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IT specifications - SaaS

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1 Introduction

This sheet should give an overview of the IT requirements for the plus10 Software as a Service solution.

2 Topology

Our software consists of several services, which are mainly:

- **DataCollector**: Collecting data from different sources, pre-processing data and sending it to our central services
- **API/Analysis service**: Processing and analyzing data, provision of results
- **Authentication**: Authentication of users/clients for our services
- **Database**: Storage of collected and processed data

The services are running as Software as a Service and are managed by plus10.

Only the *DataCollector* needs to be deployed individually.The *DataCollector*, which is used to collect data from machines in the factory, has to be deployed as near to the data source as possible, in terms of the network topology. This is due to the fact, that we are setting the timestamp of the collected data in the *DataCollector* (as our experience is, that the clocks of PLCs are often not synchronized and/or are drifting). Based on that, we need a near to deterministic network latency between the data source and the *DataCollector*.

The standard solution for the deployment of the DataCollector is deploying it on a dedicated Computer, which is connected to the machine network (best case: connected to the Switch, at which the PLCs are connected). We recommend using an Industrial PC (IPC). Depending on the number and location of machines, which need to be connected, multiple Computers can be optimal. Please consider an uninterruptible power supply (UPS) for IPCs to ensure proper shutdowns when machine main switches are turned off.

Below you find an overview of the standard IT service topology, including the needed ports.

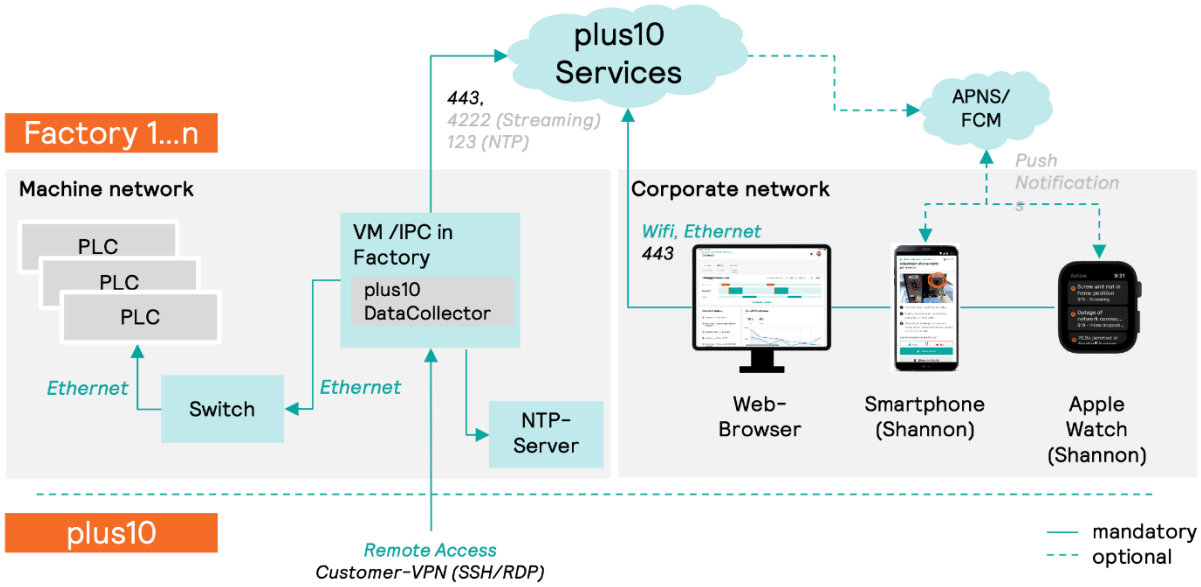

Figure 1: IT Topology (Factory part)

3 Software as a Service

Via the plus10 Cloud, you can reach our web services (Front-end, API). The clients (end users and *DataCollector* instances) are connecting to it. Here, we are also storing the processed data. All access points require authentication, and all connections are encrypted.

We are using Microsoft Azure as a Cloud Provider and are deploying environments as standard to Frankfurt, Germany.

3.1 Access

Your instance will be reachable via our plus10-webservices.com domain.

You will get a user with Administrator rights from us. With it, you can create users with specific rights.

3.2 Connection

Encryption

In general, all connections to the cloud environment are encrypted with TLS.

3.3 Data storage

Your data is stored in a dedicated, single-tenant database. This means, the database is not shared with other customers. This way, your data is isolated by design.

3.4 Data retention

We are storing calculated data for two years (e.g., downtime data). Raw data (plc signal measurements and feature measurements) is stored for three months.

3.5 Backup

Every night a data backup is performed. By default we store the latest two backups.

4 IT system requirements

In general, the required computing capacities are depending on several relative factors.

Mainly the following variables are determining the required computing capacities:

- Quantity of data (commonly PLC signals) needed to be processed per second
- Period of data retention

4.1 Data Collector

General system configuration

- Standard host: Dedicated Host in factory network (e.g., Industrial PC)
- Operating system: Windows 10
- Software needed to be installed:
  - plus10 DataCollector
- Needed User rights:
  - Install specified software
  - Start plus10 DataCollector
  - Restart system
- Network ports
  - At least one port for PLC network (maybe more if dedicated connections to each PLC is possible / required)
  - One separated port for reaching network where central services (VM or cloud) is located
- NTP
  - It is crucial that the system clock is synced with an NTP server to ensure that the timestamp of the system matches the actual time. You can either use an NTP server hosted on plus10 central services or your own NTP server.
- Computing capacity
  - As a best practice the base load of the computer (including data collection) should not be higher than 50%, so that there is enough capacity left for other services like Anti-virus software

If you use an industrial PC provided by plus10, Windows 10 IoT is installed. Nevertheless, you can use your own Windows image and/or include the PC in your domain. If you have specific (IT Security) requirements, you can apply them on the IPC.

In general, you are responsible for maintaining the host used for the Data collector (OS Updates etc.). If plus10 should maintain the host completely, this can be defined in separate support contract.

Network Port configuration

Service	Protocol	Outgoing port	Incoming port	Description	Optional
API	HTTPS	443	-	-	No
Machine data streaming	TCP	4222	-	Standard (high-performance Streaming)	Yes (alternative: WebSocket)
	WebSocket	443	-	Fallback if 4222 not possible	Yes
NTP	UDP	123			Yes (alternative: internal NTP server)
Remote access	RDP		3389		Yes (alternative: TeamViewer)
	TeamViewer	5938/443	-		Yes (alternative: RDP)

Outbound Internet URLs (only for SaaS):

Service	**URL**	**Port**	**Description**
Plus10 Services	https://plus10-webservices.com	443, (4222, 123)	

Example capacities:

- 1 Machine with one PLC, collecting in total 1,000 signals with 100 ms sampling rate
  - CPU Cores: 2
  - RAM: 4 GB
  - Disk space: 64 GB
- 1 Manufacturing line with 5 PLCs, collecting in total 10,000 signals with 100 ms sampling rate
  - CPU Cores: 4

- RAM: 8 GB
- Disk space: 128 GB

- 5 Manufacturing lines with 5 PLCs, collecting in total 50,000 signals with 100ms
  - 5 PCs with each
    - CPU Cores: 4
    - RAM: 8 GB
    - Disk space: 128 GB

5 Data Traffic

From PLC(s)/Datasources to *DataCollector*

- Data: Raw plc signals, which are requested by the *DataCollector*
- Required bandwidth is determined by number of signals and sampling rate

Example calculation (estimation):

Number signals	*Sampling rate*	*KB/s*
1,000	100 ms	~13,0
10,000	100 ms	~129,0
100,000	100 ms	~1288,0

Assumption: 70% boolean (1 bit), 30% real data (32 bit) types, 78 bit package overhead

From DataCollector to *Central Services*

- Data: Raw plc signals, Calculated features (constructed from signals)
- Only changed data values are sent (~50% less data)
- Required bandwidth is determined by number of signals, number of features (constructed from signals) and sampling rate

Example calculation (estimation):

Number signals	*Number features*	*Sampling rate*	*KB/s*
1,000	600	100 ms	8,2
10,000	4,000	100 ms	58,8
100,000	40,000	100 ms	588,6

Assumption: 70% boolean (1 bit), 30% real data (32 bit) types, 78 bit package overhead, Signals are changing its value on average every 5th sample.

6 Authentication

We provide a dedicated Authentication service (OAuth 2-based). With it, you can register users and grant them role-based access to our services. Each user has to login via this Authentication service in order to get access to our services.

7 Client devices

7.1 Web-Browser

Supported Browser

- Chrome (> v79)
- Firefox (> v70)
- Safari (> v10)
- Microsoft Edge (> v79)

Network Port configuration

Service	Protocol	Outgoing port	Incoming port	Description	Optional
API, Front-end	HTTPS	443	-	-	No

Outbound Internet URLs (for SaaS):

Service	**URL**	**Port**	**Description**
plus10 Services	https://plus10-webservices.com	443	

7.2 Smartphone (only for Shannon®)

Supported devices/OS

- iOS (minimum: iOS 12)
- Android (minimum: Android 8)

7.2.1 iOS

Supported devices

- Minimum: iOS 12

Network Port configuration

Service	Protocol	Outgoing port	Incoming port	Description	Optional
API, Front-end	HTTPS	443	-	-	No
Google Firebase	HTTPS/TCP	443, 5228-5230	-	Register for Push notifications	Only needed for Shannon

Cloud Messaging					
Apple Push Notification Service	HTTPS/TCP	443, 5223	-	Receive Push notifications	Only needed for Shannon

Outbound Internet URLs:

Service	URL	Port	Description
Plus10 Services	https://plus10-webservices.com	443	
Google Firebase Cloud Messaging	Google IP-Range or FQDN-whitelisting	443, 5228-5230	Register for Push notifications (Shannon)
Apple Push Notification Service	17.0.0.0/8	443, 5223	Receive Push notifications (Shannon)

Availability:

The app is available via the Apple AppStore.

7.2.2 Android

Supported devices

- Minimum: Android 9

Network Port configuration

Service	Protocol	Outgoing port	Incoming port	Description	Optional
API, Front-end	HTTPS	443	-	-	No
Google Firebase Cloud Messaging	HTTPS/TCP	443, 5228-5230	-	Sending Push notifications to clients	Only needed for Shannon

Outbound Internet URLs:

Service	URL	Port	Description
Plus10 Services	https://plus10-webservices.com	443	
Google Firebase Cloud Messaging	Google IP-Range or FQDN-whitelisting	443, 5228-5230	Register for Push notifications (Shannon)

Availability:

The app is available via the Google PlayStore (Business). The app is only visible after plus10 has added the Google Play Company ID of your company to its configuration.

7.3 Apple Watch (only for Shannon®)

Supported devices

- watchOS (minimum: watchOS 7)

Network Port configuration

Service	Protocol	Outgoing port	Incoming port	Description	Optional
API, Front-end	HTTPS	443	-	-	No
Google Firebase Cloud Messaging	HTTPS/TCP	443, 5228-5230	-	Register for Push notifications	Only needed for Shannon
Apple Push Notification Service	HTTPS/TCP	443, 5223	-	Receive Push notifications	Only needed for Shannon

Outbound Internet URLs (only for SaaS):

Service	**URL**	**Port**	**Description**
Plus10 Services	https://plus10-webservices.com	443	
Google Firebase Cloud Messaging	Google IP-Range or FQDN-whitelisting	443, 5228-5230	Register for Push notifications (Shannon)
Apple Push Notification Service	17.0.0.0/8	443, 5223	Receive Push notifications (Shannon)

7.3.1 Installation of Shannon® App

In order to install the Shannon® App on an Apple Watch, the Shannon® iPhone App has to be placed on a paired iPhone. If that is the case, you can open the “Watch”-App on the iPhone to install it. In the “Watch”-App, select a Watch (if it is not already) and scroll to the list of available Apps. There you should see the Shannon®-App. Tap on “Install”, to install the App on the Apple Watch.

To install an App on an Apple Watch, the Apple Watch has to be connected via Bluetooth with the paired iPhone. For that, Bluetooth needs to be enabled on both devices. In addition, in the

“Watch”-App, you have to select the correct Apple Watch by tapping on “All Watches” and then selecting the required Apple Watch.
The installation can sometimes take some time (several minutes). Sometimes the installation might also fail, then please tap on “Install” again.
If the Shannon® App does not appear on the Apple Watch, try to restart the Apple Watch. After restart, the Shannon® App should be present (restarting the Apple Watch can take several minutes).

7.3.2 Configuration of Apple Watch for Shannon® App

- Connect the Apple Watch with a Wi-Fi Network
- Keep Shannon® App active: In the “Watch”-App, tap on “General” and then “Wake Screen”. Under “Return to clock”, choose “After crown Press”. With that setting, the Shannon® App will be in the foreground of the App till one presses the crown.

7.3.3 First steps with Shannon® App

When you open the Shannon® App the first time after installation on an Apple Watch, it asks you to enter the Server URL (plus10 Shannon® Web-Service) and the (plus10) Authentication Service URL, you want to connect to. This is only needed for the first connection.

You are getting these URLs from the plus10 Support, if you do not know them.

Often the Server URL and the Auth URL have the same Domain/FQDN. In this case, you only need to enter one URL and press “connect”. It will then guess the other URL.

When having entered the URLs, tap “connect”. The app then tries to reach the services. If it was successful, the input fields have a green border, otherwise a red one.

After a successful connect, the URLs will be stored, and you can only change them by reinstalling the app. You can now login in the app.

If an Apple Watch is not connected to the paired iPhone, in the header bar of the Apple Watch a red icon is shown to indicate that. For the usage of the Shannon® App, that can be ignored, as the application is working also without the paired iPhone, as long as it is connected to Wi-Fi.

7.3.4 Update of Shannon® App

To update the Shannon® App, please first install the update on the iPhone. After that, the app on the Apple Watch is automatically updated, as soon as it is connected to the paired iPhone.
To update an App on an Apple Watch, the Apple Watch has to be connected via Bluetooth with the paired iPhone. For that, Bluetooth needs to be enabled on both devices. In addition, in the

“Watch”-App, you have to select the correct Apple Watch by tapping on “All Watches” and then selecting the required Apple Watch.
On the App list in the “Watch”-App, you should see a spinning wheel next to the Shannon®-App while it is updating.

7.3.5 Problems

- **Reset of the Shannon® Web-Service and/or Authentication Service URL:** You have to uninstall and install the Shannon® App in order to being able the enter new URLs.
- **Switch Apple Watch in “Watch”-App**: Tap on “All Watches”, disable automatic pairing and then tap on the requested Apple Watch.

8 Maintenance

8.1 Updates

We are constantly improving our software with integrating new features or doing technical updates.
The standard procedure for updating DataCollector instances is that the plus10 support is updating the deployed services via Remote access.
Arrangements regarding update policy including update authorization and update frequency as well as time windows will be defined company-specific.

8.2 Host (OS) Updates

Performing updates of the OS and non-plus10 Software on the used hosts, is in general done by the customer IT. If this is not preferred or possible, a specific agreement for these updates can be defined.

8.3 Remote access

In order to maintain our deployed software (DataCollector) and to keep the effort to do so to a minimum, in general a remote access is provided by the customer.

For remote access, the following options are fine for us:

- Access via Customer VPN (SSH/RDP)
- Access via TeamViewer

8.4 Technical support of plus10

The plus10 technical support portal is available for questions regarding all of your regularly licensed SaaS products from Monday to Friday from 9:00 to 17:00 (Time Zone Middle Europe: UTC +2h) excluding public holidays in Augsburg, Germany. You can reach us through: https://plus10.de/support/