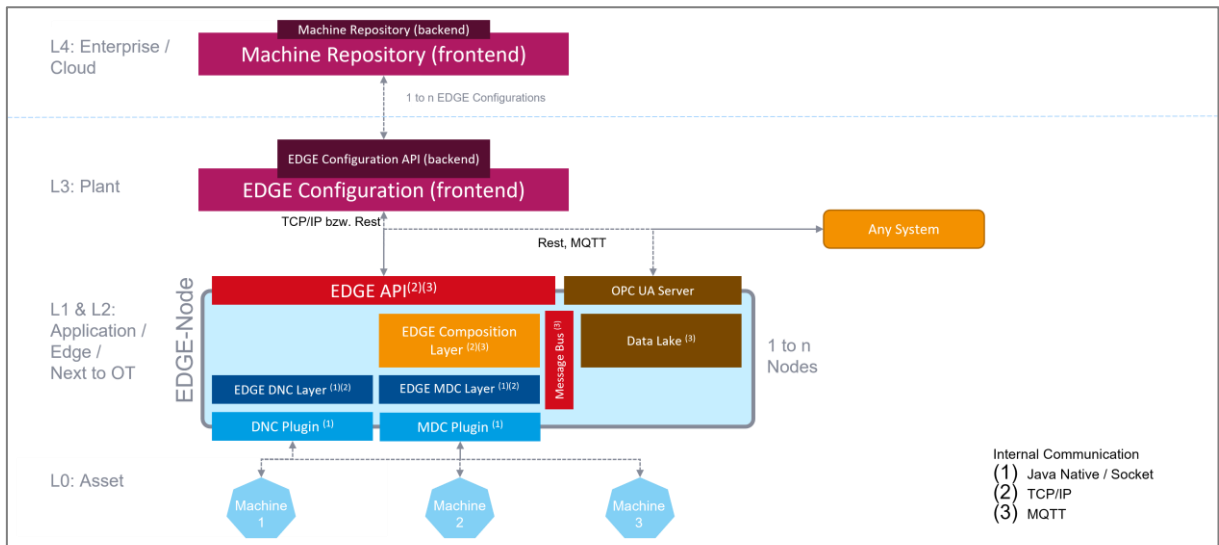
Fig. 3: Basic EDGE architectural setup for the use of additional nodes

L4:   Machine Repository as a central component with various templates for managing the machine park

L3:   User interface with a graphic representation of FORCE EDGE CONNECT and the user administration

L2:   Composition layer for data processing with MDC and DNC plugins, Data Lake, and OPC UA

L1:   Communication software component that can be accessed using plugins

L0:   All assets to be connected

Network Requirements

General Network Requirements

- Active Internet connection

ⓘ If an online license is involved, the following URLs must be available:
Primary: **https://qlm1.net/forcam/qlmlicenseserver/qlmservice.asmx**
Fallback: **https://qlmdr.com/forcam/qlmlicenseserver/qlmservice.asmx**

Ports/Firewall

Ports that must be open:
- 60067 https
- 4840 (OPC UA)
- 60066 https FORCE EDGE UI

Optional ports:
- 1883 MQTT
  - 61616 ActiveMQ
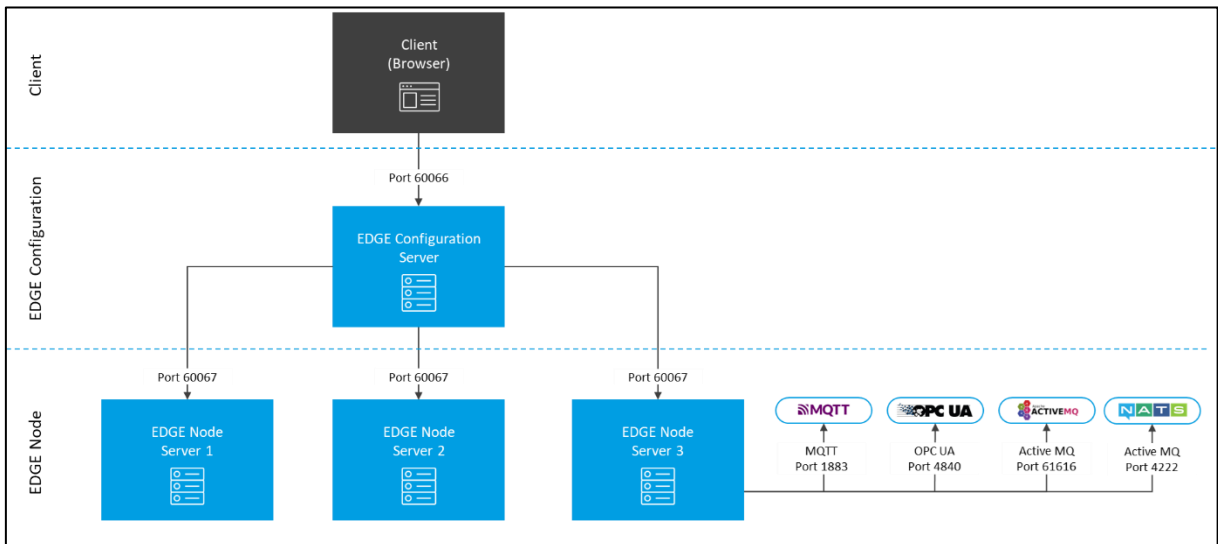   (if EDGE CONNECT is used with MES FLEX Track & Trace)

Fig. 4: Communication of FORCE EDGE CONNECT with ports and paths

HTTPS Certificates

Installation of the EDGE CONNECT Installer

- Trusted certificates or self-signed certificates are possible
  <u>Must</u> contain host name; IP address is <u>not</u> supported

New certificates must be provided for each update.

The certificate must have the following PEM format:

```
-----BEGIN CERTIFICATE-----
<<Public key>>
-----END CERTIFICATE-----
-----BEGIN PRIVATE KEY-----
<<Private key>>
-----END PRIVATE KEY-----
```

ⓘ FORCAM is not responsible for generating or maintaining the certificates.
Customers have to provide the necessary certificates.

An individual certificate must be provided for each EDGE component (EDGE Configuration, EDGE Node or Machine Repository). It is possible to use the same certificate for each EDGE component.

⚠ We strongly recommend not to use a wildcard certificate.

⚠ Although it is possible to use the same certificate for each EDGE component, we recommend using different certificates for each EDGE component.

No encrypted certificate files (PKCS 12 format) can be used.
Only files using the PEM format are allowed.

Whenever a web client (for example, a web browser) connects to the UI using a self-signed TLS certificate, a warning informs the user that the website could not be verified as a trusted website. Depending on the browser type, there are settings to suppress these warnings.
Note, that suppressing the warnings may lead to insecure connections.

ⓘ To get the host name from the Ubuntu system, run below command:
```
hostname -A
```

EDGE Node in the EDGE Configuration

During the addition of an EDGE Node in the EDGE Configuration please use a public certificate that has to have the following format:

```
-----BEGIN CERTIFICATE-----
<<Public key>>
-----END CERTIFICATE-----
```

Data Lake Requirements

Depending on the use case, the memory usage of the Data Lake may vary significantly. Especially the type and size of the sent data and the interval in which data is transmitted have a great impact on memory consumption. Therefore, the reference values stated in this document should definitely be taken into account and set in relation to the respective use case.

We recommend that you store the data in the Data Lake for a maximum of 100 days.

ⓘ The values listed below must be taken as reference values, they cannot state the real memory usage, as this heavily depends on the asset used. The values result from a test scenario simulation.

Memory consumption example

Data Lake base memory consumption
Memory usage per configured asset = 5 KB

Data delivered by asset:
Memory usage per signal = 0.4 KB
For signals with the following characteristics:

- String signal
- Sent via MQTT
- String length = 256 characters

Memory usage per Event = 0.3 KB
For an event with the following characteristics:

- State event
- State string length = 256 characters
- Contains 1 list with 4 entries (each entry has 256 characters)

Data that 3rd party systems can deliver to the EDGE:
Business parameters = 0.5 KB
For a business parameter with the following characteristics:

- Parameter length = 255 characters

Set Signal Value = 0.6 KB
For an event with the following characteristics:

- String length = 256 characters

Calculation example

Basic calculation formula: (Consumption in KB*seconds* minutes* hours*day) </to MB/to GB

Memory consumption in 100 days for 1 signal per second
(0,4KB*60*60*24*100)/1024/1024 = **3,3 GB**

Memory consumption in 100 days for 1 event every 10 seconds
(0,3KB*6*60*24*100)/1024/1024 = **0.25 GB**