

MindConnect Device Training

MindSphere 3.0

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Page 1

MindSphere 3.0

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MindSphere Academy

MindConnect Device Training

Learning Goals



**What are the MindConnect elements
&
how to get connected to
MindSphere?**

- MindConnect concept
- Evaluate the connectivity requirements
- Select the most suitable MindConnect option
- Configure MindConnect elements in TIA-Portal using S7/ OPC UA protocols, OPC UA server and MindSphere

How to connect?

MindSphere Introduction

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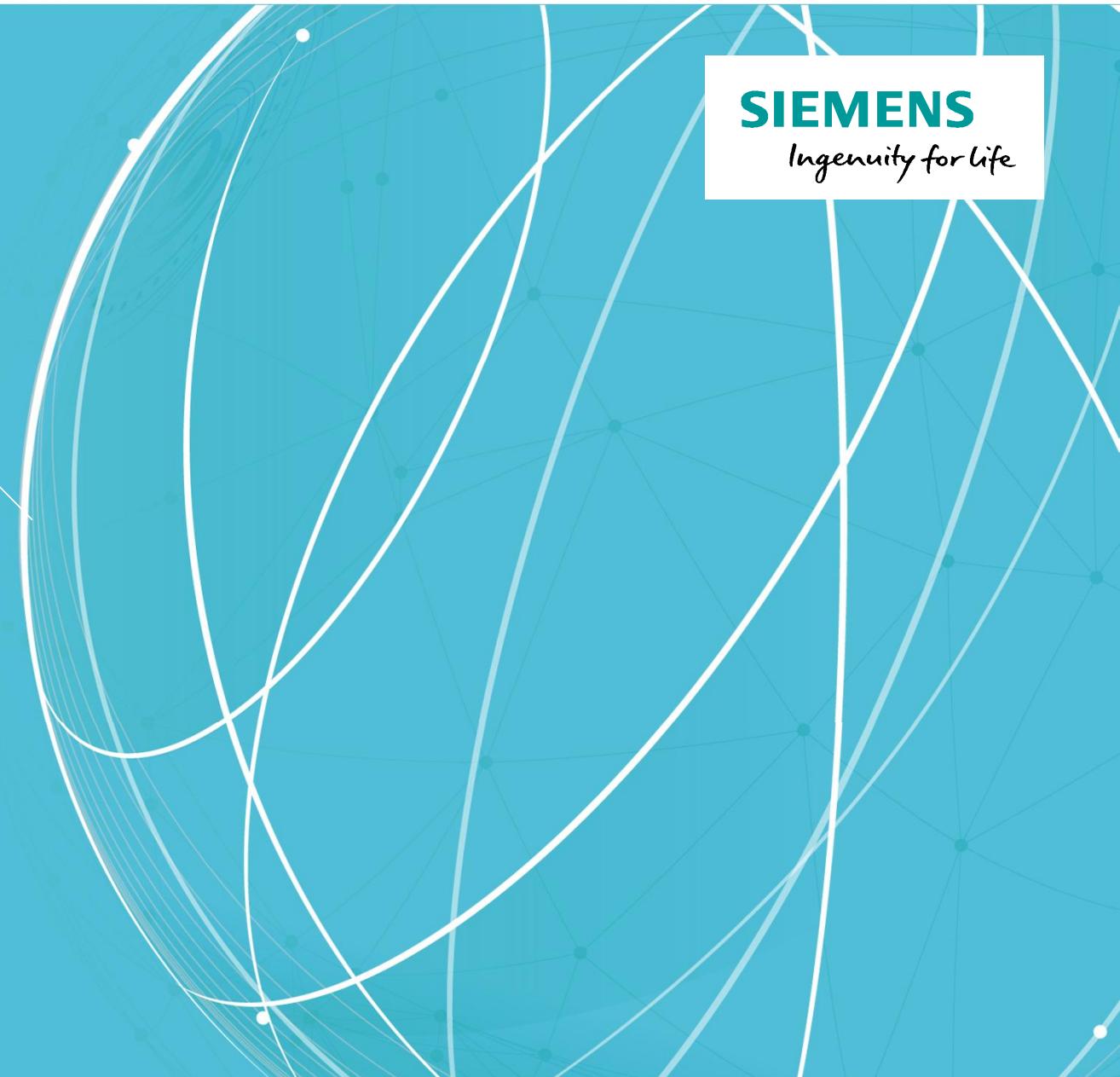
MindSphere Introduction

Learning Goals

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How does the MindSphere ecosystem look like & What are the gateways of MindSphere?

- Overview of MindSphere connect elements
- The structure of the connectivity of MindSphere



MindSphere Portfolio Overview

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MindSphere Applications

Powerful industry applications and digital services for asset transparency and analytical insights



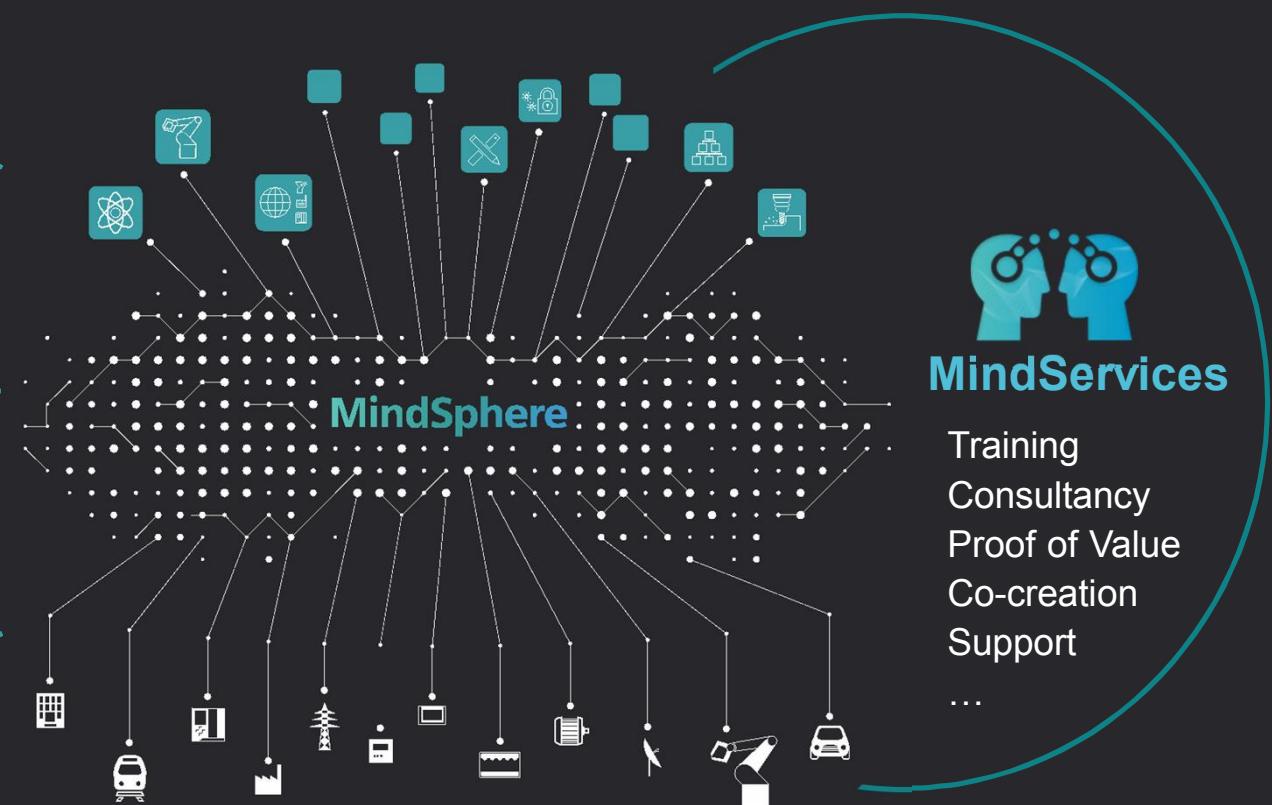
MindSphere & MindAccess

Open Platform as a Service (PaaS) for scalable, global IoT connectivity and application development



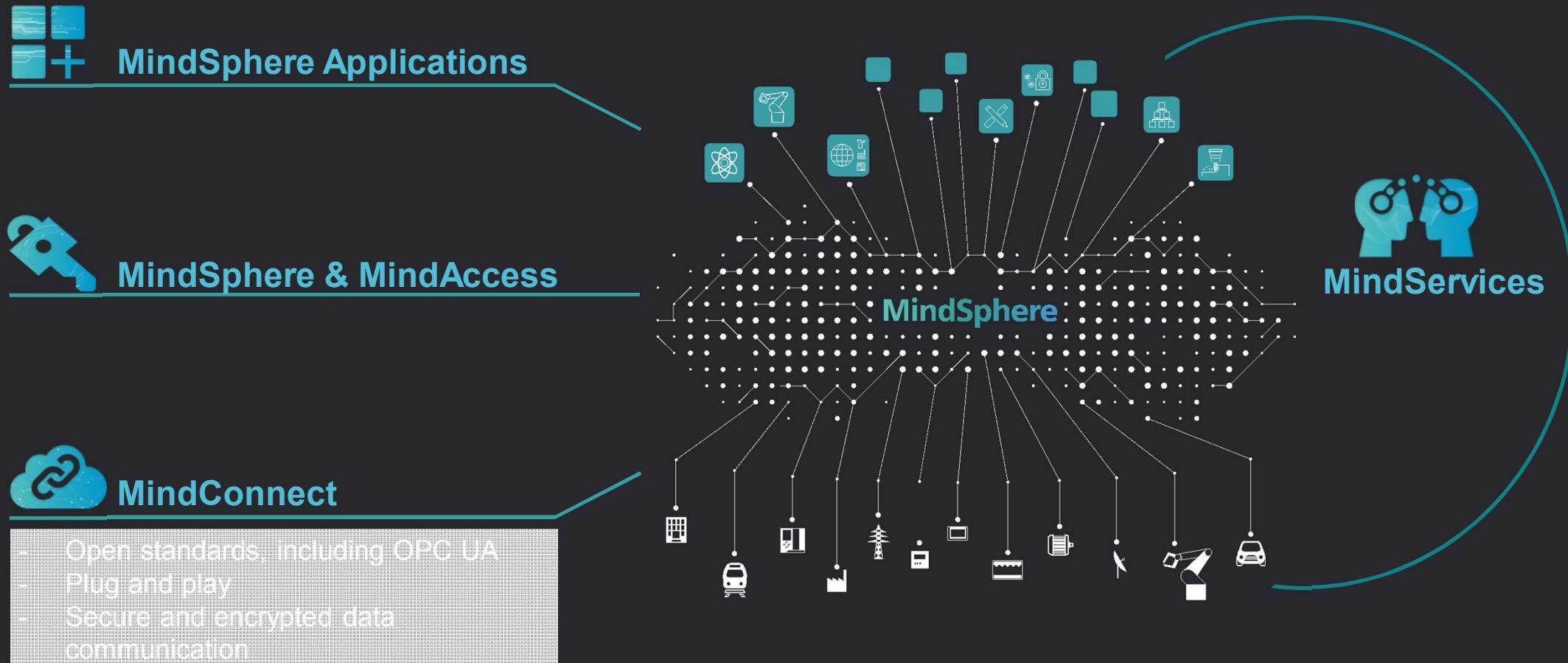
MindConnect

Secure plug and play connection of Siemens and third-party products and equipment



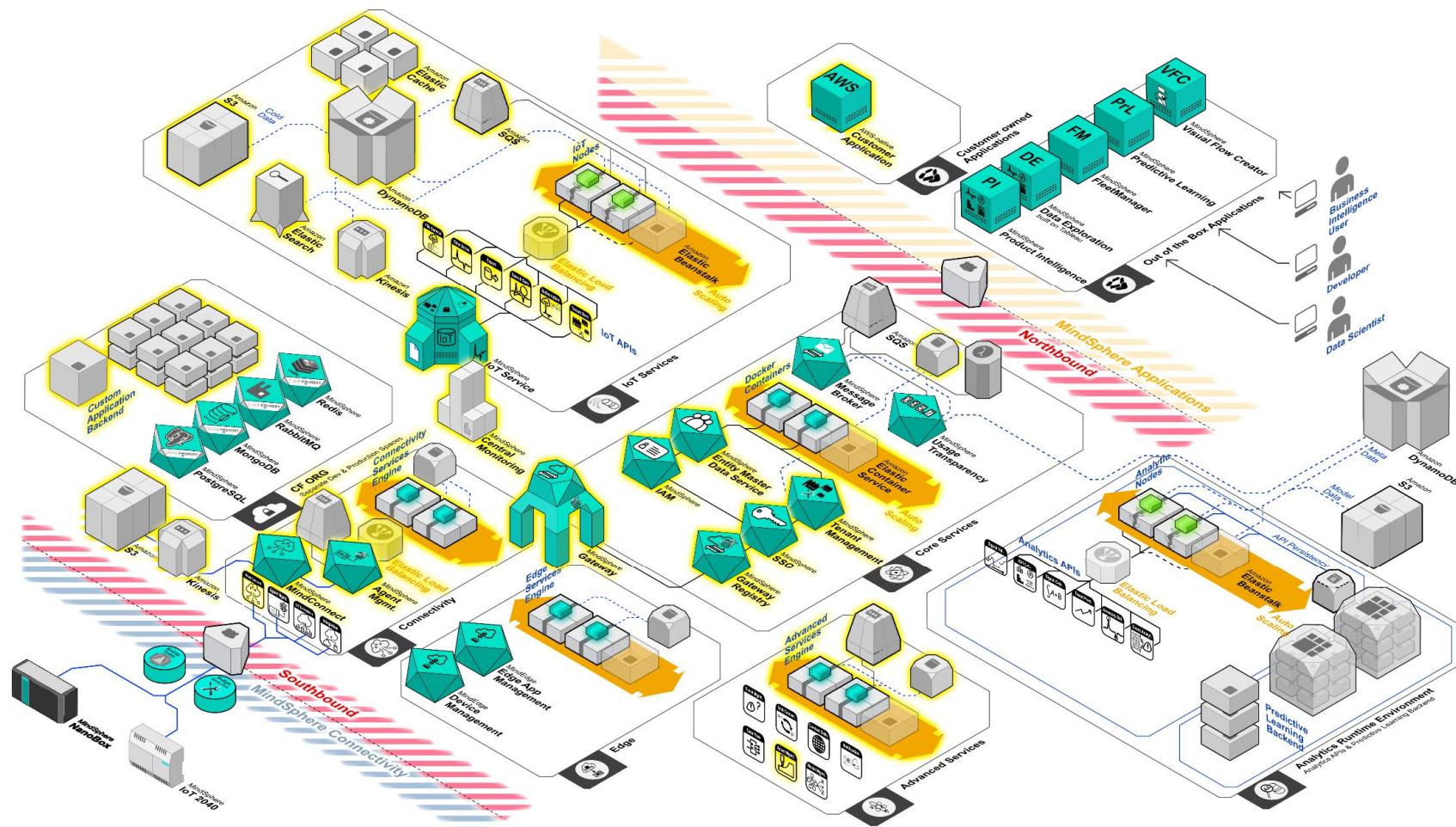
MindSphere Portfolio Overview

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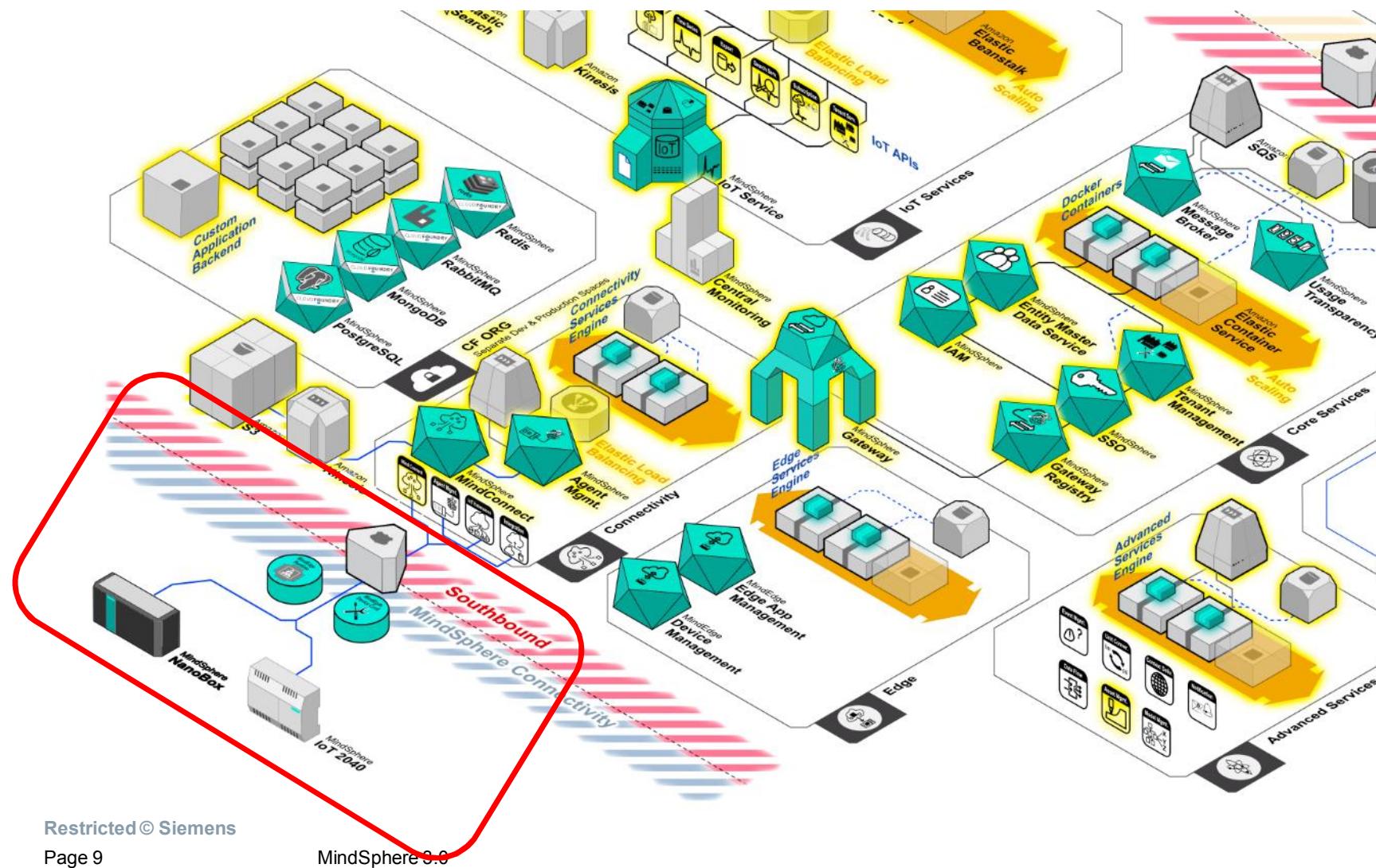
MindSphere Overview

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MindSphere Connectivity

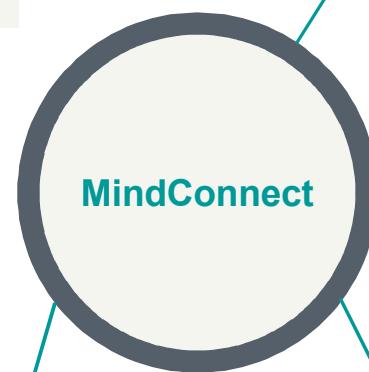
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Connectivity

MindSphere MindConnect (3.0)

With **MindConnect** provides **multiple**, varied and **easy-to-implement connectivity** solutions (connectors, agents, libraries, ...) to be able to **onboard a wide range of assets** (Siemens and 3rd-party) in both brown- and greenfield environments as well as Siemens or 3rd-party systems. For assets which can not be onboarded from scratch, the MindSphere also enables **self programming** of connectivity modules by using the **APIs**.



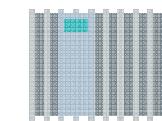
MindSphere Lib and APIs

Restricted © Siemens

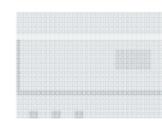
Page 10

MindSphere 3.0

MindSphere IoT Connectors



MindConnect Nano



MindConnect IoT2040

>> comes past 02/2018 <<

3rd Party Connectivity



MindConnect
IoT Extension



MindConnect
Integration

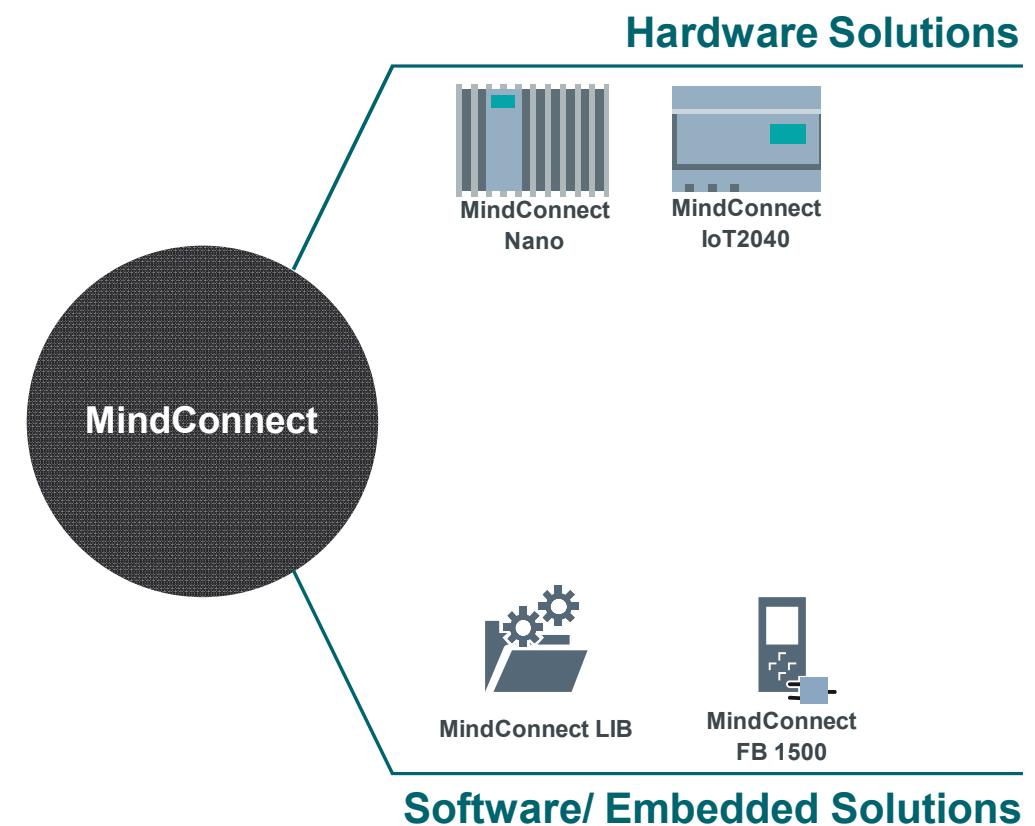
✓ Already released
MindSphere Academy

Connecting Assets to MindSphere (2.0)



With MindConnect MindSphere provides multiple, **varied** and **easy-to-implement connectivity** solutions to **onboard a wide range of assets (Siemens and 3rd-party)** in both **brown- and greenfield**:

- Focusing on brownfield installations, dedicated IoT Connectors like **MindConnect Nano** and **MindConnect IoT2040**, which provide **plug and play** connection of Siemens and 3rd party products thanks to communication via **open standards** like OPC UA
- MindConnect **embedded agents** in **Siemens industrial products** like SIMATIC and SINUMERIK focusing on greenfield projects
- For every further product, including 3rd-party, **MindConnect LIB**, which enables **self programming** of **connectivity modules** by interacting with the MindSphere southbound APIs



1 Hardware Gateway

MindSphere Connectivity Suite MindConnect Nano

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Description

MindConnect Nano is a device for collecting data using different protocols and transferring the data to MindSphere. The device supports transmission of data through a secure internet connection, to enable cloud-based applications and services.



Benefits

- Fast and easy connectivity of industrial machines and automation systems to MindSphere
- Data collection via standard industrial protocols
- Software update management – Always up to date
- Rugged design for maintenance-free, continuous operation
- Comprehensive security concept in accordance with applicable industry standards
- Up to 500MB local data buffer



Supporting Protocols

- Siemens S7 (for collecting data from S7-3xx / S7-4xx / ET-200s PLCs);
- OPC UA (for collecting data from all data sources which can provide data via an OPC UA server); the MindSphere Nano supports data collection with Part 8 of the OPC UA specification (Data Access)
- Additional Field protocols will follow



Performance

- Data reading cycle: Up to 250 data points / second
- Data transfer cycle: Every 10 seconds

MindSphere Connectivity Suite

MindConnect IoT2040



Description

MindConnect IoT2040 is a device for collecting data using different protocols and transferring the data to MindSphere. The device supports transmission of data through a secure internet connection, to enable cloud-based applications and services.



Benefits

- Fast and easy connectivity of industrial machines and automation systems to MindSphere
- Data collection via standard industrial protocols
- Software update management – Always up to date
- Rugged design for maintenance-free, continuous operation
- Comprehensive security concept in accordance with applicable industry standards
- Up to 500MB local data buffer



Supporting Protocols

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- Additional Field protocols will follow



Performance

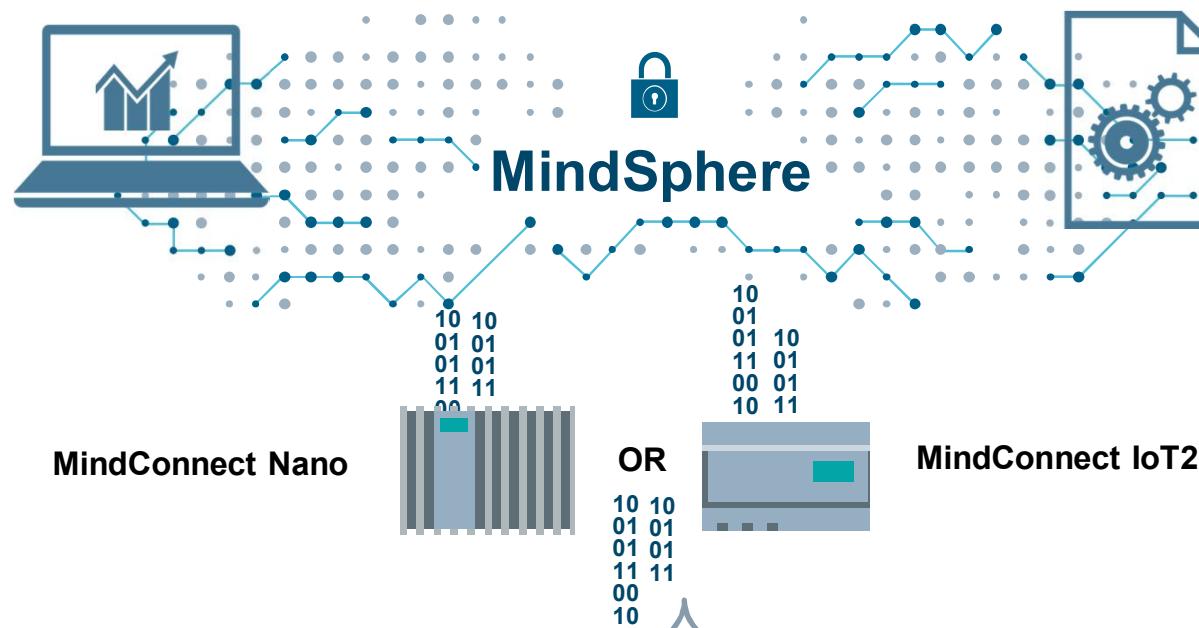
- Data reading cycle: Up to 30 data points / second
- Data transfer cycle: Every 10 seconds

Structure of MindSphere Connectivity

MindConnect Nano/ IoT2040

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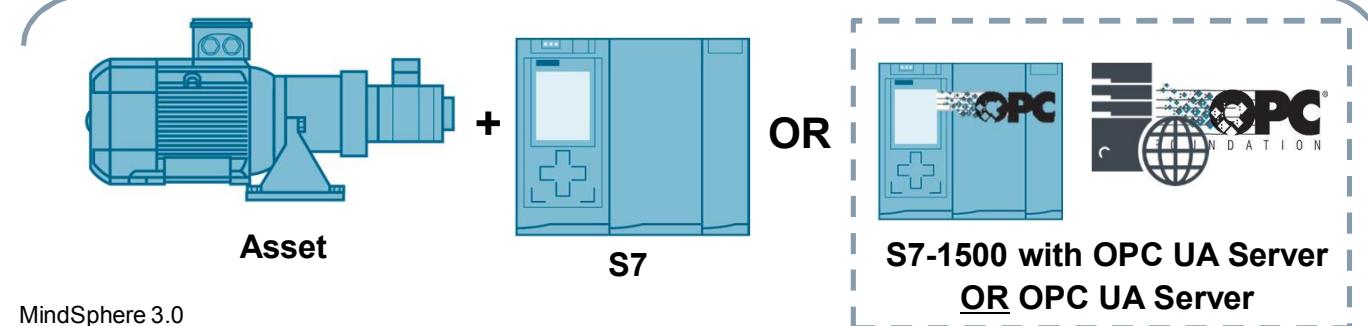
MindSphere



To use OPC UA together
with MindSphere, you need a
S7-1500 V2.x or an OPC UA
server.



MindConnect
Elements



With TIA Portal V14

MindSphere Academy

MindSphere Connectivity Suite

MindConnect FB 1500*



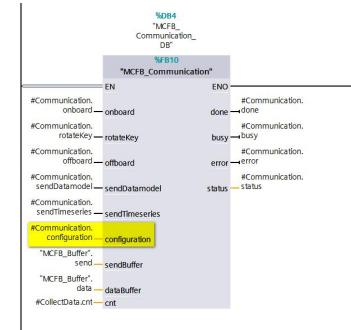
Description

MindConnect FB is a TIA Portal STEP7 Library to extend the functionality of the S7-1500 PLC. It supports encrypted transmission of PLC data to MindSphere through a secure internet connection, to enable cloud-based applications and services.



Benefits

- Fast and easy connectivity of industrial machines and automation systems to MindSphere
- Simple configuration and commissioning - Configure your data model in STEP 7 (TIA Portal V14)
- No additional hardware needed
- Unencrypted onsite (local) traffic which allows local package inspection
- Comprehensive security concept in accordance with applicable industry standards
- Local data buffering possible



Supporting Protocols

S7-1500 acts as gateway into field-level which allows access to various data sources



Performance

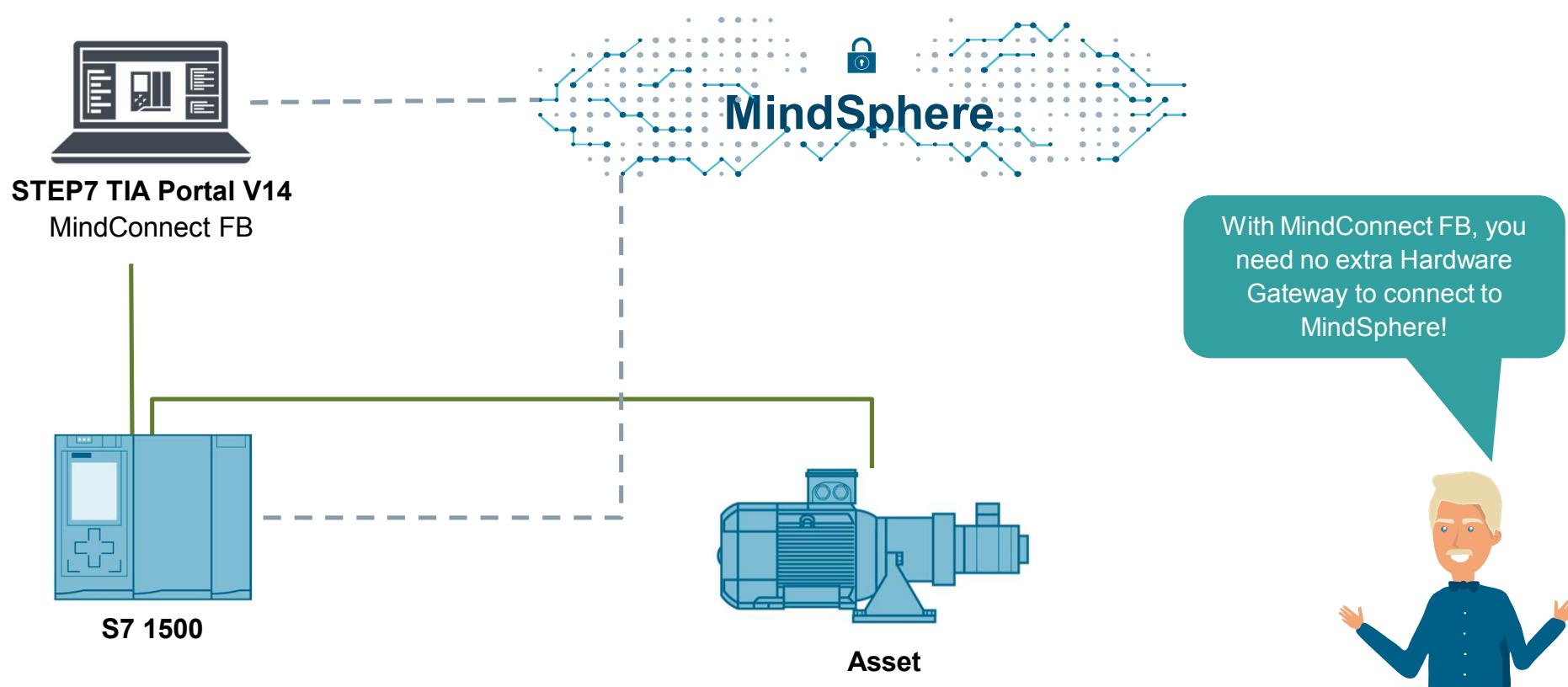
- Data reading cycle: Up to 110 data points per second can be configured in TIA Portal (the exact amount of data points depends on each controller)
- Data transfer cycle: Every 10 seconds

* Compatible with S7-1511 to S7-1518 with firmware 2.0 or higher

Structure of MindSphere Connectivity

MindConnect FB 1500

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MindSphere Connectivity Suite

MindConnect LIB



Description

MindConnect LIB is a software development kit (SDK) which enables self programming of customer or use case specific connectivity agents by interacting with the MindSphere southbound APIs. It supports encrypted transmission of onsite data to MindSphere through a secure internet connection, to enable cloud-based applications and services

- Enables connectivity for almost every asset (Siemens and 3rd party)
 - Requires only a small number of system resources
 - Secure connectivity from an onsite device to the MindSphere platform (e.g. authentication, encryption)
 - Firewall-friendly communication via RESTfull API
 - Logical workflows: Implement triggers to specify the calls that initiate a run of your data collection, integration and transfer processes
 - File transfer functionality
 - Local data buffering possible

Benefits

Depends on your local decision as to where the MindConnect LIB is going to be used, including interface to custom data parser at the platform backend for non timeseries data. Generally speaking: Any field protocol could be supported (with development into the Custom Agent)

Supporting Protocols

- Data reading cycle: Depending on each use case, up to 250 data points per second for the first released version
 - Data transfer cycle: Every 10 seconds



Performance

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MindSphere 3.0

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Connectivity

MindConnect IoT Extension (3.0)

Welcome to Administration

With this application you can Add or remove [users](#) and [roles](#) and configure their permissions. Subscribe to applications and [set up](#) your own applications. Configure your [own processing rules](#) and actions. Change application [settings](#).

Current month usage	Last month usage	Subscribed apps
Usage between 1 Nov 2017 - 2 Nov 2017	Usage between 30 Sep 2017 - 32 Oct 2017	Cockpit cockpit
12121 API requests, including:	0 API requests, including:	
7808 device API requests	0 device API requests	
2.8 MB storage	0 storage	
Amount of data in use on 2 Nov 2017	Amount of data in use on 31 Oct 2017	
2 root devices	0 root devices	
Number of root devices on 2 Nov 2017. Does not include child devices.	Number of root devices on 31 Oct 2017. Does not include child devices.	
2 devices	0 devices	
Number of devices on 2 Nov 2017, including child devices.	Number of devices on 31 Oct 2017, including child devices.	
1 user		

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MindSphere 3.0



MindConnect IoT Extension¹⁾

Expand MindSphere connectivity to all machines across the production floor

- **SW Agents:** MQTT Agent, Java Agent, C++ Agent
- **Agent Development:** REST API
- **Field protocols:** HTTP/HTTPS, TCP, VNC, MQTT / MQTT+TLS, REST, SmartRest 1.0 / 2.0, OPC-UA, Modbus/RTU, Modbus/TCP, CAN bus, MMC, SPI, I2C, McASP, device specific protocols
- **Devices:** Adeunis LoRAWAN, BeagleBone Black, Cinterion Java Modules, CloudGate, Dell Edge Gateway, INSYS Smart Devices – INSYS OS, INSYS Smart Devices – icom OS, Janz Tec emPC A/RPI, Libelium-Mesehlum, Mbed u-blox C027, Meitrack, Netcomm, PCUA Java Gateway, OWA3x, QuecLink, RaspberryPi, Red Lion RAM, SMARTBox, Robustel, SIGFOX, SMARTBox IO, SMARTBox Mini, TC3G, Telic, TinkerForge, Tixi

1) Limited to small files and time series values

MindSphere Academy

Connectivity

MindConnect Integration (3.0)

MindSphere MindConnect Integration

MindConnect Integration Applications Develop Monitor Recipes Settings

Applications ?

Search Applications...

 Siemens MindSphere Version 1
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Proin non leo suscipit erat iaculis condimentum eu vitae magna. Nulla feugiat, magna sed malesuada congue, odio est euismod nisl, sed gravida arcu mauris porttitor purus.

 Siemens MindSphere Version 1
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Proin non leo suscipit erat iaculis condimentum eu vitae magna. Nulla feugiat, magna sed malesuada congue, odio est euismod nisl, sed gravida arcu mauris porttitor purus.

 Alfabet Version 1
webMethods Integration Cloud connects to Alfabet using the Interface for RESTful Web Services version 1 and supports working with the various object types as defined in Alfabet. You can use it to query, retrieve, create, update, and delete objects of any type, and also manage relations between the objects.

 Amazon Simple Storage Service (S3) Version 2006-03-01
webMethods Integration Cloud connects to Amazon Simple Storage Service (S3) using the REST interface and provides read, write, and delete access to the Amazon S3 buckets and objects within the Amazon instance.

 Amazon Simple Queue Service (SQS)
Version 2012-11-05 (AWS4) ▾  This is the latest version
webMethods Integration Cloud connects to Amazon Simple Queue Service (SQS) using the REST interface and provides access to the SQS objects within the Amazon instance.



MindConnect Integration¹⁾

Establish connectivity with existing databases and enterprise systems to open new avenues of analysis

- **Cloud connectors:** FTP(S), SOAP, REST, OData 2.0, OData 4.0, Alfabet, Cumulocity, Apps, BigQuery, Calendar, Cloud Storage, Contacts, Drive, Cloud Pub/Sub, Sheets, S3, SNS, SQS, Apache Solr, AvaTax, Concur, Coupa, Magento, Marketo, Microsoft Dynamics, NetSuite, SAP cloud, SAP Hana Marketing Cloud, Salesforce, Salesforce CRM, ServiceNow, Slack, Strikelron, SuccesFactors, SugarCRM, Zendesk
- **On premise connectors:** Ariba, OnRamp, LotusNotes, OFTP, Oracle, PeopleSoft, Remedy, SAP, SAP XI, Siebel, AS/400, JavaBeans, JDBC, Apache HIVE, MongoDB, Cassandra, HDFS, Apache Impala, Apache WebSphereMQ, Tuxedo, MSMQ, Apache Kafka

1) Limited to small files and time series values

Connecting Assets to MindSphere: MindConnect



MindConnect Nano and MindConnect IoT2040

Establish a plug and play connection to MindSphere and collect and buffer data from multiple field devices using dedicated IoT connectors like the MindConnect Nano or the MindConnect IoT2040 (for an entry level).



MindConnect API/LIB

For assets which can not be onboarded from scratch, the MindConnect API enables self programming of own connectivity agents and use further modules like Agent Management, Firmware Updates, etc. The MindConnect LIB provides an application example to facilitate the development of connectivity agents using the MindConnect API.



MindConnect Edge Analytics

Collect data at higher sampling rates and utilizing X-Tools as a collector and pre-processor for high dynamic signals.



MindConnect IoT Extension

Extend the range of IoT devices that can easily be connected to MindSphere (e.g. Raspberry Pi, SIGFOX, Dell Edge GW) or use further adaptable software-agents (e.g. MQTT, Java, C++ agents) on your custom device.



MindConnect Integration

Integrate cloud-based (e.g. Salesforce.com and on-premise based enterprise and data (e.g. historian server or SCADA systems) systems to MindSphere and enrich your data model with an extensive range of additional context data.

MindSphere Introduction

Learning Goals

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How does the MindSphere ecosystem look like?

**Open and large; scaling fast;
contains large and small
partners of different sectors**

What are the gateways of
MindSphere?

**Hardware Gateway with
MindConnect Nano/ IoT2040,
Integrated Gateway with S7
1500 or Software Gateway
with MindConnect LIB**



MindSphere Launchpad

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MindSphere Launchpad

Learning Goals

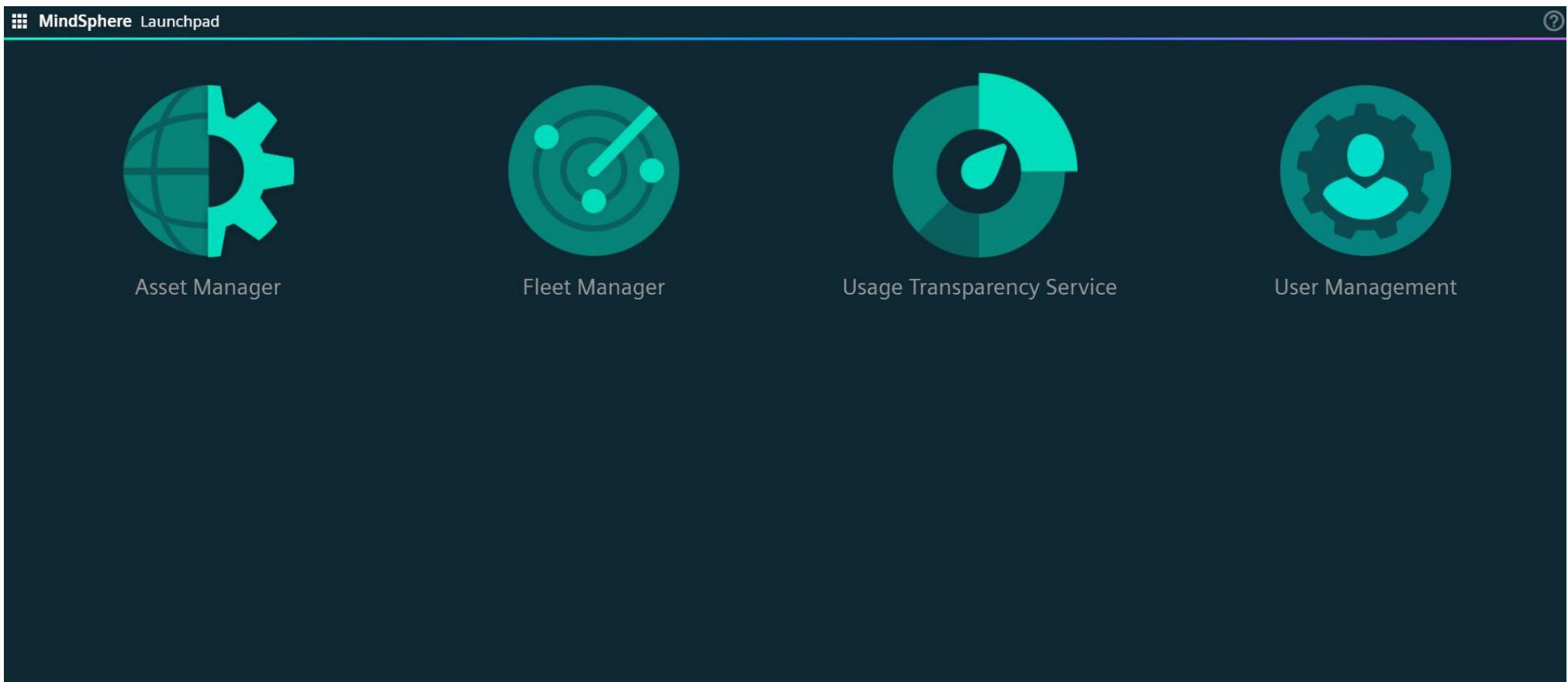
How does the MindSphere Launchpad look like?

- Asset Manager
- Fleet Manager
- Application Manager
- Manage MyMachines

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MindSphere Launchpad Overview (3.0)



Asset Manager

The Asset Manager offers the means to configure Assets, Asset type and Aspect type

MindSphere 3.0

Asset Manager



The screenshot shows the MindSphere Asset Manager interface. On the left, there's a sidebar with three tabs: ASSETS (selected), ASSET TYPES, and ASPECT TYPES. Below the tabs is a list of assets, with 'casseoe' selected. The main panel displays the 'Basic Settings' for the asset 'casseoe'. The asset type is listed as 'BasicEnterprise core.basicenterprise'. The description is 'Root Asset for casseoe tenant'. There are fields for Country, Region, Location, Postal code, Street, Longitude, and Latitude, all of which are currently empty. At the bottom right of the main panel are 'Edit' and 'New' buttons.

IoT Data Modeler is replaced by Asset Manager.

- **Asset:** assets can be created, onboarded, modified, cloned, moved, deleted or offboarded.
- **Assets Types:** administration of Assets Types/Templates.
- **Aspect Types:** administration of Aspect Types/Templates.

•Assets

Creates an asset in the three main topics: device types, agent types and hierarchy types. You can configure, read and manage an asset or the root asset. An asset is accessed by its ID.

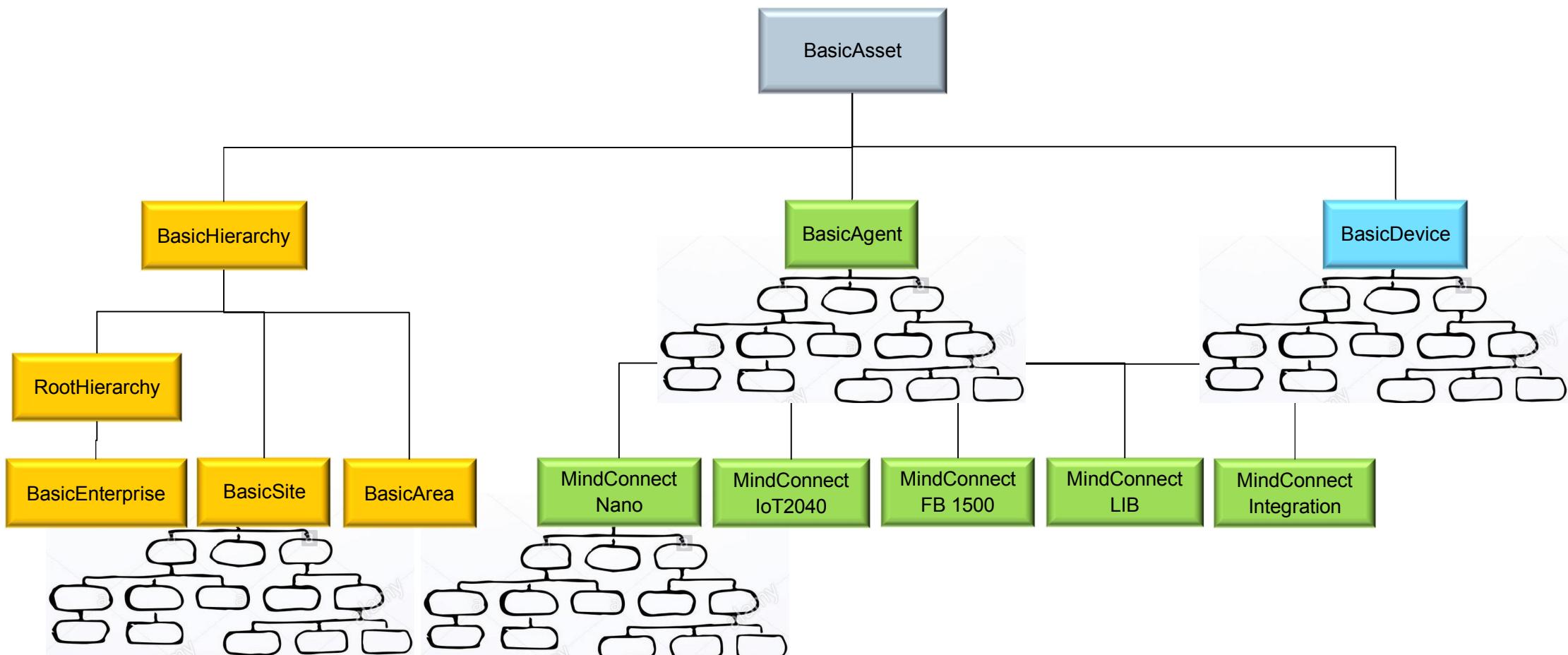
•Aspects

You can manage all aspects of an asset. An aspect is the representation of the data sources of an agent. The measured time series data are stored for aspects. An aspect can contain multiple variables.

MindSphere 3.0

Asset and Hierarchy

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Fleet Management

Always up to date

The key data for your connected components and systems

MindSphere 3.0

Fleet Manager

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Transparency of
installed base

Analysis for each asset cluster of
multiple data sources

Request function, defining actions
after an occurrence of an event

Map View

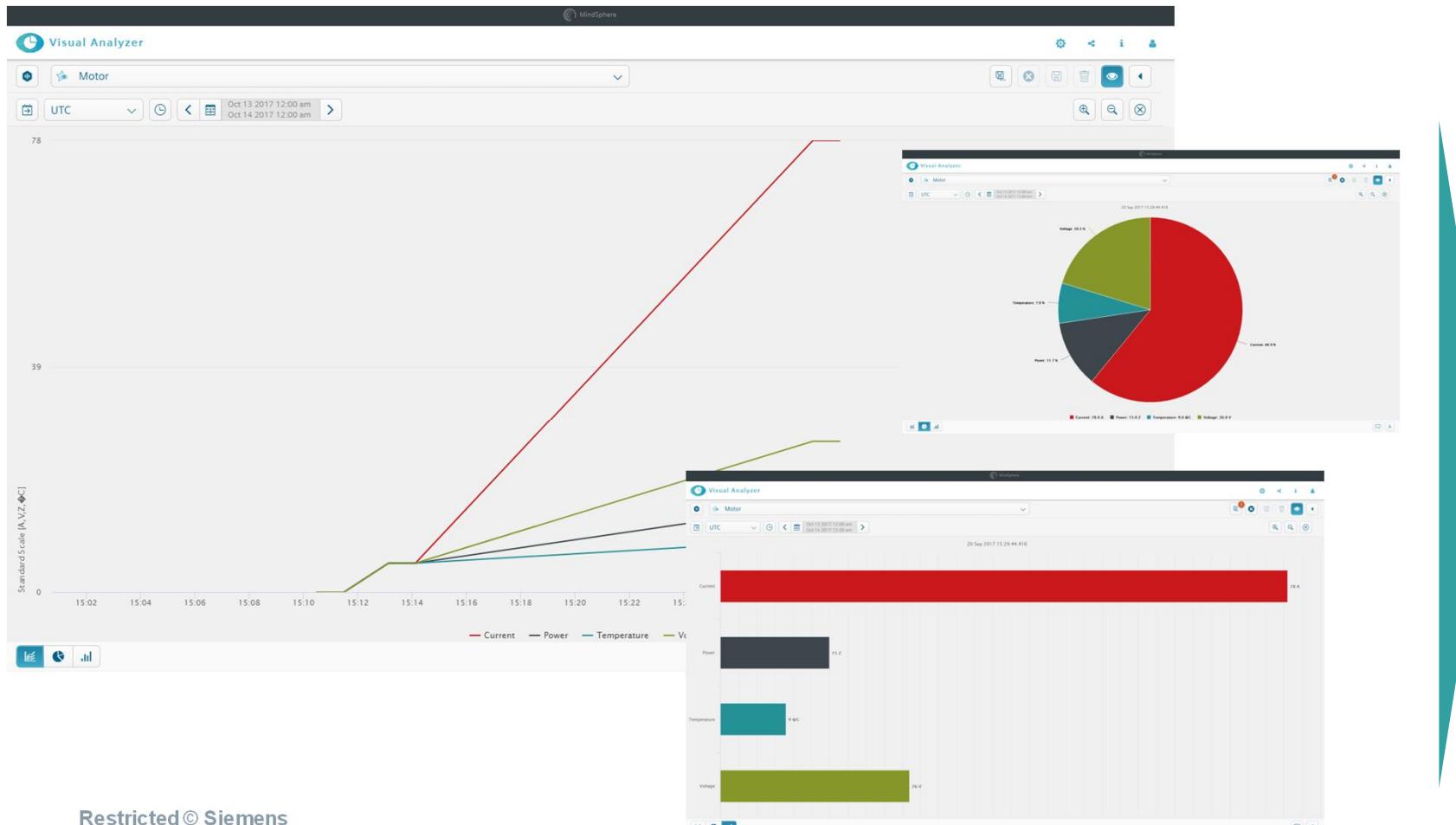
The screenshot shows the MindSphere Fleet Manager interface. On the left, there is a list of assets: NEW_GENERIC_..., TBAAsset1 (Address: Germany), Test_Asset_AC, testtao, Traingrack_1 (Address: Schuhstr. 60, Erlangen, Bavaria, Germany), Training_Agent_N..., Training_Box_1 (Address: Siemensallee 84, 76187, Karlsruhe, Deutschland), Training_Box_1a (Address: Siemensallee 84, 76187, Karlsruhe, Germany), and Training_room (Address: Siemensallee 84, 76187, Karlsruhe, Germany). On the right, a detailed view of 'TBAAsset1' is shown, including its ID (b75549b996014c60809902662df158c7) and Type (casseeo.TBAssetType1). Below this, a map displays the location of the asset in a global context.

Equipment transparency:

- Live process data
- Root cause analysis
- Rule triggered events

Fleet Manager Visual Analyzer

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MindSphere 3.0

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Visualize the data:

- Select visualization
- Select time frame
- Save and share current view

MindSphere Applications

Hands-On Exercise 1

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Exercise 1: MindSphere Launchpad and MindApp

Hands-on



MindSphere Launchpad

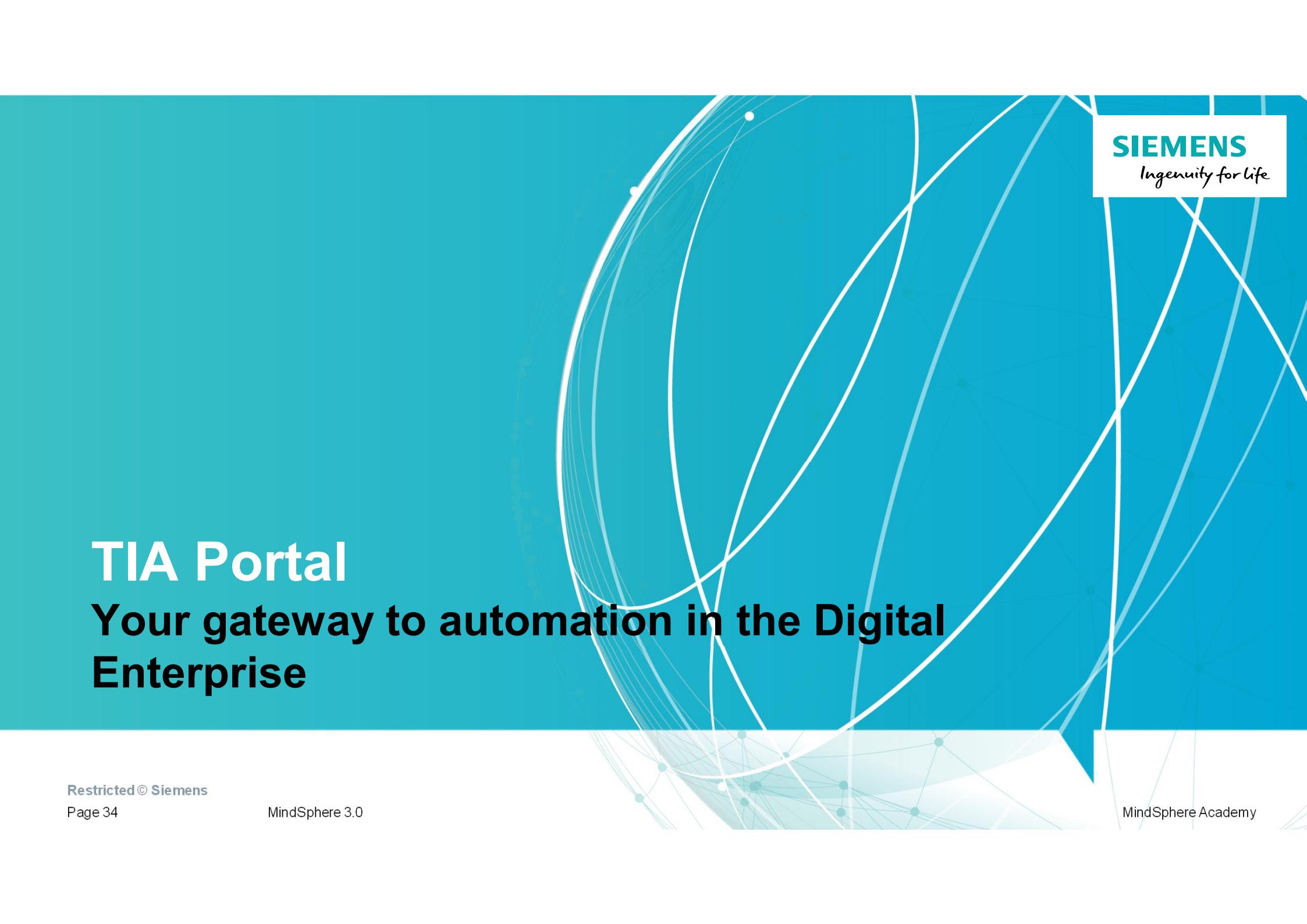
Summary

How does the MindSphere Launchpad look like?

Asset Manager, Fleet Manager, Visual Analyzer, Application Manager, UTS Reporting

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TIA Portal

Your gateway to automation in the Digital Enterprise

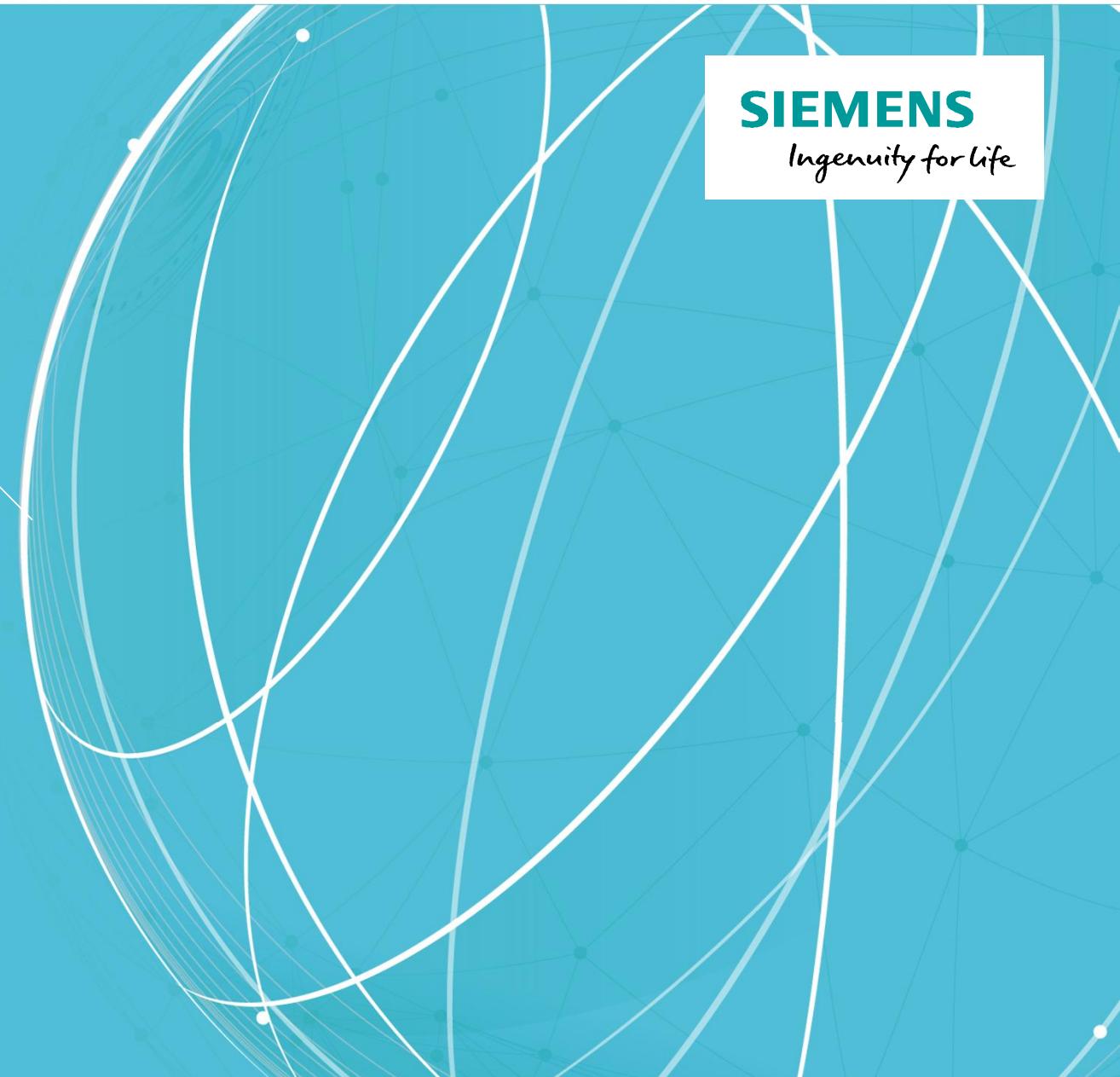
TIA Portal

Learning Goals

**What is TIA Portal
&
why do we need it?**

- Unrestricted access to the complete range of digitalized automation
- Integrates software and hardware

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- TIA = Totally Integrated Automation
- Supports process of product engineering and the connection of industrial software with automation- and production technology
- It's an automation development environment with "One Engineering Environment" approach
- Engineering from one workplace and screen over whole supply chain
- From planning to commissioning and maintenance
- Increasing automation systems
- Using the TIA portal, automation solutions in the production phase can be further optimized.
- TIA-portal opens up the entire functionality of the S7-1500 controller
- STEP7 Professional is the common tool for configuring the hardware set-up and the programming of the user program together with the program simulation and the diagnosis

TIA Portal is a tool to make all settings for your data points which should be collected from your asset and send to MindConnect Elements or MindSphere.



TIA Portal

Hands-On Exercise 2

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Get 3 Data Points from S7-300 in TIA Portal for MindSphere

Hands-on



TIA Portal Summary

What is TIA Portal and
why do we need it?

**Unrestricted access to the complete
range of digitalized automation
Integrates software and hardware**

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MindSphere Assets Configuration with S7

2018

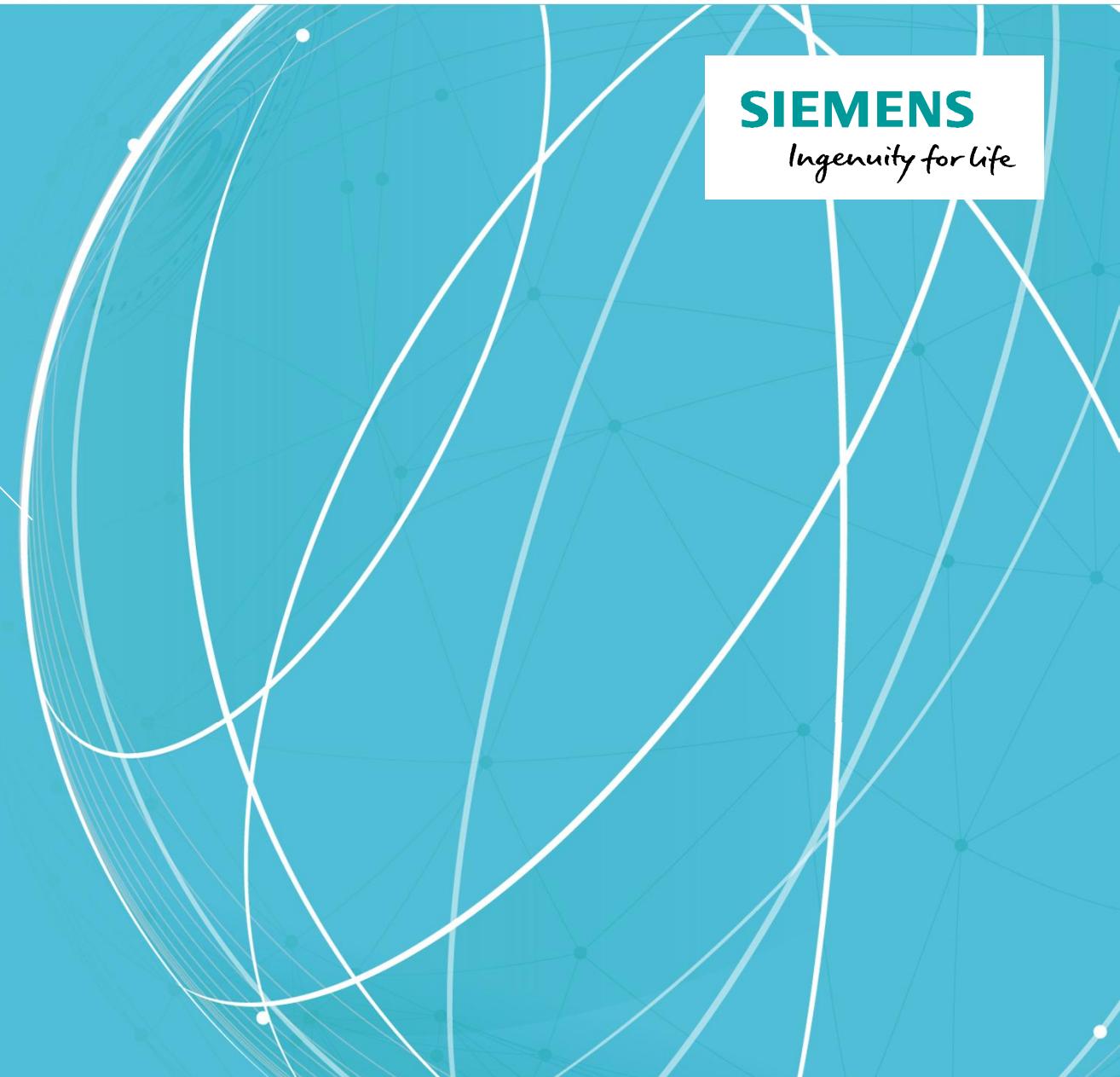
MindSphere Assets

Learning Goals

**How do I create and connect
an asset via S7 protocol in
MindSphere?**

- Create an asset in MindSphere
- Connect an asset in MindSphere via S7 protocol
- Learn the onboarding process of MindConnect Nano

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Configuration with S7

Requirements for Configuration

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- MindConnect Nano/IoT 2040 is mounted on your asset
- MindConnect Nano/IoT 2040 is prepared (refer to Getting Started MCN/IoT 2040 Chapter 3)
- PC with internet access, USB stick (FAT or FAT32)
- Valid credentials for MindSphere

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MindSphere with MindConnect Nano and MindConnect IoT2040

Getting Started

Preface
Safety Notes 1
Getting Started with MindSphere 2
Preparing MindConnect Elements for MindSphere 3
Onboarding MindConnect Elements 4
Configuring Data Collection 5
Performing a Visual Analysis of Assets 6
Appendix 7
Glossary 8

Version March 2017
03/2017

Preparing MindConnect Elements for MindSphere

3 Preparing MindConnect Elements for MindSphere

3.1 Overview

Mindconnect Elements, MindConnect Nano and MindConnect IoT2040, are embedded Industrial PCs. They are able to connect to MindSphere, collect data from the field and transfer it encrypted to MindSphere.

Mindconnect Nano is a preconfigured industrial PC that allows connectivity to MindSphere. Refer to the chapter "Technical specifications of MindConnect Nano" in the Appendix of this document.



Figure 3-1 MindConnect Nano

MindConnect IoT2040 has compact design and can be also used for collecting and transferring data to MindSphere in smaller production environments. Refer to chapter "Technical specification of MindConnect IoT2040" of the Appendix in this document.



Figure 3-2 MindConnect IoT2040

You can find the Getting Started Guides on SIOS!



Configuration with S7

What is S7 protocol



S7 protocol is Siemens' standard protocol for industrial communication.

It is supported by all available S7 controllers and communication processors. Furthermore, PC systems with appropriate hardware and software support communication via the S7 protocol.

Features, e.g.:

- Block orientated: it is divided in Protocol Data Units
- Independent of the bus medium
- Function oriented: each transmission contains a command or a reply

In MindSphere, you can choose between S7 and OPC UA protocol!

Structure:



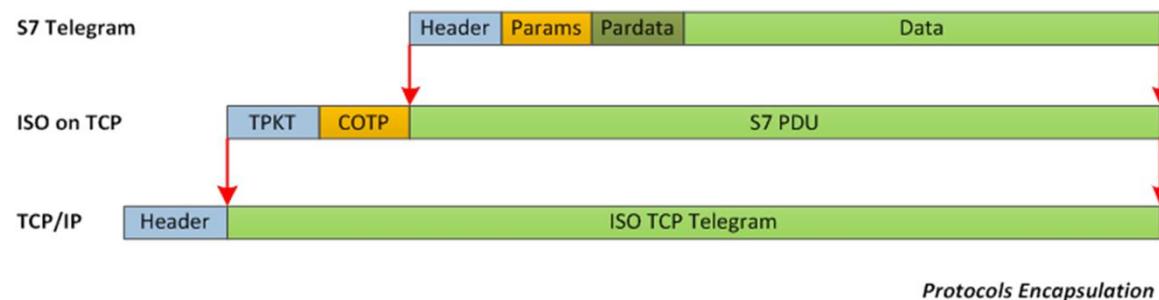
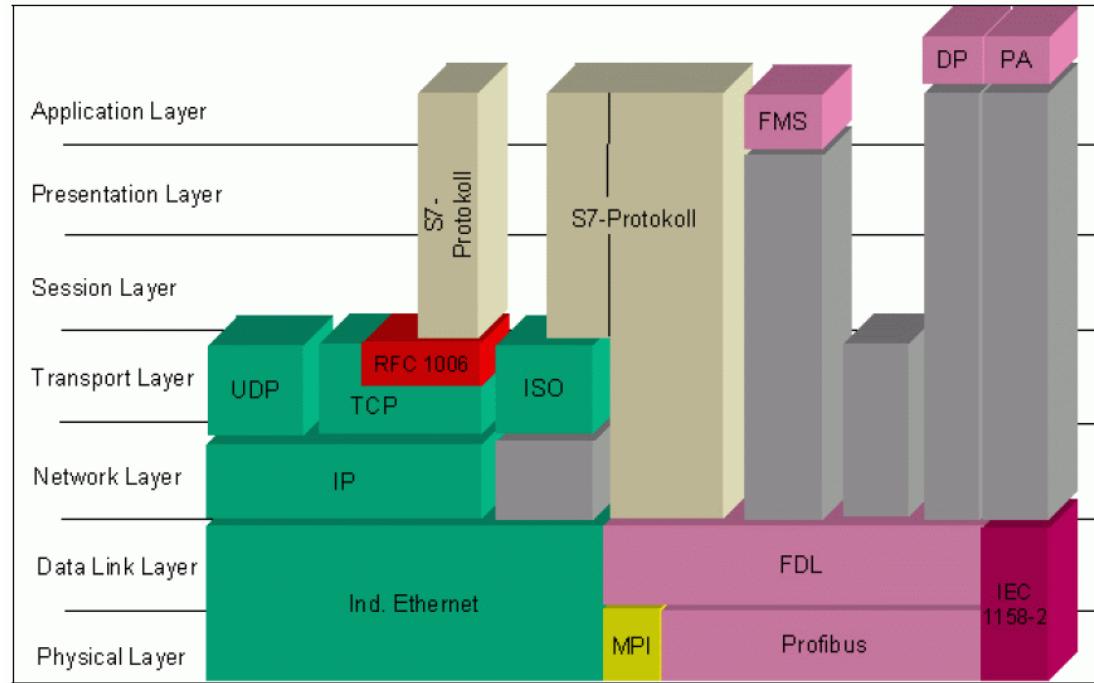
Write this **data into **DB 10** starting from the offset **4**.**



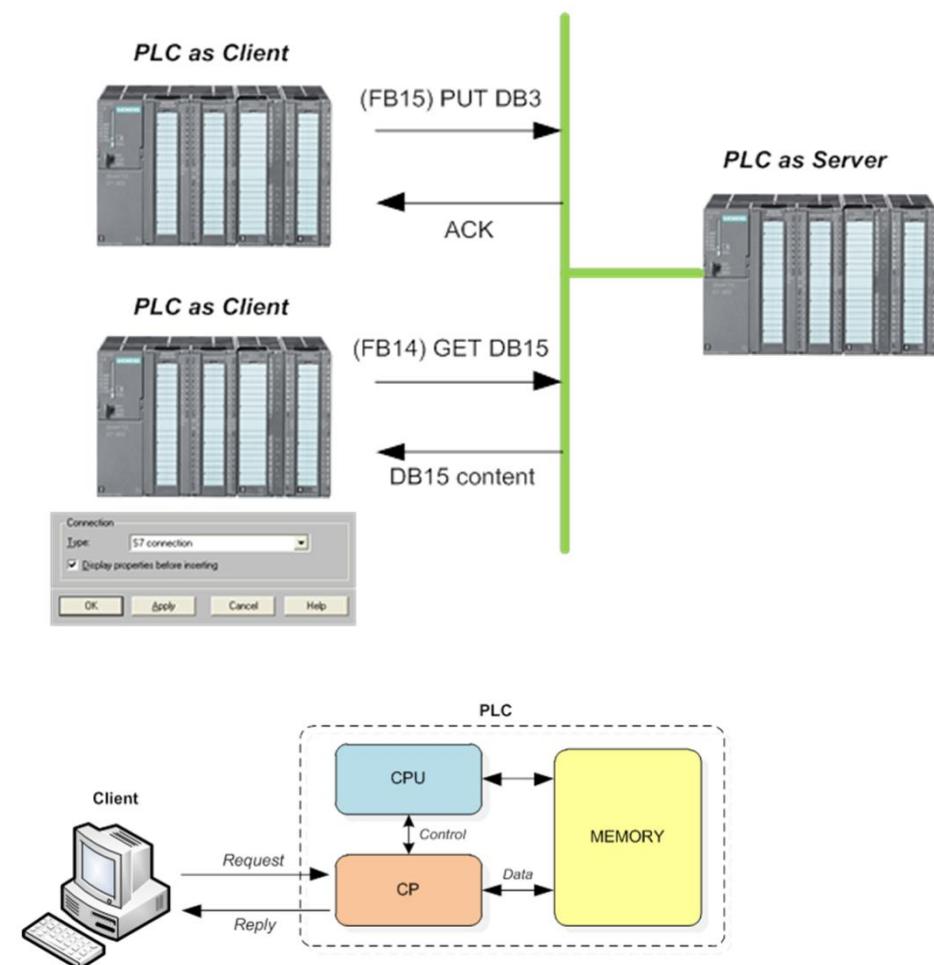
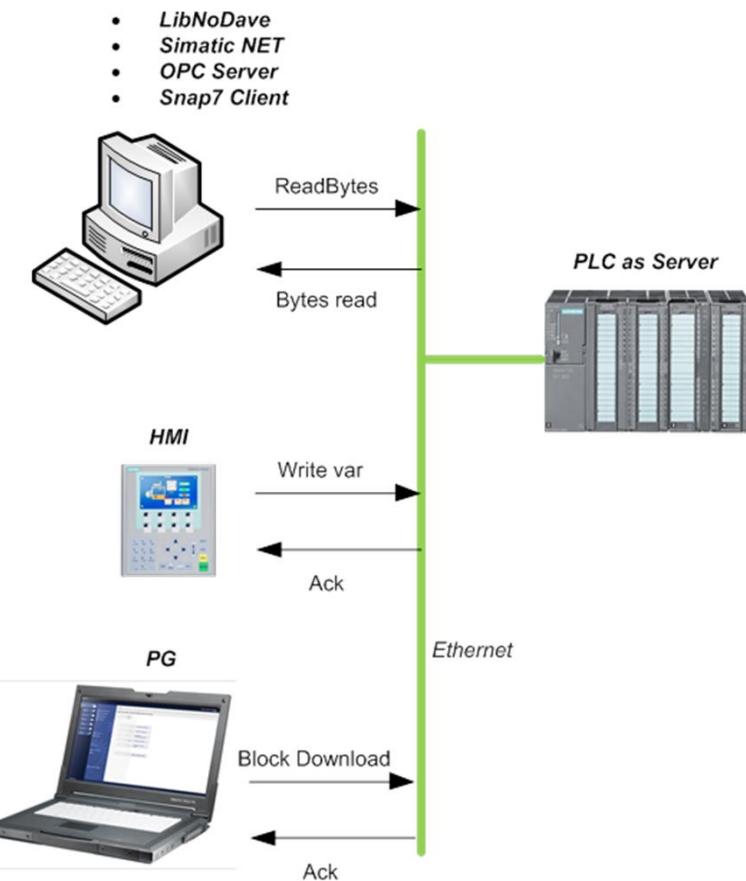
Configuration with S7

S7 protocol

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Configuration with S7 Server and Client



Configuration with S7

Hands-On Exercise 3

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Onboarding of MindConnect Nano/IoT 2040 with MindSphere 3.0

Hands-on

MindSphere



Configuration with S7

Hands-On Exercise 4

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Configure data points with onboarded MindConnect Nano/IoT 2040

Hands-on

MindSphere



Configuration with S7 Summary

What are the necessary steps to receive data in MindSphere via MindConnect Nano and S7 protocol?

Create an Asset in MindSphere by choosing MindConnect Nano, fill in all relevant information and transfer configuration via USB stick to MindConnect Nano, create aspect and configure data points with S7 protocol



MindSphere Assets Configuration with OPC UA

2018

Configuration with OPC UA

Learning Goals

**What is OPC UA
and
How do I create and connect
an asset via OPC UA in
MindSphere?**

- Connect an asset in MindSphere via OPC UA



Configuration with OPC UA

What is OPC UA



OPC Unified Architecture (OPC UA) is an industrial M2M communication protocol for interoperability developed by the OPC Foundation.

It has a cross-platform service-oriented architecture for process control, while enhancing security and providing an information model for complex information structures.

Features, e.g.:

- Discovery: find the available OPC Servers on local PCs and/or networks
- Redundancy support
- Heartbeat for connections in both directions (to indicate whether the other end is "alive").

With OPC UA, you are able to connect 3rd party assets to MindSphere!
To use OPC UA, you need an S7-1500 V2.x or any other OPC UA server!

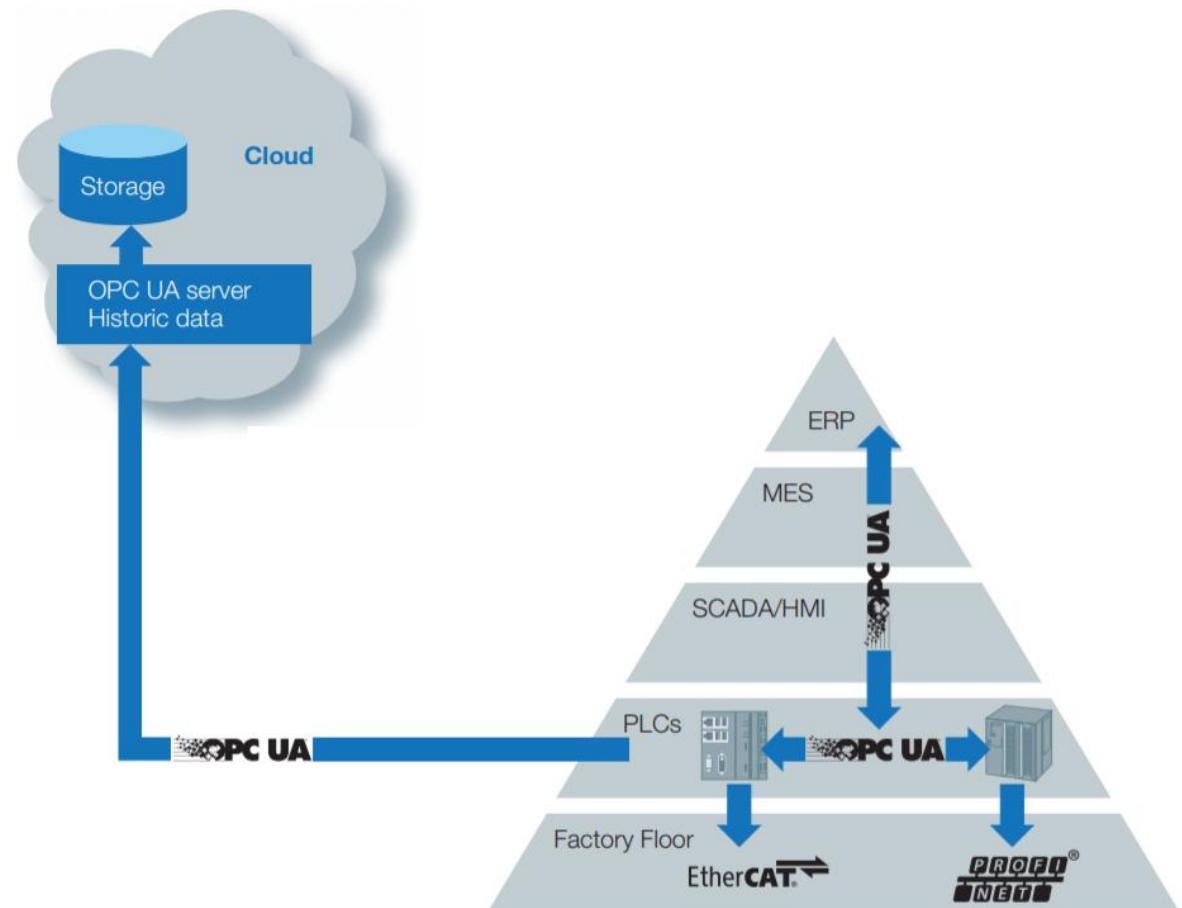


Configuration with OPC UA

Industry 4.0

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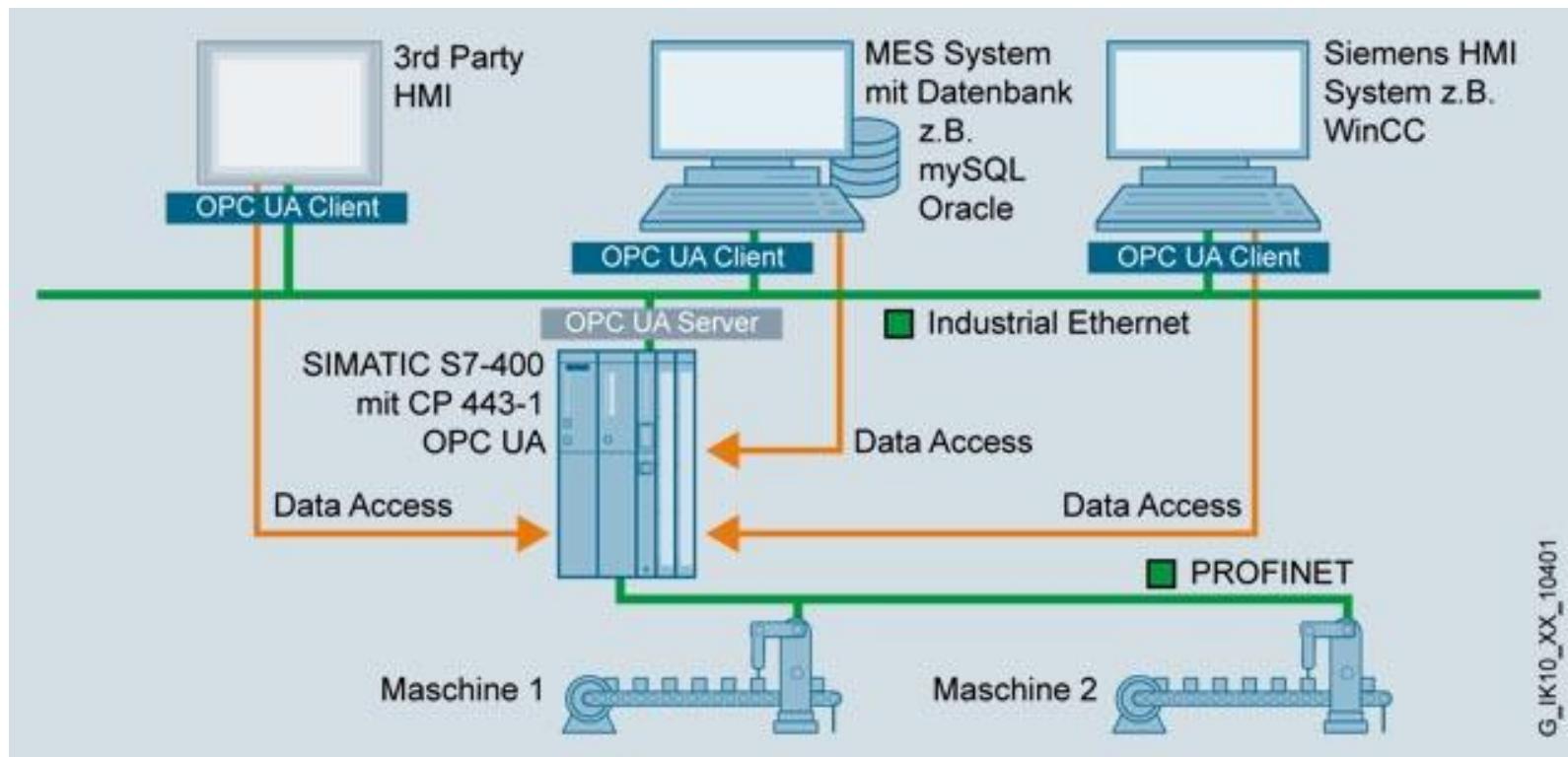
- **Functional equivalence:** all COM OPC Classic specifications are mapped to UA
 - Discovery
 - Address space
 - On-demand
 - Subscriptions
 - Events
 - Methods
- **Platform independence:** from an embedded micro-controller to cloud-based infrastructure
- **Secure:** encryption, authentication, and auditing
- **Extensible:** ability to add new features without affecting existing applications
- **Comprehensive information modeling:** for defining complex information



Configuration with OPC UA

Siemens Reference

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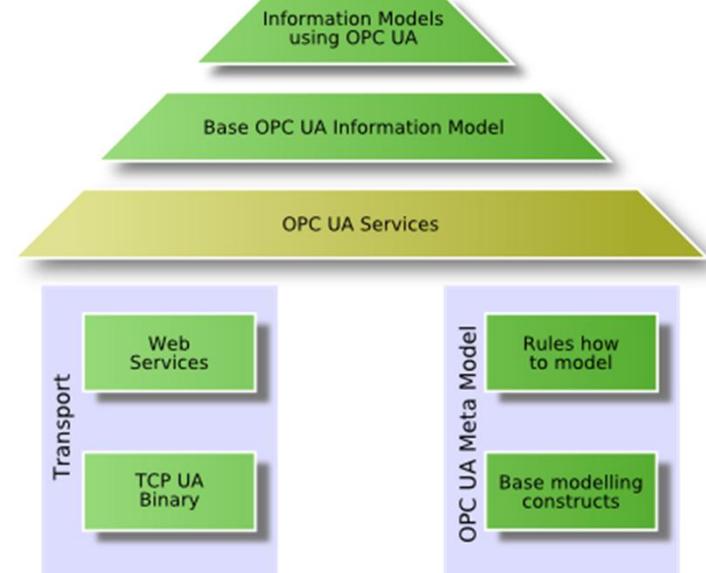
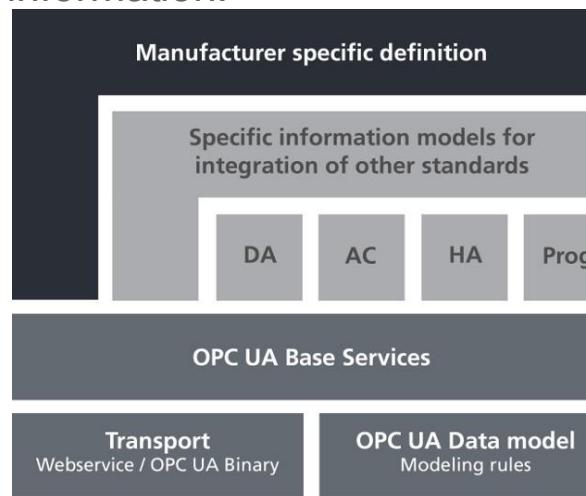
Configuration with OPC UA

Information Modeling



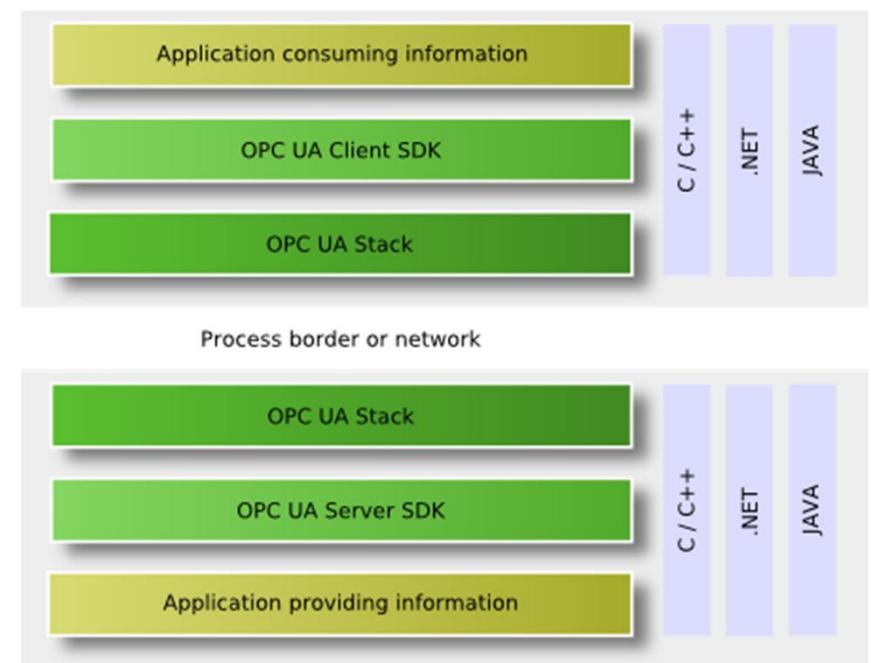
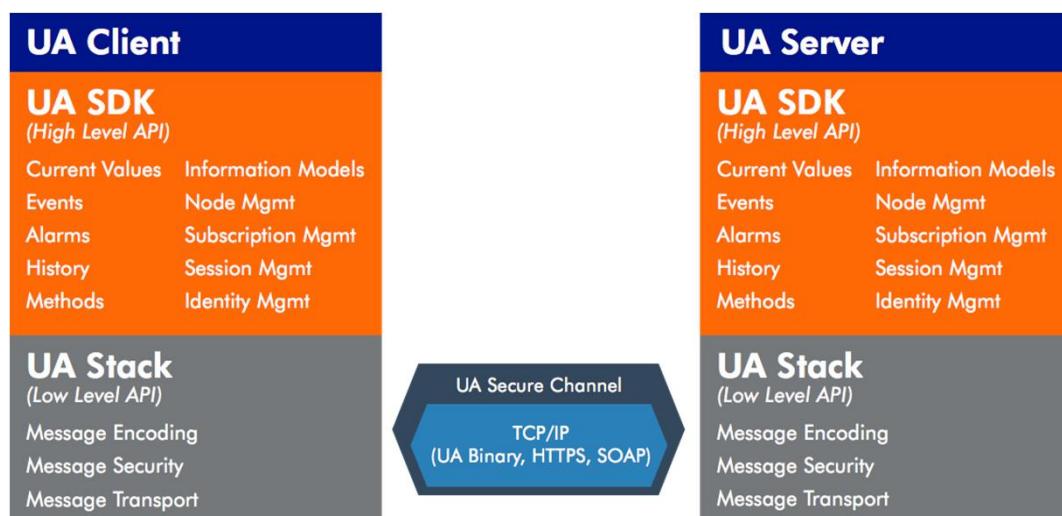
The OPC UA information modeling framework turns data into information. With complete object-oriented capabilities, even the most complex multi-level structures can be modeled and extended.

- Transport – for the data exchange mechanisms between OPC UA applications. Different transport protocols exist for different requirements (optimized for speed and throughput = UA TCP with UA Binary; firewall-friendly = HTTP + Soap).
- Meta model – specifies the rules and basic components for publishing an information model via OPC UA. It also includes various basic nodes and basic types.
- Services – they constitute the interface between a server as information provider and clients as users of this information.



Configuration with OPC UA

OPC UA Server and Client



Configuration with OPC UA

OPC UA Transport

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Configuration with OPC UA

OPC UA Services

INTEGRATED SERVICES

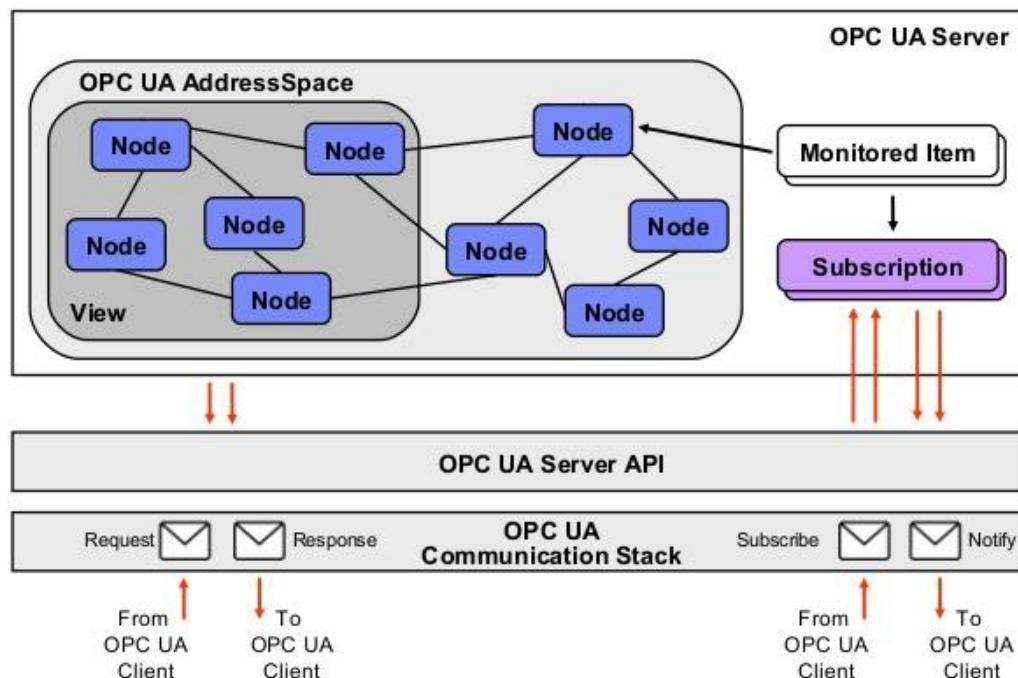
OPC UA defines the services required to navigate through the namespace, read or write variables, or subscribing for data modifications and events. The OPC UA services are organized in logical groupings, so-called service sets. Service request and response are transmitted through exchange of messages between clients and servers.

- SecureChannel service set
- Session service set
- NodeManagement service set
- View service set
- Attribute service set
- Method service set

- MonitoredItem service set
- Subscription service set

Configuration with OPC UA

Address Space Concepts



NodeClass Graphics Elements

- OPC UA defines eight **node classes**. Each **node** in the address space is an instance of one of these node classes.

NodeClass	Graphical Representation	Comment
Object	Object	Can contain the TypeDefinition separated by ":", e.g., "Object1::Type1"
ObjectType	ObjectType	Abstract types use italic, concrete types not
Variable	Variable	Can contain the TypeDefinition separated by ":", e.g., "Variable1::Type1"
VariableType	VariableType	Abstract types use italic, concrete types not
DataType	DataType	Abstract types use italic, concrete types not
ReferenceType	ReferenceType	Abstract types use italic, concrete types not
Method	Method	-
View	View	-

Configuration with OPC UA

NodeID



In OPC UA, every entity in the address space is a node. To uniquely identify a Node, each node has a NodeID, which is always composed of three elements: **NamespaceIndex**, **IdentifierType**, **Identifier**.

There is an XML notation defined by the OPC UA XML Schema which represents a fully qualified NodeID. The format of the string is: **ns=<namespaceIndex>;<identifierType>=<identifier>**

NodeID	
NamespaceIndex	2
IdentifierType	numeric
Identifier	5001

NodeID	
NamespaceIndex	2
IdentifierType	opaque
Identifier	M/RbKBsRVkePCePcx24oRA==

NodeID	
NamespaceIndex	2
IdentifierType	string
Identifier	MyTemperature

NodeID	
NamespaceIndex	2
IdentifierType	GUID
Identifier	09087e75-8e5e-499b-954f-f2a9603db28a

Flag	Identifier Type
i	NUMERIC (UInteger)
s	STRING (String)
g	GUID (Guid)
b	OPAQUE (ByteString)

Examples:

ns=2;s=MyTemperature

namespace index 2, string identifier

i=2045

namespace index 0, numeric identifier

ns=1;g=09087e75-8e5e-499b-954f-f2a9603db28a

namespace index 1, GUID identifier

ns=1;b=M/RbKBsRVkePCePcx24oRA=='

namespace index 1, Opaque/ByteString identifier

OPC UA Configuration

Hands-On Exercise 4

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Asset configuration OPC UA

Hands-on

MindSphere



MindSphere Launchpad

Summary

What is OPC UA and why is it important for MindSphere communication?

OPC UA is a M2M communication protocol for industrial automation developed by the OPC Foundation. It is an open, cross-platform, Service-oriented architecture with robust security.

By being able to use OPC UA, MindSphere becomes an open source platform to connect 3rd party assets.



MindSphere Assets

Configuration of MindConnect FB

2018

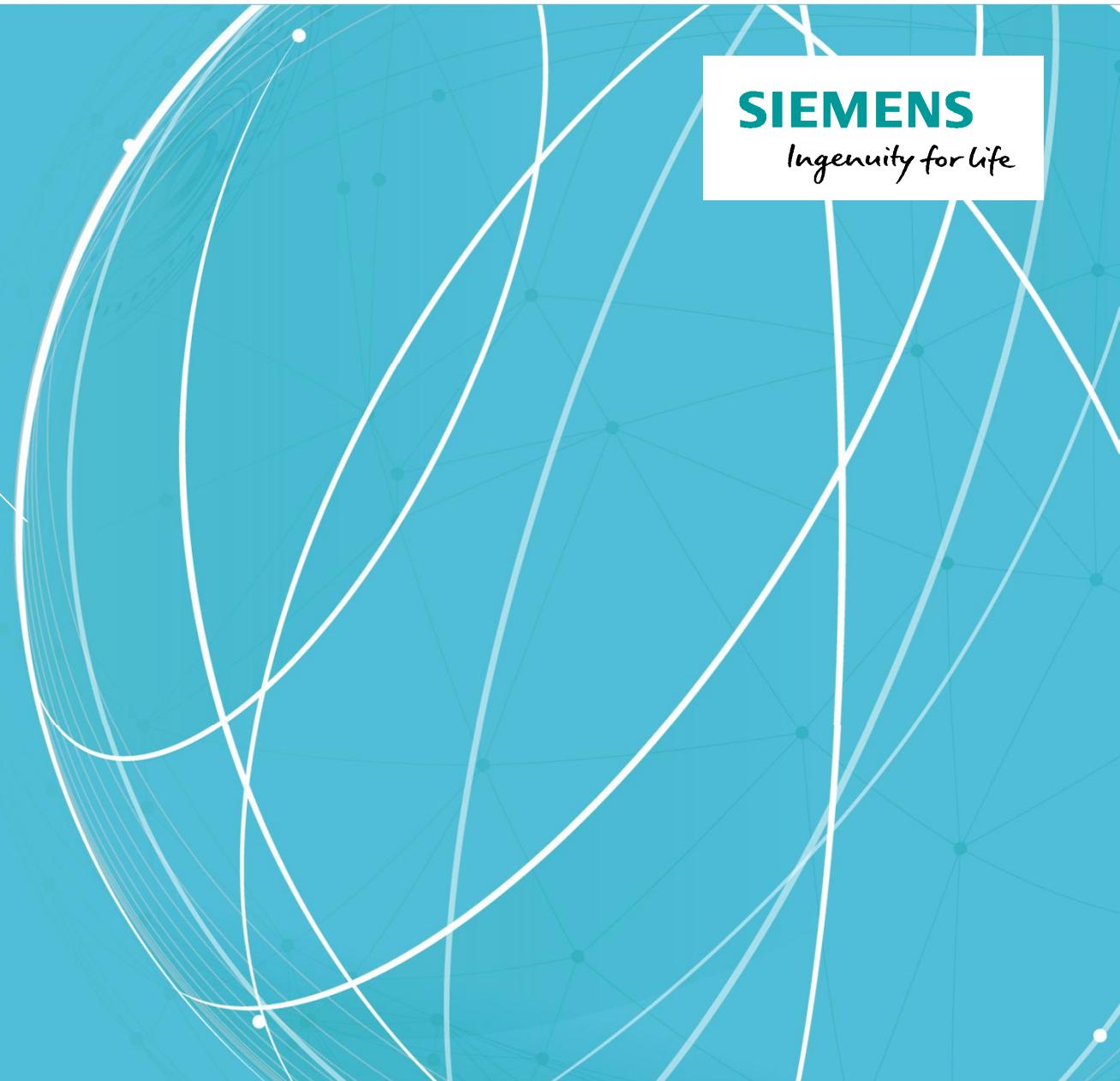
MindSphere Assets

Learning Goals

**What ist the MindConnect FB
And
How is the MindConnect FB
onboarded to MindSphere?**

- Configure MindConnect FB in TIA-Portal
- Onboard MindConnect FB to MindSphere

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MindSphere Connectivity Suite

MindConnect FB 1500*



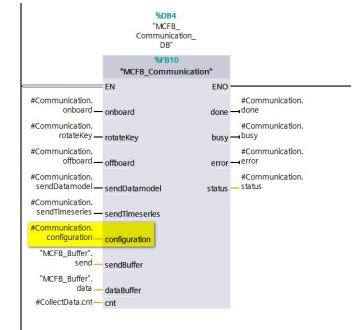
Description

MindConnect FB is a TIA Portal STEP7 Library to extend the functionality of the S7-1500 PLC. It supports encrypted transmission of PLC data to MindSphere through a secure internet connection, to enable cloud-based applications and services.



Benefits

- Fast and easy connectivity of industrial machines and automation systems to MindSphere
- Simple configuration and commissioning - Configure your data model in STEP 7 (TIA Portal V14)
- No additional hardware needed
- Unencrypted onsite (local) traffic which allows local package inspection
- Comprehensive security concept in accordance with applicable industry standards
- Local data buffering possible



Supporting Protocols

S7-1500 acts as gateway into field-level which FH(PCM2)cess to various data sources



Performance

- Data reading cycle: Up to 110 data points per second can be configured in TIA Portal (the exact amount of data points depends on each controller)
- Data transfer cycle: Every 10 seconds

* Compatible with S7-1511 to S7-1518 with firmware 2.0 or higher

Folie 63

FH(PCM2 word missing: gateway into field level ?? which...

Fields, Holly (DF PL CLD MK&BS); 07.08.2017

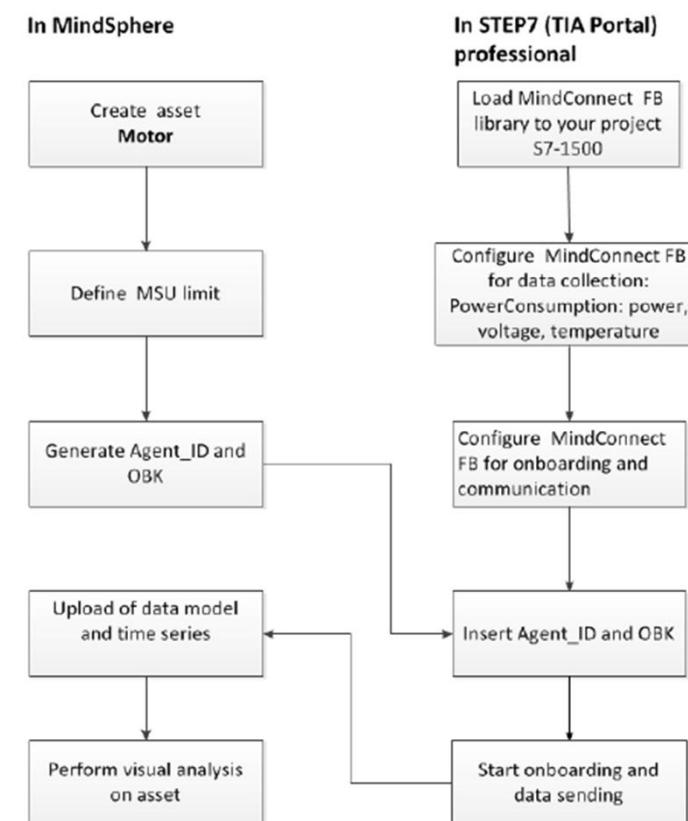
Sample of data configuration of a motor with its data points “temperature”, “voltage” and “power” of the aspect “PowerConsumption” in MindSphere and STEP7 (TIA Portal) professional.

Configuring steps:

- Configure Asset in MindSphere
- Configure MindConnect FB in TIA Portal
- Start onboarding and data sending



To use the MindConnect FB, TIA Portal V14 and S7-1500 V2.x is needed!



MindConnect FB Configuration

Hands-On Exercise 6



Pc with internet access and valid credentials for MindSphere is available

Create MindConnect FB as asset in MindSphere and prepare onboarding information to configure MindConnect FB in S7-1500

Onboard MindConnect FB from TIA Portal

Hands-on

MindSphere



Configuration of MindConnect FB

Summary

What are the differences between
MindConnect Nano/IoT2040 and
MindConnect FB?

MindConnect FB is no physical connect element, it is a function block for TIA-Portal which you can directly integrate in your S7-1500 to connect to MindSphere without a MindConnect Nano or MindConnect IoT2040.



MindConnect IoT Extension & MindConnect Integration

MindConnect IoT Extension & MindConnect Integration

Learning Goals



What ist MindConnect IoT
Extension &
MindConnect Integration?

- Get familiar with the two new MindConnect Elements
- Get familiar with the user interface

Connectivity Services

Offering Overview – connectivity for MindSphere 3.0



Offering in V3.0

Added Value

MindConnect Integration

Integrate **cloud-based and on-premise based Enterprise & Data Systems** to MindSphere and enrich your data model with an extensive range of additional context data

new

MindConnect IoT Extension

Extend the range of IoT devices that can easily be connected to MindSphere (e.g. Raspberry Pi, SIGFOX, Dell Edge GW) or use further adaptable software-agents (e.g. MQTT, Java, C++ agents) on your custom device

new

MindConnect API

Get access to a **restful API** to develop your own agents and bring your data into MindSphere

new

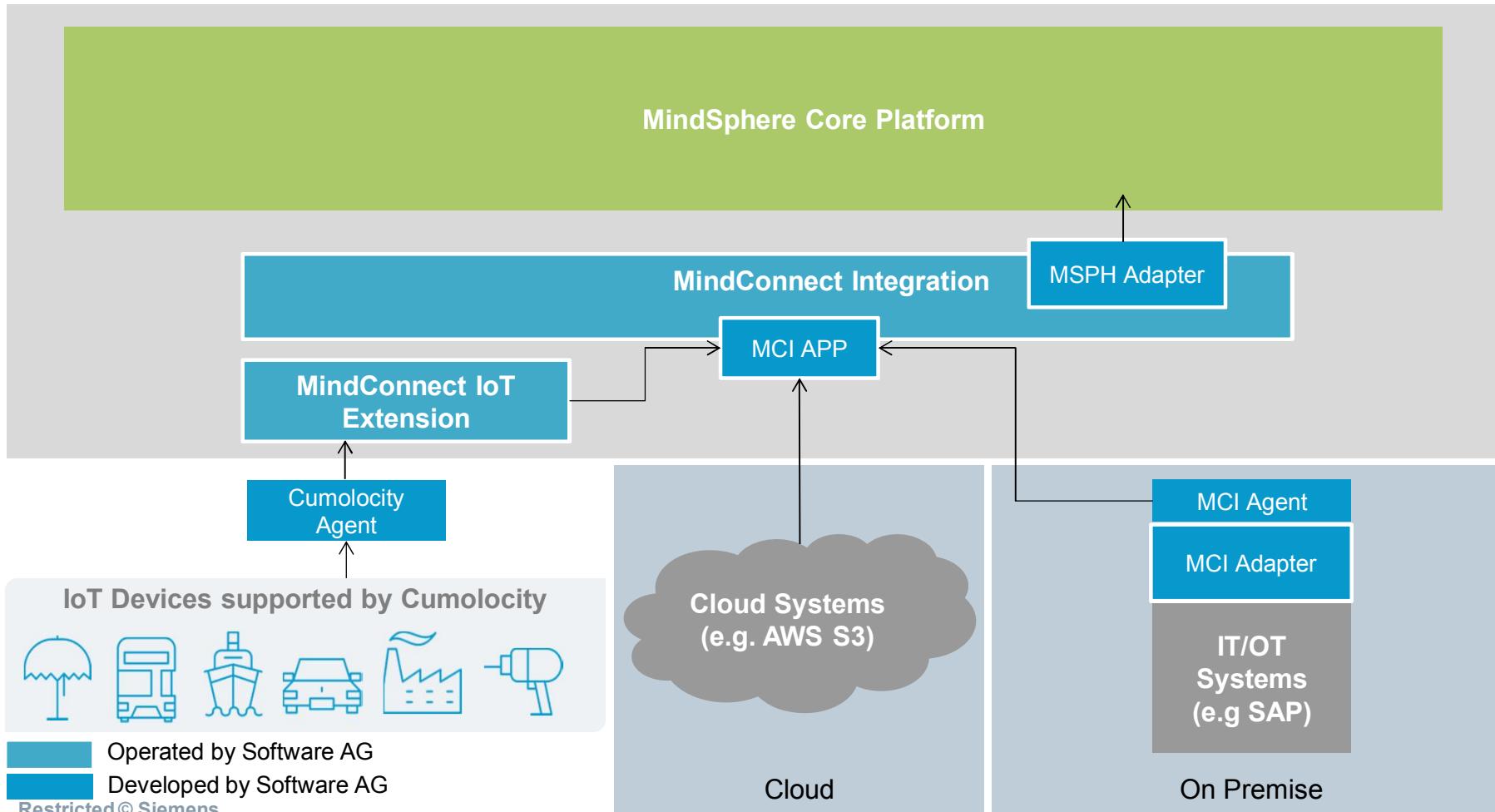
MindConnect LIB

Use a C-based library as an application example to **develop your own agents** and bring your data into MindSphere

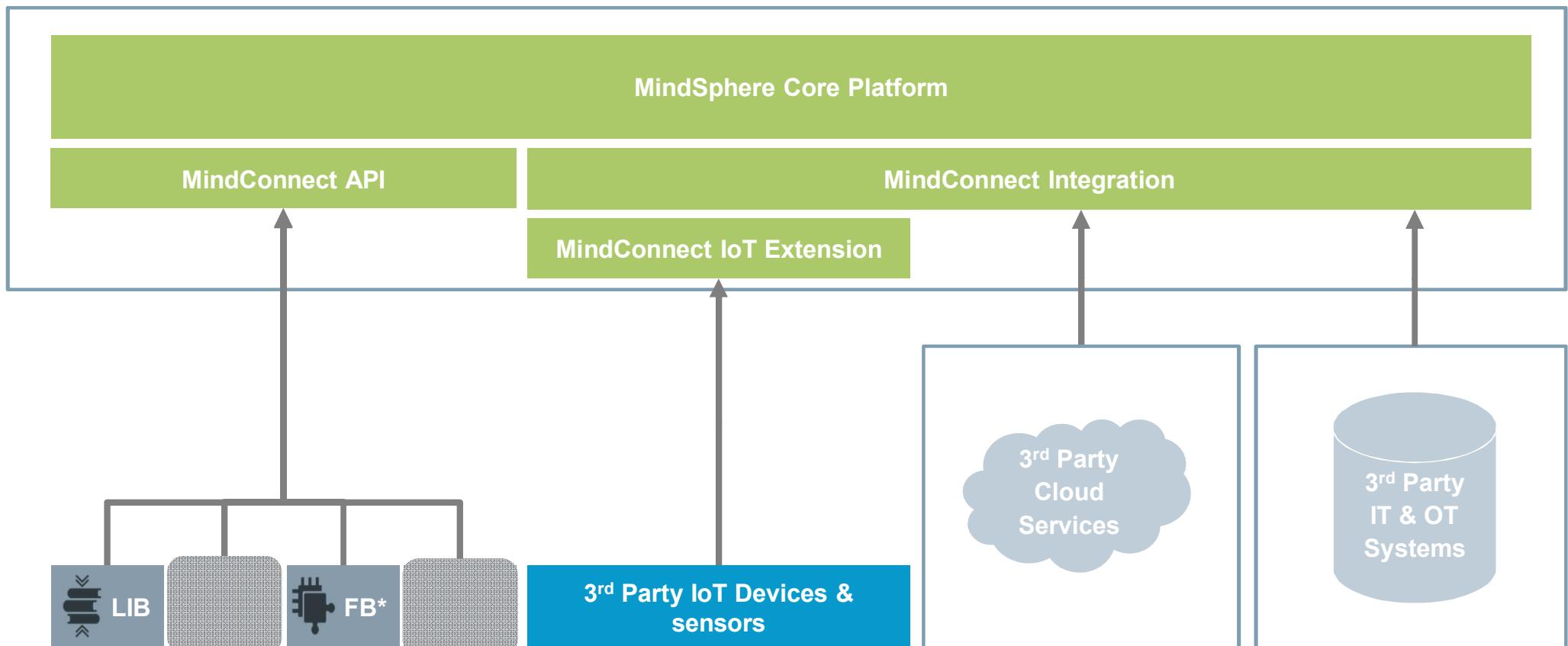
improved

Architecture MindConnect Integration & IoT Extension

Usecase 1: Timeseries Upload



Big Picture Connectivity



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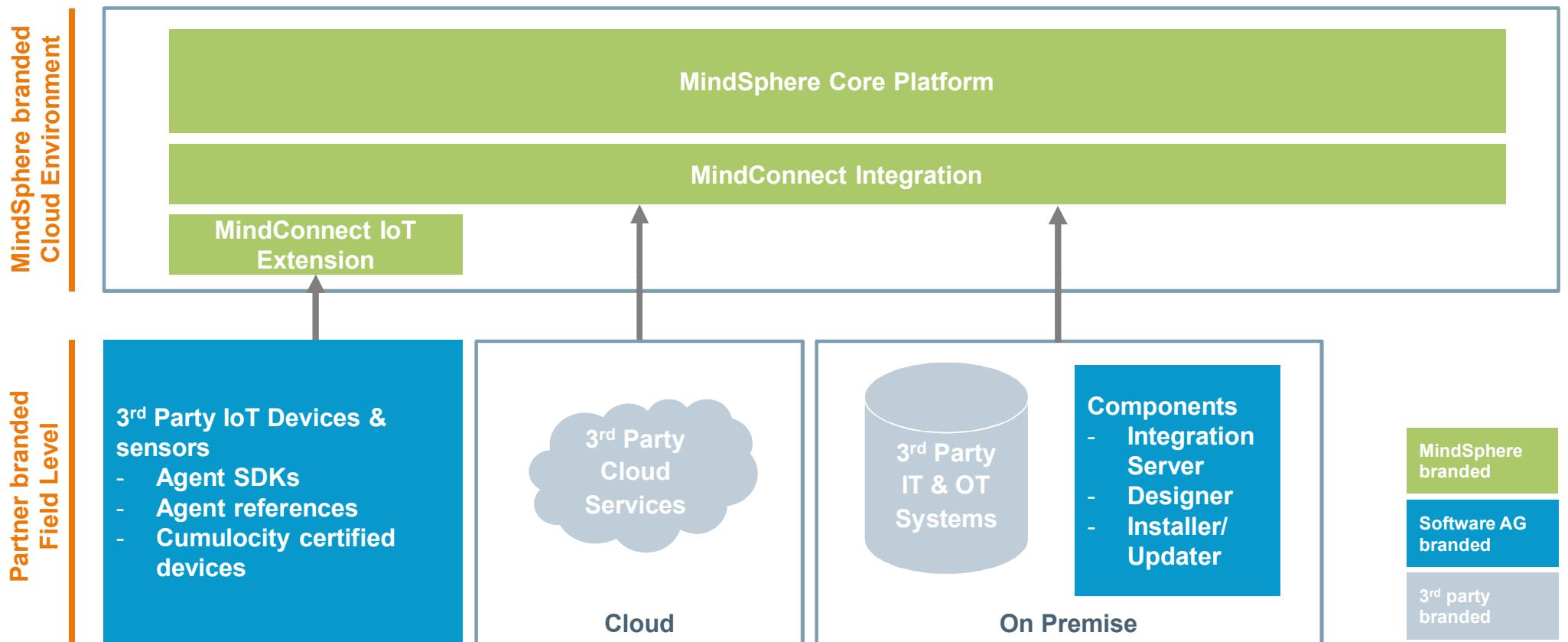
MindSphere 3.0

MindSphere Academy

*ownership transferred to DF FA SUP

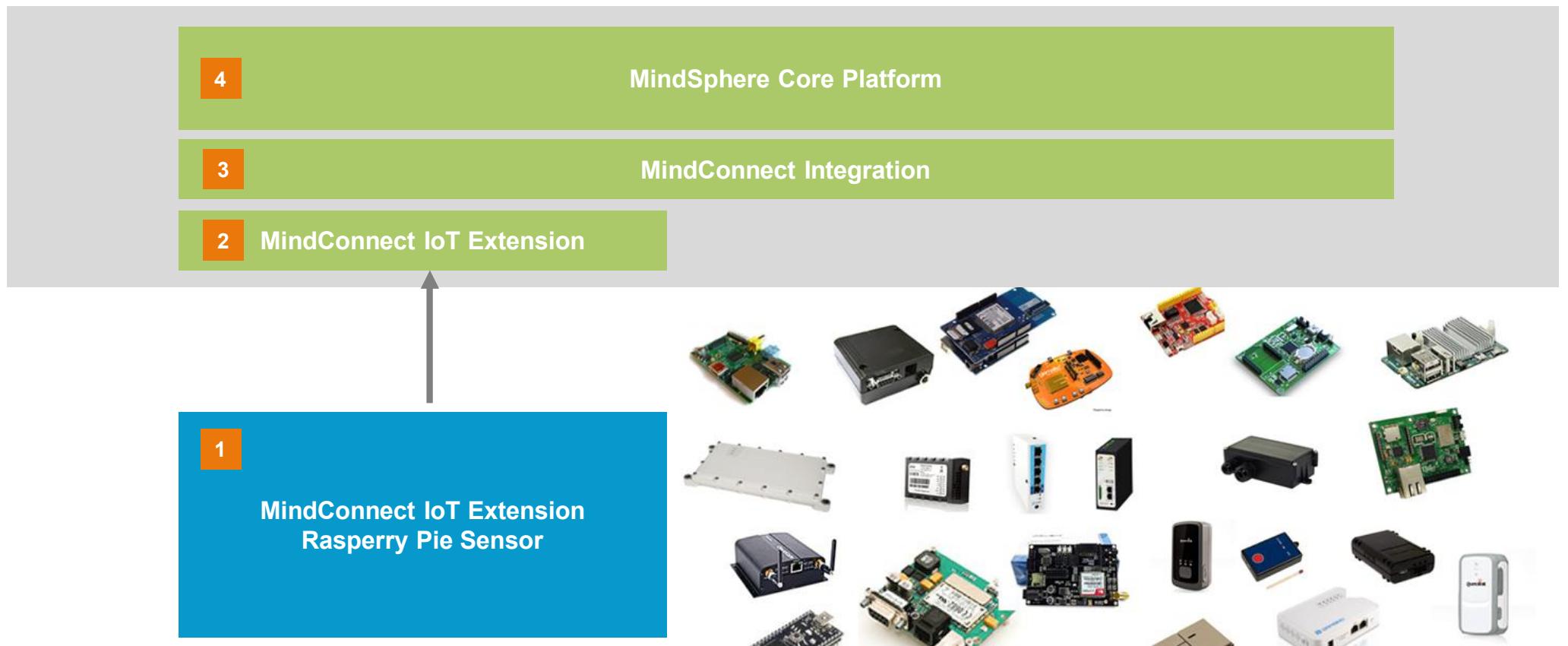
Architecture MindConnect Integration & IoT Extension

Whitelable Overview



Architecture MindConnect Integration & IoT Extension

User Journey Overview



MindConnect Integration & IoT Extension

Whitelabeling Aspects

- ✓ The complete customer journey on cloud side is white labeled
 - Allow seamless MindSphere experience between all cloud services
- Everything needed on field level is branded as Software AG/Cumulocity/3rd party
 - ✓ Cumulocity is a huge, established ecosystem including SDKs, forums and communities which we need to leverage
 - Agent & on premise adapter development environment is very dynamic und would cause continuous white labeling efforts
 - Software AG is domain expert in on-premise integration scenarios
- To get access to installer, designer, on premise adapters, SDKs and agent references for field level the customer leaves the MindSphere branded environment and uses Software AG/ Cumulocity branded content.

Connectivity

MindConnect IoT Extension

Welcome to Administration

With this application you can Add or remove [users](#) and [roles](#) and configure their permissions. Subscribe to applications and [set up](#) your own applications. Configure your [own processing rules](#) and actions. Change application [settings](#).

Current month usage	Last month usage	Subscribed apps
Usage between 1 Nov 2017 - 2 Nov 2017	Usage between 30 Sep 2017 - 32 Oct 2017	Cockpit cockpit
12121 API requests, including:	0 API requests, including:	
7808 device API requests	0 device API requests	
2.8 MB storage	0 storage	
Amount of data in use on 2 Nov 2017	Amount of data in use on 31 Oct 2017	
2 root devices	0 root devices	
Number of root devices on 2 Nov 2017. Does not include child devices.	Number of root devices on 31 Oct 2017. Does not include child devices.	
2 devices	0 devices	
Number of devices on 2 Nov 2017, including child devices.	Number of devices on 31 Oct 2017, including child devices.	
1 user		

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MindSphere 3.0



MindConnect IoT Extension¹⁾

Expand MindSphere connectivity to all machines across the production floor

- **SW Agents:** MQTT Agent, Java Agent, C++ Agent
- **Agent Development:** REST API
- **Field protocols:** HTTP/HTTPS, TCP, VNC, MQTT / MQTT+TLS, REST, SmartRest 1.0 / 2.0, OPC-UA, Modbus/RTU, Modbus/TCP, CAN bus, MMC, SPI, I2C, McASP, device specific protocols
- **Devices:** Adeunis LoRAWAN, BeagleBone Black, Cinterion Java Modules, CloudGate, Dell Edge Gateway, INSYS Smart Devices – INSYS OS, INSYS Smart Devices – icom OS, Janz Tec emPC A/RPI, Libelium-Mesehlum, Mbed u-blox C027, Meitrack, Netcomm, PCUA Java Gateway, OWA3x, QuecLink, RaspberryPi, Red Lion RAM, SMARTBox, Robustel, SIGFOX, SMARTBox IO, SMARTBox Mini, TC3G, Telic, TinkerForge, Tixi

1) Limited to small files and time series values

MindSphere Academy

Connectivity

MindConnect Integration

MindSphere MindConnect Integration

 MindConnect Integration Applications Develop Monitor Recipes Settings

Applications ?

Search Applications...

 Siemens MindSphere Version 1 <small>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Proin non leo suscipit erat iaculis condimentum eu vitae magna. Nulla feugiat, magna sed malesuada congue, odio est euismod nisl, sed gravida arcu mauris porttitor purus.</small>	 Alfabet Version 1 <small>webMethods Integration Cloud connects to Alfabet using the Interface for RESTful Web Services version 1 and supports working with the various object types as defined in Alfabet. You can use it to query, retrieve, create, update, and delete objects of any type, and also manage relations between the objects.</small>
 Amazon Simple Storage Service (S3) Version 2006-03-01 <small>webMethods Integration Cloud connects to Amazon Simple Storage Service (S3) using the REST interface and provides read, write, and delete access to the Amazon S3 buckets and objects within the Amazon instance.</small>	 Amazon Simple Queue Service (SQS) Version 2012-11-05 (AWS4) <small>This is the latest version</small> <small>webMethods Integration Cloud connects to Amazon Simple Queue Service (SQS) using the REST interface and provides access to the SQS objects within the Amazon instance.</small>

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MindSphere 3.0



MindConnect Integration¹⁾

Establish connectivity with existing databases and enterprise systems to open new avenues of analysis

- **Cloud connectors:** FTP(S), SOAP, REST, OData 2.0, OData 4.0, Alfabet, Cumulocity, Apps, BigQuery, Calendar, Cloud Storage, Contacts, Drive, Cloud Pub/Sub, Sheets, S3, SNS, SQS, Apache Solr, AvaTax, Concur, Coupa, Magento, Marketo, Microsoft Dynamics, NetSuite, SAP cloud, SAP Hana Marketing Cloud, Salesforce, Salesforce CRM, ServiceNow, Slack, Strikelron, SuccesFactors, SugarCRM, Zendesk
- **On premise connectors:** Ariba, OnRamp, LotusNotes, OFTP, Oracle, PeopleSoft, Remedy, SAP, SAP XI, Siebel, AS/400, JavaBeans, JDBC, Apache HIVE, MongoDB, Cassandra, HDFS, Apache Impala, Apache WebSphereMQ, Tuxedo, MSMQ, Apache Kafka

1) Limited to small files and time series values

MindSphere Academy

MindConnect IoT Extension & MindConnect Integration

Hands-On Exercise 7



MindConnect IoT Extension and MindConnect Integration

<https://tepusr.eu1.mindsphere.io>

<https://demoprvm.mcintegration.eu-central-preview.mindsphere.io/integration/login#/login>

<https://demoprvm.mciotextension.eu-central.mindsphere.io/apps/cockpit/index.html#/>

MindConnect IoT Extension & MindConnect Integration

Summary

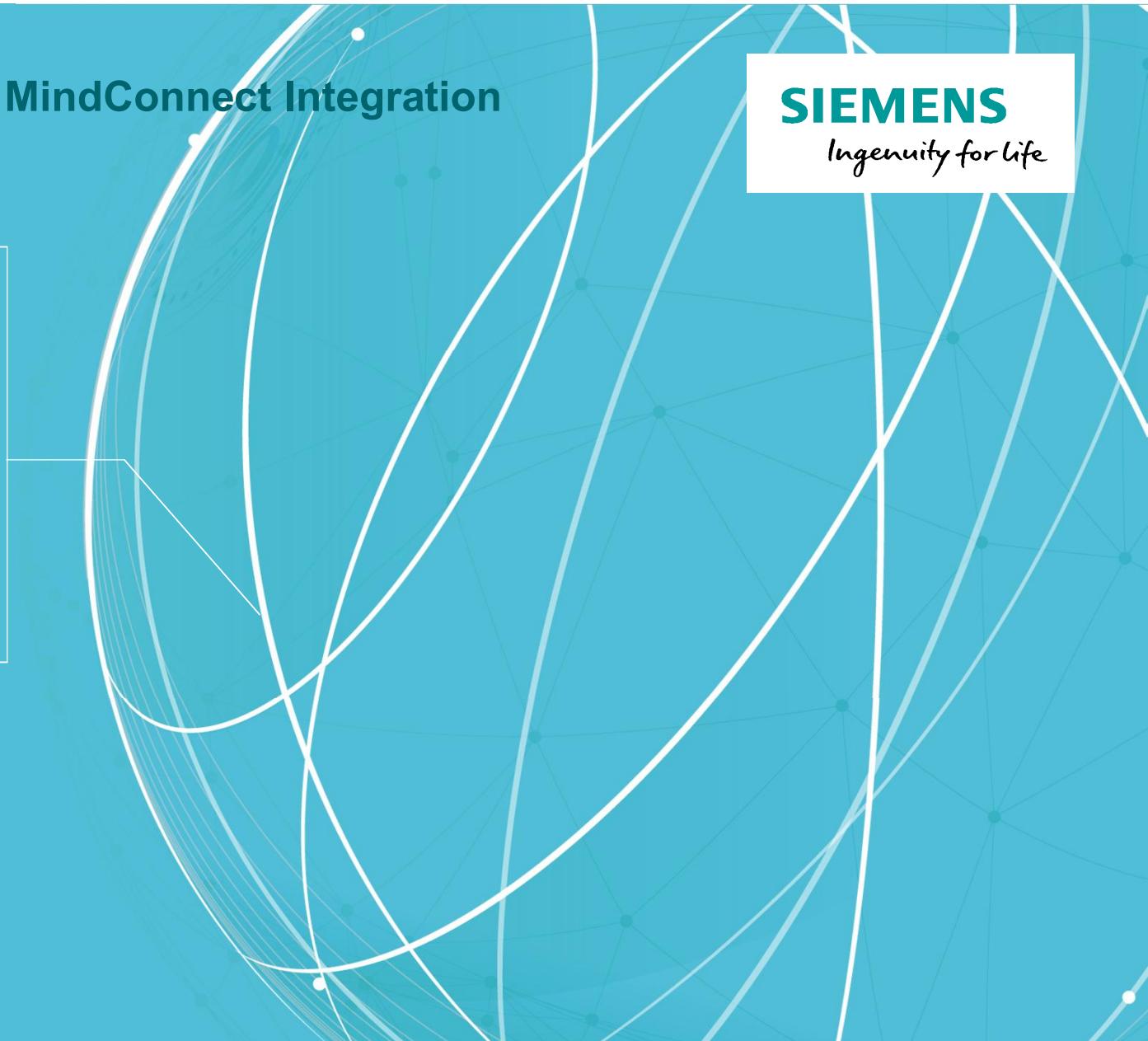


MindConnect IoT Extension

Expand MindSphere connectivity to all machines across the production floor

MindConnect Integration

Establish connectivity with existing databases and enterprise systems to open new avenues of analysis



MindConnect Device Training Summary & Feedback 2018

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MindSphere Summary & Feedback

Learning Goals



Where do I find relevant information about
MindSphere and MindSphere products?



- Ecosystem Community
- SIOS
- Support Contacts

MindSphere Forums & Network



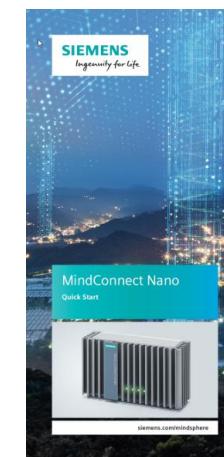
SIOS: Siemens Industry Online Support

Provide the last technical documents from Fact Sheets to Quick Start Guides and Customer Documents

The screenshot shows the Industry Online Support (mySupport) interface. At the top, there's a navigation bar with links for ASSIST, calvatis, LEDA, SIOS, SCD, and R2H. The main content area has a banner for 'Industry Online Support mySupport'. Below it, there's a search bar and a 'Site Explorer' dropdown. On the left, a sidebar titled 'Navigation' includes links for Persönliche Nachrichten, Anfragen (selected), Produkte, Benachrichtigungen, Filter, Favoriten, Tagging, Zuletzt gesehene Beiträge, Dokumentation, Persönliche Daten, CAx-Daten, and Extraneats. The central part of the screen displays a list of 'Meine Anfragen' (My Requests). The table includes columns for SR-Nummer, Produkt und Betreff, Status, and Erstellt am. Two entries are listed:

SR-Nummer	Produkt und Betreff	Status	Erstellt am
1-4470743224	MindAccess Users CALVATIS: Reconnection der MCN nicht automatisch, Daten werden nicht in VA angezeigt	In work	28.06.2016 07:47
1-4469723096	MindAccess Users CALVATIS: Reconnection der MCN nicht automatisch, Daten werden nicht in VA angezeigt	HQ Requested	27.06.2016 10:37

<https://support.industry.siemens.com>



The screenshot shows the 'MindSphere - Getting Started' document. It features a table of contents on the right side with numbered links from 1 to 8. The table of contents includes:

- Preface
- Safety Notes
- MindSphere - Getting Started
 - Getting Started with MindSphere
 - Prepare MindConnect Nano for MindSphere
 - Onboard MindConnect Nano to MindSphere
 - Configure Data Collection
 - Perform visual analysis on an Asset
- Appendix
- Glossary

At the bottom, it says 'Valid from V1.1 Version' and '06/2016'.

MindSphere

Connect to Us



Website	www.mindsphere.io
MindSphere Community	https://community.plm.automation.siemens.com/t5/MindSphere/ct-p/MindSphere
MindSphere General	contact@mindsphere.io
MindSphere Support Team	Call Center: +49 (0)911 895 7 272 (Germany) Online Support: http://www.siemens.com/automation/service&support Support Request: http://www.siemens.com/automation/support-request
MindSphere Academy	training@mindsphere.io

Forums & Network Summary



Where do I find relevant information about MindSphere and MindSphere products?

A: MindSphere offers a wide range of opportunities to network within the ecosystem and collect informations.



Thank you.