

# Specification

HumanOS® SmartGateway

HumanOS® SmartControl

## Content

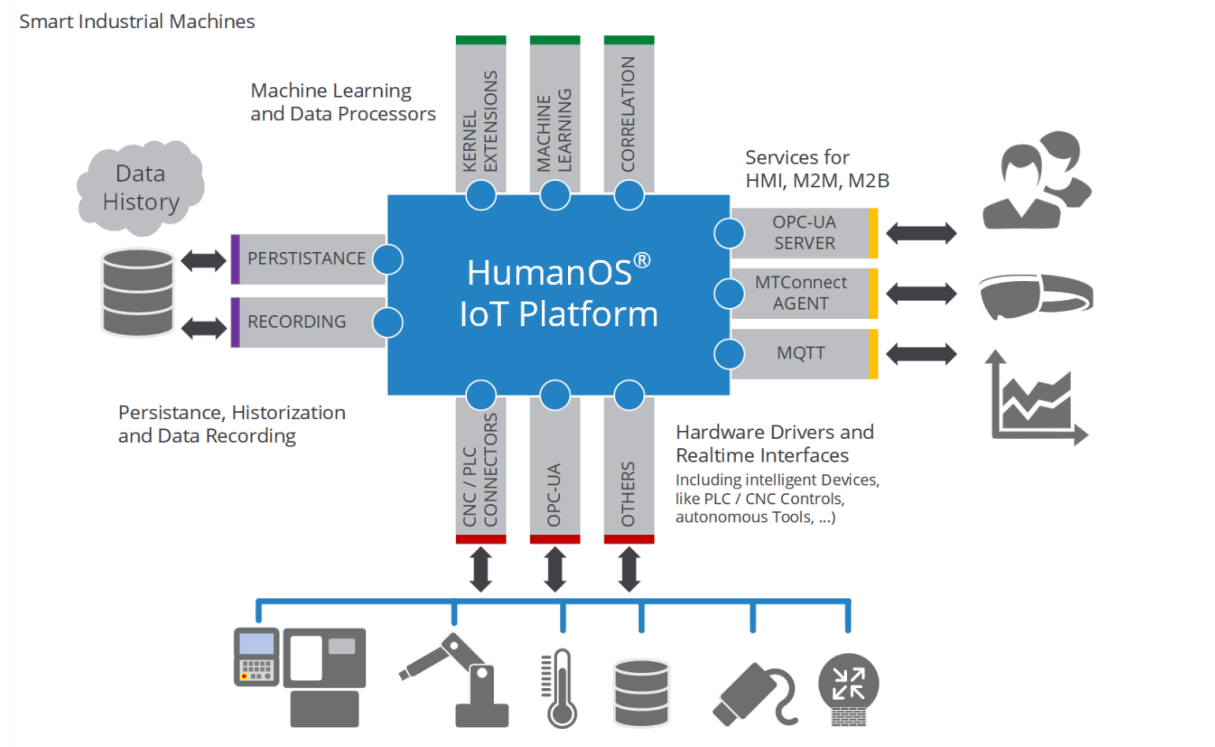
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## 1 HumanOS® IoT Platform

The HumanOS® IoT platform was originally developed to fully integrate machines into MES, OEE and SmartFactory environments.

The platform enables the collection and correlation of data directly to the machine. The platform also enables the management of tool life data and NC program data.

A principle of HumanOS is that all data points and correlations in XML files are configurable. This means that the end customer can adapt the platform according to his needs and configure new data correlations even after years.



### 1.1 Basic Functions

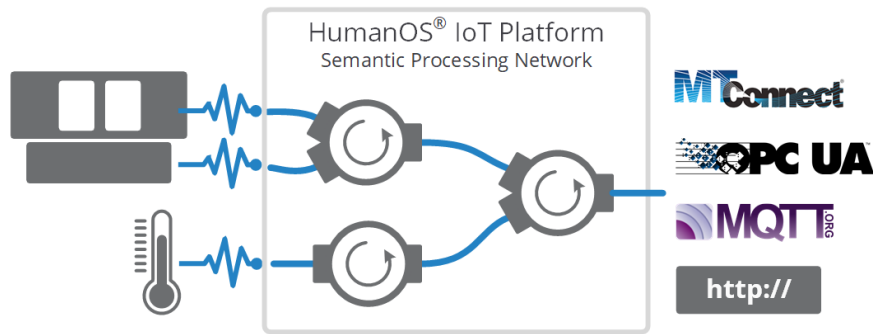
The basic functions are included equally in the versions HumanOS® SmartControl and HumanOS® SmartGateway.

#### 1.1.1 Data Correlations Directly at the Machine

At the heart of the platform is the HumanOS® Kernel, a dynamic and highly flexible tool for defining processing networks and leveraging workshop know-how for digitization.

With the system-specific data correlations, the heterogeneous machine park can be abstracted to a homogeneous information model. This allows new machine types to be easily and cost-effectively integrated into existing ERP and MES systems.

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The data correlations at the plant also have the advantage that the traffic between systems massively reduced, since raw data can already be linked and processed on the system to meaningful information units.

### 1.1.2 Historization

All data and events can be historicized at will. The history is divided into two parts: one high-resolution (up to 20Hz) from the last five minutes; and a long-term history whose record rate and expiration are individually configurable for each data point.

The history is stored locally in a database to prevent data loss in the event of a network outage (e.g. unavailable MES services, IT maintenance windows, etc.).

HumanOS® uses only persistence technologies to ensure data integrity even in the event of uncontrolled shutdown of systems (e.g. in the event of a power failure).

### 1.1.3 OPC-UA Server and Client

The HumanOS® IoT platform integrates a high-quality OPC-UA server, which implements the following modules:

- Data Access (DA)
- History Access (HA)
- Alarm & Conditions (A&C)
- Commands
- Program Management
- Image Transfer for Web Cams

Also included is an OPC-UA client to connect OPC-UA capable controllers such as BECKHOFF, SIEMENS and B & R. The client currently only supports Data Access (DA) and Commands.

### 1.1.4 MTConnect Agent

The signals of the connected devices are available to an internal MTConnect agent. The MTConnect Agent implements the 1.3 specification without the asset extensions.

The combination with arbitrary connectors enables a flexible bridging of protocols to MTConnect:

- OPC-DA to MTConnect Bridge

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- OPC-UA to MTConnect Bridge
- Modbus to MTConnect Bridge
- ...

### 1.2 HumanOS® SmartControl

The HumanOS® SmartControl extends the basic functions to realize even more flexible customer-specific connections and complex control sequences.

#### 1.2.1 Data Recorder

The Data Recorder can record and output data according to events. This enables, for example, part-specific recording and saving of KPIs during production.

#### 1.2.2 Skill based Workflows

The workflow engine in HumanOS® SmartControl is unique. It offers the possibility to model and automate complex processes.

There is the possibility of a human-machine collaboration to realize in which certain processes are automated, but other processes are currently still to be done by people.

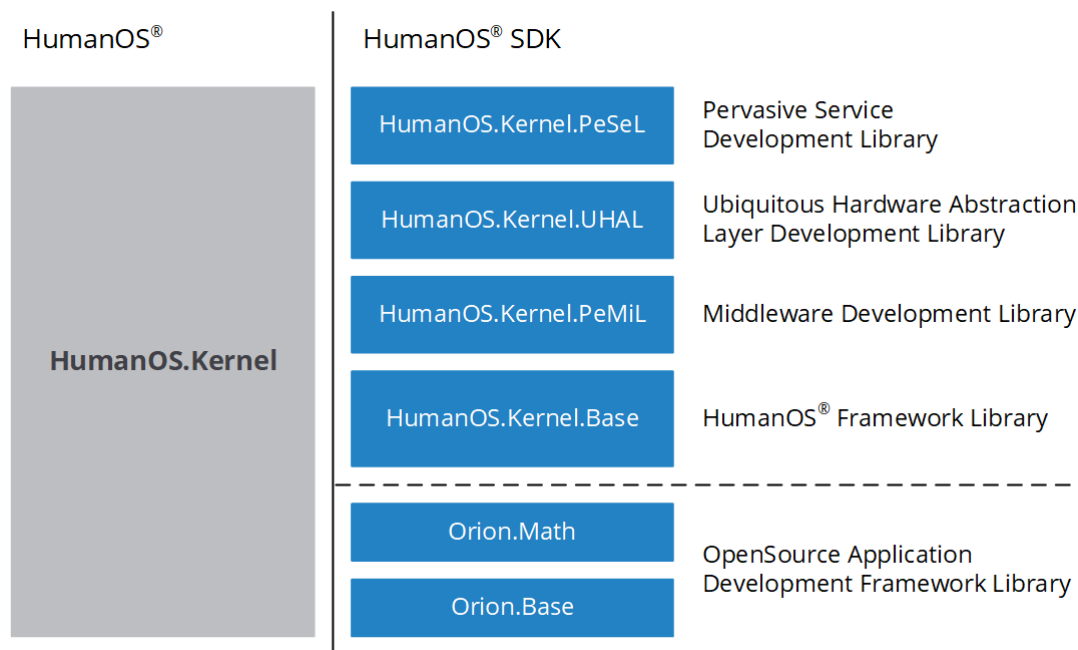
The workflows are skills based. This means that the system can learn skills over time and then do the appropriate activities over time.

#### 1.2.3 Open Platform – Your Own Extensions

The SmartControl offers a wide range of expansion capabilities to tailor the behavior of plugins and kernels to the needs of the factory.

The extension takes place via C # scripts, which can be developed and tested with Microsoft® VisualStudio.

- **Connectors** can be extended with their own business logic to make new functions available to users.
- Development of dedicated **processors** for correlating data, events and error messages.
- **Kernel** can be extended with new functions (commands) and processes (workflows).
- Development of own **plugins** allows to realize specific proprietary connections of machines or systems.



## 1.3 With HumanOS® at an Advantage

HumanOS® offers many advantages over other IoT platforms:

### 1.3.1 Reduction of Dependencies

HumanOS® is functional with and without cloud / networking. Data can be correlated and historicized directly on the system. It is the decision of the user, which data he wants to save where.

HumanOS® IoT platform does not require internet access. This does not affect security in the IT or OT network.

### 1.3.2 Transparent Licensing

The HumanOS® IoT platform includes easy and transparent licensing per connected device. Any number of HumanOS® instances can be set up and operated in parallel.

Thus, investment costs and fixed costs can be accurately determined before use. Construction of redundant systems does not result in additional costs.

### 1.3.3 Realization of Your Ideas

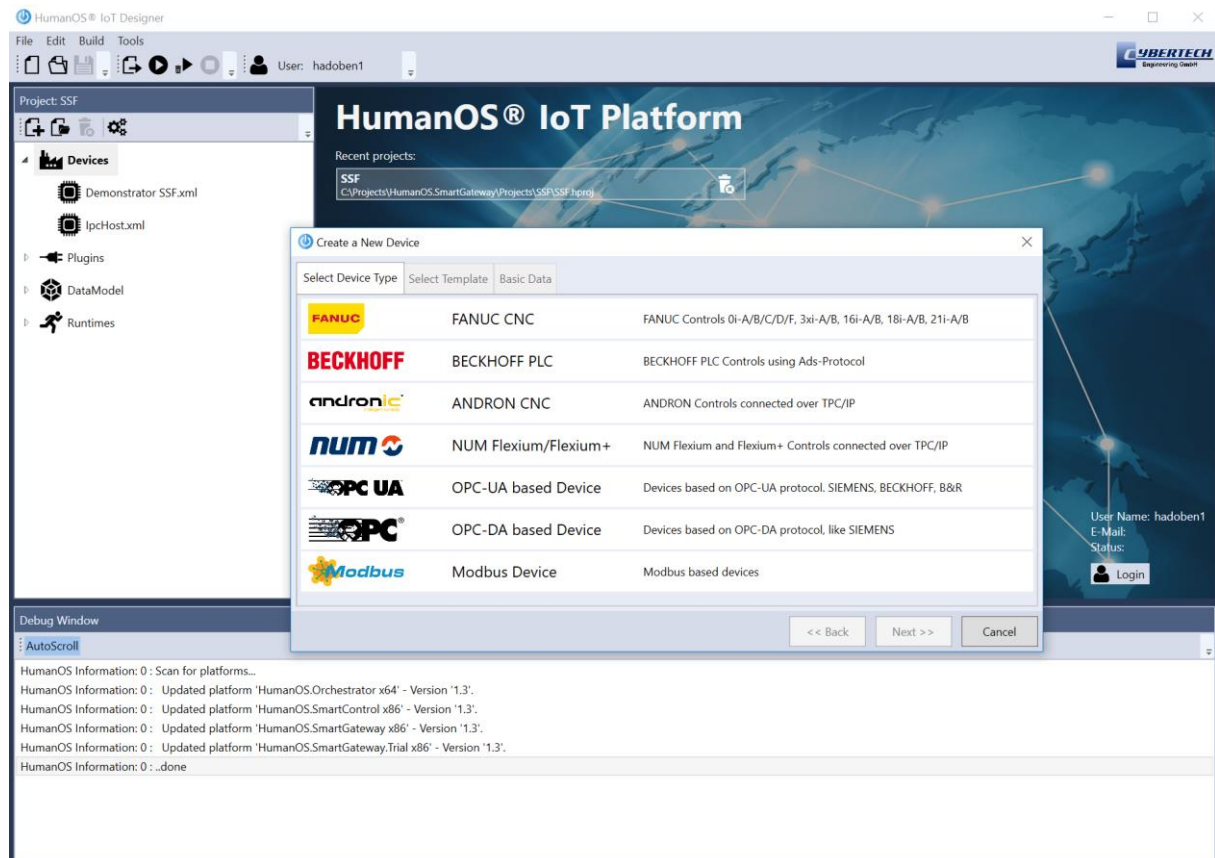
There are no limits to the HumanOS®. The generic platform can be easily extended with own scripts and plugins.

CyberTech Engineering GmbH also offers comprehensive consulting, training and project support.

## 2 HumanOS® IoT Designer

HumanOS® IoT Designer is a development environment that can be used to digitize a machine park in a simple and efficient way.

The Designer can be downloaded for free along with the HumanOS® SmartGateway Trial Platform: <https://www.cybertech.swiss/index.php/de/downloads-de>



### 2.1 Design – Test – Deploy

With just a few clicks devices and configurations can be put together and tested. The designer offers a wealth of templates for this:

- Project templates for OPC UA servers, MTConnect agents, OPC UA bridges, and much more
- Device templates for MDE and DNC

After successful testing, the IoT platform can be rolled out for any number of devices. Binaries and configurations for the desired target device are completely assembled so that the installation and update effort is minimal.

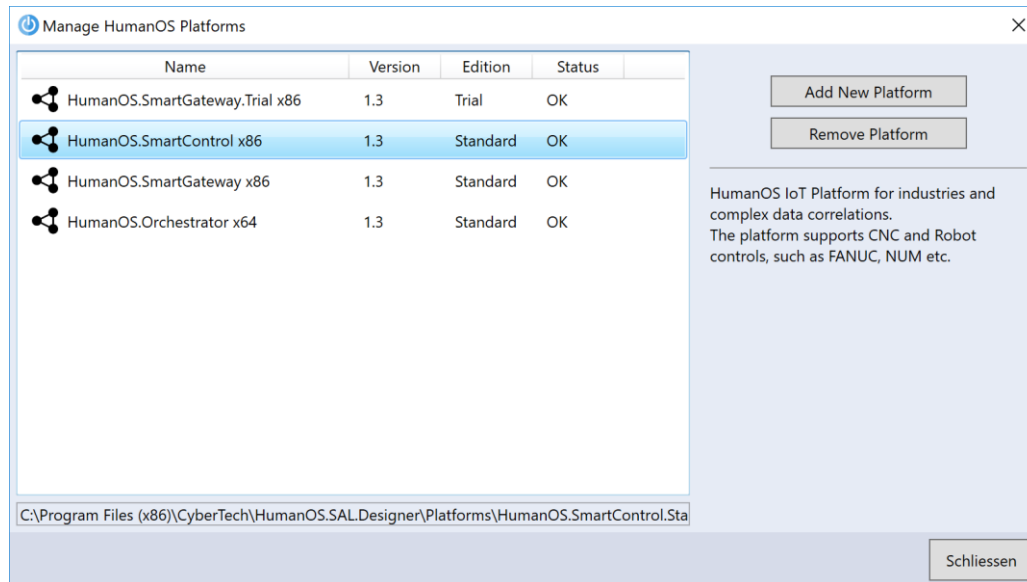
### 2.2 Platforms

The HumanOS® Designer supports all HumanOS® IoT platforms:

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- HumanOS® SmartGateway Trial
- HumanOS® SmartGateway
- HumanOS® SmartControl
- HumanOS® Orchestrator

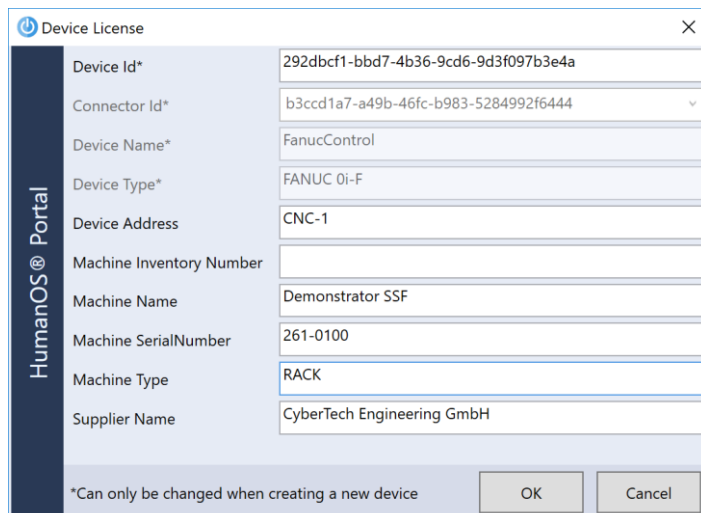
Different platform versions are easy to manage and can be used in parallel.



## 2.3 Licenses – Everything under Control

Licensing of the connected devices takes place directly in the Designer. New licenses can be requested and managed online at CyberTech Engineering GmbH.

Once the licenses are created, they can be copied to the attachment along with the IoT configuration. It is no longer necessary to access via the Internet, so that the system can be operated without Internet access.



HumanOS® Portal

Device License

Device Id\* 292dbcf1-bbd7-4b36-9cd6-9d3f097b3e4a

Connector Id\* b3ccd1a7-a49b-46fc-b983-5284992f6444

Device Name\* FanucControl

Device Type\* FANUC 0i-F

Device Address CNC-1

Machine Inventory Number

Machine Name Demonstrator SSF

Machine SerialNumber 261-0100

Machine Type RACK

Supplier Name CyberTech Engineering GmbH

\*Can only be changed when creating a new device

OK Cancel



### 3 Connectors

The following CNC controls are supported with the current version. Further hardware plugins are in the development list of CyberTech Engineering GmbH. The cooperative development of further customer-specific connectors is described in chapter **Fehler! Verweisquelle konnte nicht gefunden werden..**

#### 3.1 CNC/PLC Controls

If your controller does not appear in this list, please contact CyberTech Engineering GmbH. We are constantly developing new connectors for our customers.

| Control  | Description  |
|--|--|
| <i>FANUC CNC Controls</i><br>Oi-D/F, 30i-A/B, 31i-A/B, 32i, 35i<br><br>(15i, 16i, 18i, 21i, as well as 15, 16, 18, 21) * | Features: <ul style="list-style-type: none"> <li>- Connection via Ethernet or HSSB</li> <li>- Auto Configuration Detection</li> <li>- High Performance Memory Cache</li> <li>- Access to all PMC and NC Memory</li> <li>- Multi-Path Support for PMC and NC</li> <li>- Program Management</li> <li>- Tool Life Management</li> </ul> |
| <i>OPC-UA enabled Controls</i>   | Integration of OPC-UA compatible hardware devices (BECKHOFF, B&R, SIEMENS, ...)<br><br>Features: <ul style="list-style-type: none"> <li>- Data Access</li> <li>- Commands</li> <li>- Alarm &amp; Condition</li> <li>- Server Authentication</li> </ul>   |
| <i>OPC-DA enabled Control</i>  | Integration of OPC-capable hardware devices (SIEMENS, ...)<br><br>Features: <ul style="list-style-type: none"> <li>- Data Access</li> </ul>  |
| <i>Modbus TCP</i>  | Features: <ul style="list-style-type: none"> <li>- reading and writing signals</li> </ul>  |
| <i>BECKHOFF Controls</i>   | Features: <ul style="list-style-type: none"> <li>- Connection via Ethernet (ADS protocol)</li> <li>- Access to entire PLC memory</li> </ul>  |

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|---------------------------------|--|
| <i>NUM Flexium and Flexium+</i> | <p>Features:</p> <ul style="list-style-type: none"> <li>- Connection via Ethernet</li> <li>- Program, axes and operation status</li> <li>- Access to PLC and NC memory variables</li> <li>- All alarms and events</li> </ul> <p>(Requires FXServer installation on the HumanOS Host IPC)</p> |
| <i>NUM Axiom **</i>             | <p>Features:</p> <ul style="list-style-type: none"> <li>- Connection via Ethernet</li> <li>- Program, axes and operation status</li> <li>- Access to PLC and NC memory variables</li> <li>- All alarms and events</li> </ul> <p>(Requires AXServer installation on the HumanOS Host IPC)</p> |
| <i>ANDRON Controls</i>          | <p>Features:</p> <ul style="list-style-type: none"> <li>- Connection via Ethernet</li> <li>- Program, axis and operation status</li> <li>- Hand-parameter</li> <li>- Alarms and events</li> </ul>  |
| <i>EROWA JMS / MDC</i>          | <p>Integration of EROWA loader and control systems</p> <p>Features:</p> <ul style="list-style-type: none"> <li>- Management of products</li> <li>- Create and monitor orders</li> <li>- Status Query of machines on the EROWA system</li> </ul>  |

(\*) The FANUC controls 15i, 16i, 18i, 21i, as well as 15, 16, 18, 21 first require a technical clarification.

(\*\*) Available from summer 2019

### 3.2 Further Connectors

Many machines do not store their data exclusively in the controller; they have their own HMI operating software and corresponding data storage in an IPC. To access this data, the HumanOS® IoT platform offers additional connectors:

| Data Sources                  | Descriptions  |
|-------------------------------|---|
| <i>Generic RESTful Client</i> | <p>Allows the connection of software and hardware supporting the REST protocol</p> <p>Features:</p> <ul style="list-style-type: none"> <li>- HTTP and HTTPS</li> <li>- GET, DELETE, POST, PATCH, PUT</li> <li>- http authentication</li> <li>- Payload as text, XML and JSON</li> <li>- Create or process payloads through C # scripts</li> </ul> |
| <i>Hosting System (IPC)</i>   | <p>Features:</p> <ul style="list-style-type: none"> <li>- Information about operating system and HumanOS installation</li> <li>- Memory usage HDD</li> <li>- Logged in users</li> <li>- Run powershell scripts</li> <li>- Starting applications in the user context</li> </ul>  |
| <i>USB Web CAM</i>            | <p>Plug and play of web cameras directly at the machine for process monitoring. Access via OPC-UA server possible.</p> <p>Features:</p> <ul style="list-style-type: none"> <li>- Start and Stop of the camera</li> <li>- - Frame rate approx. 10-50Hz depending on utilization.</li> </ul>  |
| SQL Database                  | <p>Connection of SQL databases</p> <p>Features:</p> <ul style="list-style-type: none"> <li>- MySQL, MSSQL and MS Access</li> <li>- Read only access</li> </ul>  |
| XML File                      | <p>Connection of XML files</p> <p>Features:</p> <ul style="list-style-type: none"> <li>- - Reading and writing possible</li> <li>- - Automatic update when the content of the file changes.</li> </ul>  |

## 4 Services

HumanOS® IoT platform can be easily integrated into higher-level systems. For this the following services are available in the current version:

| Services                           | Descriptions  |
|------------------------------------|---|
| <i>OPC-UA Server</i>               | <p>Access to all data points, alarms and their historization via the OPC-UA protocol</p> <p>Features:</p> <ul style="list-style-type: none"> <li>- Data Access (DA)</li> <li>- Alarm &amp; Conditions (A &amp; C)</li> <li>- History Access (HA) of data, events &amp; messages</li> <li>- Commands, for example program and tool management at FANUC controls</li> <li>- authentication</li> </ul>                     |
| <i>MQTT Publisher / Subscriber</i> | <p>Access to data points via the MQTT protocol for Cloud / Fog connections</p> <p>Features:</p> <ul style="list-style-type: none"> <li>- Publishing and Subscribing of data points</li> <li>- Configurable and customizable payload allows flexible connection to known cloud (e.g. MS Azure Cloud, AWS, Red-Node, ...)</li> </ul>  |
| <i>MTConnect Agent</i>             | <p>All data points can be read with the MTConnect protocol according to specification 1.3.</p> <p>Features:</p> <ul style="list-style-type: none"> <li>- Probe: reading the data model</li> <li>- Current: Read the current values</li> <li>- Samples: read the recorded values</li> </ul>  |
| <i>Generic RESTful API</i>         | <p>Generic access to all kernel structures via RESTful API.</p> <p>Features:</p> <ul style="list-style-type: none"> <li>- Complete access to the internal node space</li> <li>- Execute commands</li> <li>- Execute and monitor workflows</li> <li>- CRUD access to entity framework (database objects)</li> <li>- http and https</li> <li>- RESTful filter</li> <li>- Multiple WebServer instances possible</li> </ul> |

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| Features  | HumanOS®<br>SmartGateway | HumanOS®<br>SmartControl      | HumanOS®<br>Orchestrator*     |
|---|--------------------------|-------------------------------|-------------------------------|
| <b>General Features</b>   |                          |                               |                               |
| Data persistence (MySQL, SQLite, ...)   | X                        | X                             | X                             |
| Data correlations and aggregations  | X*                       | X                             | X                             |
| Alarm and Event Handling  | X                        | X                             | X                             |
| Data Recorder and Data Logger   |                          | X                             | X                             |
| <b>Connectors</b>   |                          |                               |                               |
| Industrial collection (see chapter3)  | X                        | X                             |                               |
| IT collection   |                          |                               | X                             |
| Customer-specific extensions of the connector functionality (C # scripts)                 |                          | X                             | X                             |
| <b>Services</b>   |                          |                               |                               |
| OPC-UA Server (Data Access, History Access, Commands, Alarm & Conditions, Authentication) | X                        | X                             |                               |
| MTConnect Agent   | X                        | X                             |                               |
| Generic RESTful API   | X                        | X                             | X                             |
| MQTT Publisher and Subscriber   | X                        | X                             | X                             |
| <b>Extended Features</b>  |                          |                               |                               |
| Custom extensions of the kernel (C # scripts)   |                          | X                             | X                             |
| Workflow Engine (full or semi-automated processes)  |                          | X                             | X                             |
| Machine Learning with TensorFlow  |                          | X                             | X                             |
|   |                          | X                             | X                             |
| <b>Platforms</b>  |                          |                               |                               |
| .Net Platform   | .net 4.6.1               | .net 4.6.1                    | .net 4.6.1                    |
| Windows Platforms   | Win7 or higher<br>32bit  | Win7 or higher<br>32bit/64bit | Win7 or higher<br>32bit/64bit |
| Target Systems  | IPC, Server              | IPC, Server                   | Server                        |

(\* ) limited - without C # scripts

## 5 Support

CyberTech Engineering GmbH is committed to world-class customer service. In order to optimally meet the needs of our customers, we offer various subscriptions:

- Maintenance Subscription: Maintenance and upkeep of your software installation, incl. Technical support.
- Upgrade subscription: download the latest HumanOS® IoT platform for free.

| Technical Support                            | Maintenance | Update | No Program |
|--|-------------|--------|------------|
| General Technical Support                    | X           | *      | *          |
| Troubleshooting per Remote                   | X           | *      | *          |
| Fault notification by e-mail and telephone   | X           | *      | *          |
| Access to ticketing system                   | X           | *      | *          |
| Access to Online Knowledge Base <sup>1</sup> | X           |        |            |
| Development partner status                   | X           |        |            |
| <b>Software Updates and Upgrades</b>         |             |        |            |
| Software Patches and Bugfixes                | X           | X      | *          |
| Software Updates and Upgrades                | X           | X      | *          |
| <b>License Administration</b>                |             |        |            |
| Access to HumanOS® Lizenzportal              | X           | X      | X          |
| License Recovery                             | X           | X      | *          |

(\*) Services can be ordered. Charging takes place after effective effort.

(1) Available in mid-2019

## 6 Explanations to the Terms and Conditions

The following explanations are a summary of the official terms and conditions of CyberTech Engineering GmbH. These explanations are not binding. Read the terms and conditions of CyberTech Engineering GmbH.

### 6.1 License Agreement

CyberTech Engineering GmbH HumanOS® software licenses are based on a simple machine base with no runtime or renewal fees. This maximizes the cost savings in the distribution and installation of machinery.

With the program license you can use HumanOS® in your company. With a device license, you can connect a specific device to the HumanOS® IoT platform. The price of the license includes initial support incidents and updates for one year. Support can be continued through a maintenance or update subscription. In addition, individual support packages are available on request.

When you purchase a HumanOS® IoT platform, you will receive the following:

- A Program License: The right to install and use the HumanOS® IoT Platform as an end user
- Device Licenses: The right to connect a device to HumanOS® IoT Platform per license
- Support: The program license contains an initial maintenance subscription. Additional subscriptions can be purchased accordingly
- The latest tested and released version of the HumanOS® IoT platform
- The latest version of the HumanOS® IoT Designer to create and manage your configurations

The administration of the licenses takes place via the HumanOS® license portal and is carried out independently by the customer.

Read the full software license agreement for more details.

### 6.2 Support Conditions

In the first year, the purchase of a maintenance subscription is obligatory. This is included in the basic license package. From the second year, a maintenance or update subscription can be purchased.

#### 6.2.1 Maintenance Subscription

The maintenance subscription covers the following:

- Response time within one working day
- Support by e-mail or phone during the time a maintenance package is valid
- Support and updates only on licensed devices

Not included are:

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- Training and consulting. Basic training and personalized consulting on HumanOS®, OPC-UA, hardware driver configuration, or your specific application are not covered by the standard support guidelines, but can be requested for an additional service fee
- On-site technical support is not included but may be requested for an additional service charge
- Support for unlicensed machines and computers are additional services and are not covered by the standard support policy

### 6.2.2 Update Subscription

With the update subscription, you will receive the latest HumanOS® IoT platform incl. the latest collection of industrial connectors.

Not included are technical support, training, etc. These services will be charged extra.

### 6.3 Payment & Delivery

All HumanOS® products must be paid in advance. The delivery follows immediately after receipt of payment. CyberTech Engineering only accepts bank transfers. All transfer fees are charged to the buyer. Payments must be made in Swiss francs (CHF). The download link to HumanOS® products will be sent by e-mail. The software is available for download on the *Wetransfer* website.

Support fees are due on the 1st of January and can be paid twice a year by arrangement. For license packages purchased after January of the previous year, the difference will be counted on a monthly basis.

**For example**, for a package purchased in March 2018, three-quarters of the support fee for this package will be payable on January 1, 2019.

### 6.4 Supported Operating Systems

The HumanOS® IoT platform requires at least the .NET Framework Version 4.6. CyberTech Engineering GmbH recommends running the HumanOS® IoT platform on Windows10 Home, Professional or Windows10 IoT Enterprise. The software is also tested on Windows 7 and 8 platforms. Windows XP does not support the .NET Framework version 4.6.

We recommend that you no longer use versions of Microsoft that have been discontinued by Microsoft!

HumanOS® IoT SmartControl uses many Win32 / 64 drivers (e.g. FOCAS for FANUC). As a result, HumanOS® can NOT be run on Windows RT, Windows Mobile, Android or other Unix-based systems.

Any free support is excluded if unsupported operating systems are used.



## 6.5 Development of new Connectors and Services

Our policy is that we connect each device to the HumanOS® IoT platform. To implement this principle, we use up to 50% of the maintenance subscription revenue for the new and further development of connectors and control features.

Customers with a valid maintenance subscription are entitled to influence these developments by being able to co-define the prioritization of the development work together with CyberTech Engineering GmbH. The exact functions and features to be implemented are agreed individually and bilaterally with the customer. However, the development authority is in any case with CyberTech Engineering GmbH.

The sequence of the developments follows the principle of "first-come first serve", whereby key customers enjoy a higher priority.

The new features and features are automatically made available to all customers with the software updates and are free within the current subscription.

In the following situations, CyberTech Engineering GmbH reserves the right to develop a specific project and financing plan with the customer:

- Expense exceeds 50% of the agreed total amount of the subscription
- High procurement costs or license fees for trial software and test hardware
- Very low number of machines (10 or less machines).

## 6.6 Contact Address

Headquarters in Switzerland

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CyberTech Engineering GmbH  
Strättlighügel 10  
CH-3645 Gwatt  
Schweiz

Tel. +41 33 531 1010  
Email: [info@cybertech.swiss](mailto:info@cybertech.swiss)

