SALES PRESENTATION, SEPTEMBER 2019, 3ADR010445_A

AC500 product family

New AC500 V3 CPU

Rémy Ameloot, Product Manager AC500 / Business Unit Machine & Factory Automation

AC500 product family and new V3 CPU

– PLC Automation product family
– AC500 lifecycle – A new milestone
– AC500 V3 – Positioning with AC500 V2
– AC500 V3 – Motivation within the platform
– AC500 V3 – Segments and Markets
– AC500 V3 - Deliverables
– AC500 V3 – New or specific functionalities
– AC500 V3 - At the glance
– AC500 V3 – Hands on material

IAMF – PLC Automation

Product portfolio

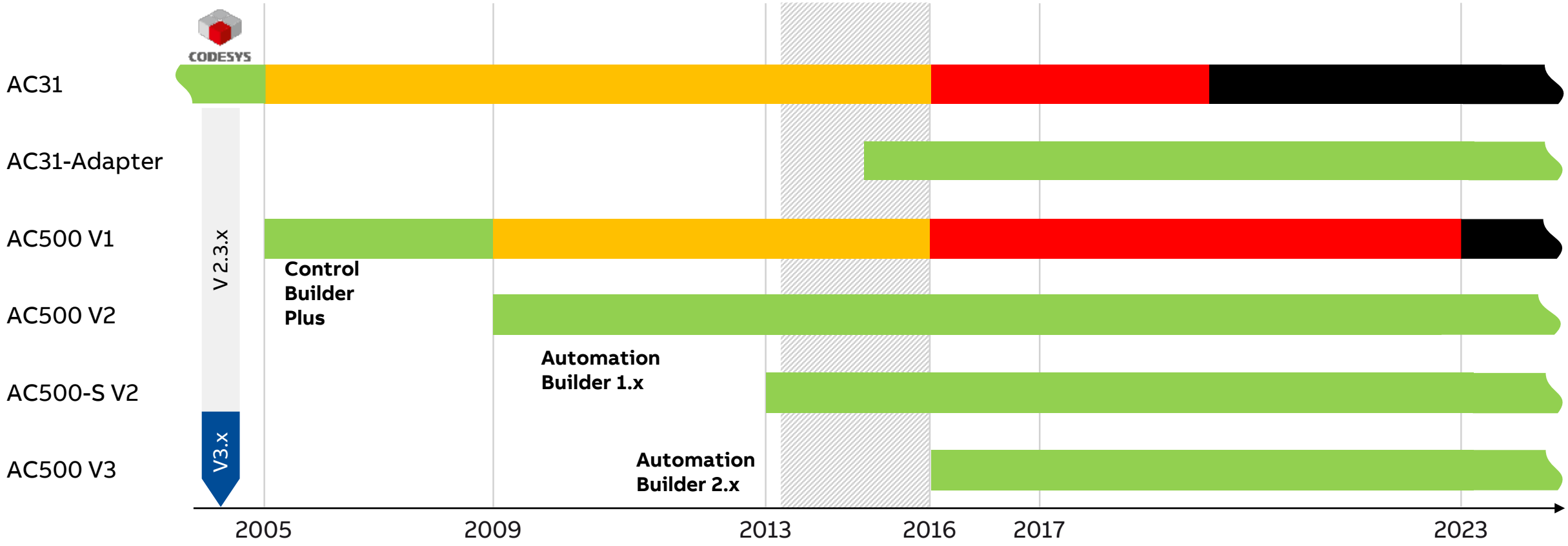
	**AC500** PLC		Water / Pumping, Buildings / HVAC, Material Handling, High Speed Machines
	AC500-**XC** PLC		Harsh environment Industries – Water, Wind, Solar, Transportation, Tunnel Automation
	AC500-**eCo** PLC		General Industry and Machinery – Solar, HVAC, Pumping, Compact Machines
	AC500-**S** **Safety** PLC		Factory Automation - Material Handling, Cranes, Hoist, Winches, Tunnel Automation
	**CP600** HMI		All Industries and Automation and control solution markets
	**Automation Builder** & Library Packages		Engineering SW & Library Packages for all Automation Industries & Control Solutions

AC500 Lifecycle

A new milestone

AC500 – product lifecycle

Time for a new milestone…



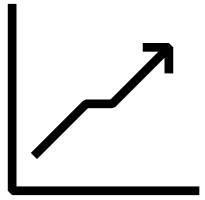
AC500 V3 – A new milestone…

Motivation – Vision for the future

- Provide to our today customers state of the art features (e.g. OPC UA, …)
- Enforce our position in infrastructure and enable us to enter OEM machinery business
- Ensure a smooth and clear lifecycle transition of the successful AC500 platform
  - Securing customer investment and help him moving to new generation of products
  - Reuse of major existing products and feature from the AC500 platform
  - Two CPU family within the same platform to enlarge the offer and capture new applications within targeted segments
  - Provide a wide product range from low-end eCo CPU V3 up to high-end High performance V3 PM595 like
- Develop a next generation automation and control product **range** that positions ABB as a **recognized challenger in automation solutions**
  - By moving the AC500 platform Hardware and Software to the state of the art
  - Enhancing the product features to enter new market or application to increase our Business
  - Entering to the future of Industry 4.0

AC500 – product lifecycle

Clear commitment for our customers



AC500 is our today and future successful product **platform** and will help us to grow!

We **continue to develop** and increase features in **both** families to adapt the global portfolio to customer needs!

AC500 V2 and **V3** product families are part of the platform and will **remain available** for years!

We keep our **commitment** with our customer **securing** their investments and always providing smooth product transition!

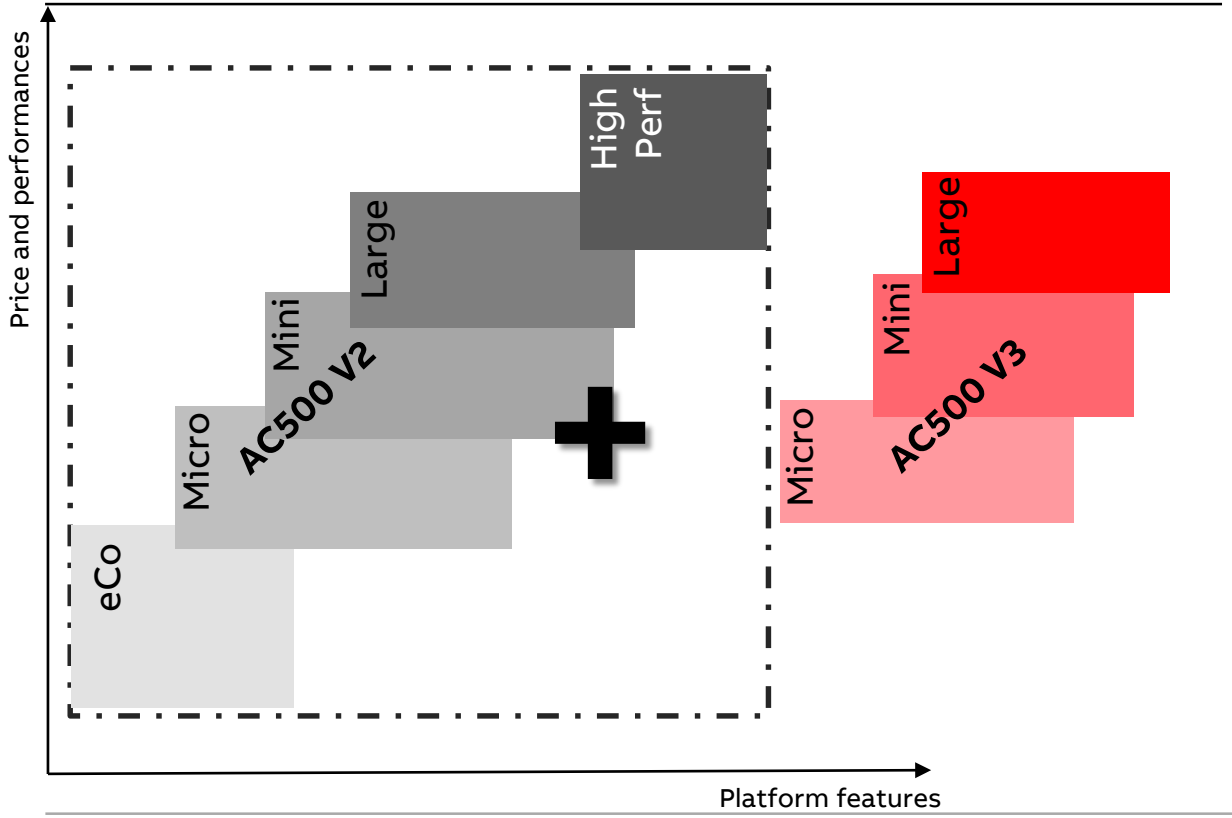
AC500 V3

Positioning with AC500 V2

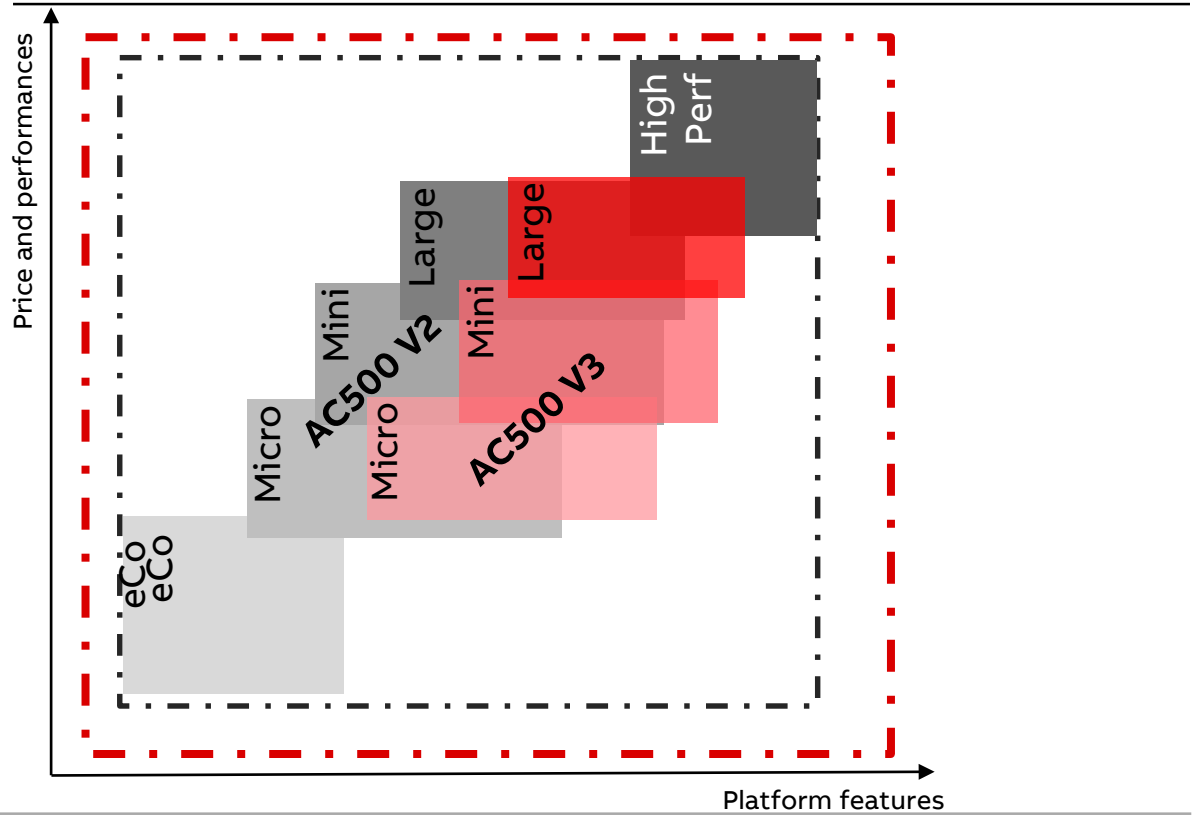
AC500 V3 – AC500 V2

One common platform

Two complementary ranges with new features ....



Together for more future success...



AC500 V3 CPU

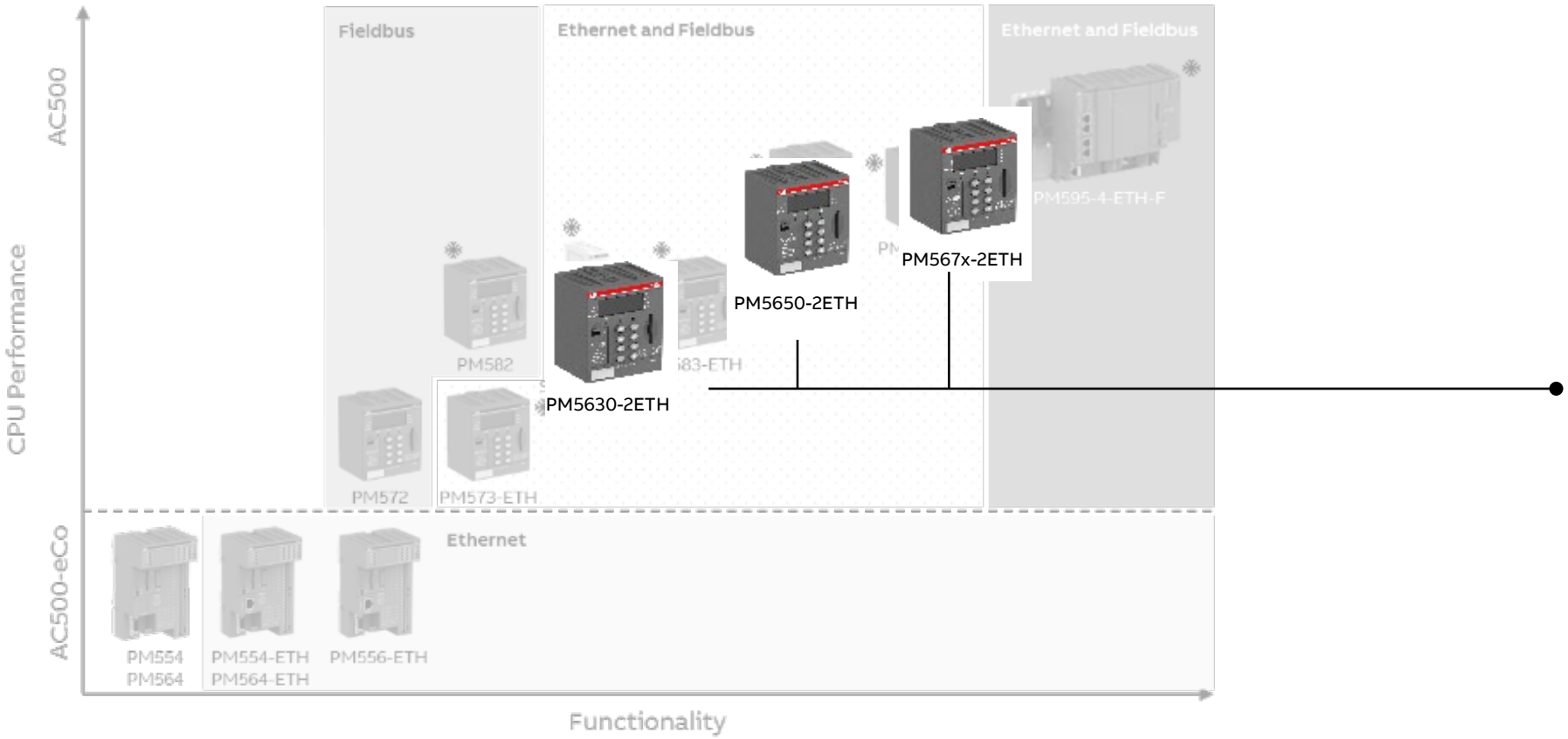
Smooth but clear lifecycle vision as extension of AC500 V2

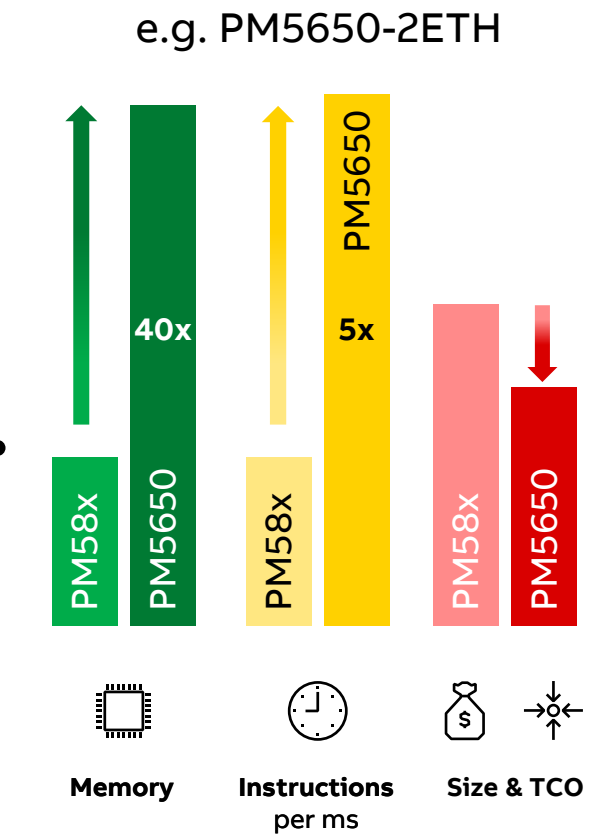
CODESYS V2.3.x		CODESYS V3.x	
PM5XX AC500 CPUs V2		**PM5XXX** AC500 CPUs V3	
TB5XX AC500 terminal bases V2		**TB5XXX** AC500 terminal bases V3	
1x Ethernet interface		Ethernet interface	Ethernet interface
Integrated web server (Java)		WebVisu (HTML5)	Larger Web mem.
Modbus TCP, UDP/IP, IEC 60870-5-104, MQTT			IEC 61850 MMS & GOOSE (1)
OPC DA / AE Server		OPC UA Server / OPC DA	
		Ethernet Switch	Network Variables
		Onboard Ethernet Fieldbus protocols	
		Ethernet IP(1) Adapter	EtherCAT(1) Master / PROFINET IO(1) Controller
Serial interface	Serial interface	1x serial interface	
Onboard CS31 interface for simple remote		Onboard CANopen master, CAN 2A/2B, J1939 interface	
AC500-S safety solution			SM560-S with PROFISAFE(1)
CM5xx communication modules			
CI5xx communication interface modules			
S500 IO / S500 – eCo modules			

(1) Licensed and/ or in preparation

AC500 V3 CPU

Positioning within AC500 platform – performances





Ethernet enabled
Fieldbus enabled
Ethernet, Fieldbus, High Availability and enlarged memory
Ethernet, Fieldbus, High Availability enabled

eXtreme Conditions version available

AC500 V3 / V2 – CPU Family

Specific strengths of the two complementary CPU families

AC500 V3 – CPUs and platform

- Large Ethernet based protocols communication facility, built-in or externally
- New performant CPUs with less HW types but scalable using HW/SW/FW feature licensing
- New built-in protocols or communication features
- Privileged Ethernet interface on each CPU with 2 independent and switch possibility
- Larger Ethernet socket number (e.g. up to 120 Modbus clients)
- HTML5 Web Visualization for portable devices
- IoT enabled CPU with standard OPC UA server and secured communication using TLS, MQTT
- High-availability on Ethernet based protocol, support S500 Hotswap IO modules locally or remotely
- AC500 V3 CPU as KNX controller

AC500 V2 – CPUs and platform

- Large product family and CPU types with huge installed base and proven solution in lot of applications
- Extreme reliability in all environments
- Modularity and scaling with several different HW products according to performance features needed
- Additional communication using external communication modules mostly
- Safety enabled product family with extremely performant safety features CPUs.
- Large amount of product library for dedicated applications
- Interpolated Motion capability with high speed CPU and EtherCAT
- IoT enabled with MQTT and secured communication, OPC DA
- High-availability on Ethernet based protocol or CS31 with very fast switching time, support of S500 Hotswap IO modules

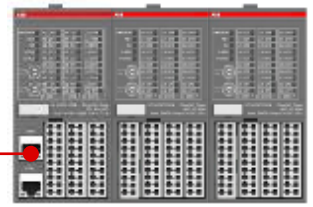
(1) In preparation

AC500 V3

Motivation within the platform

AC500 V3 CPU

Moving to state of the art



Automation Builder

CODESYS

IEC 61131
V3 Features

New CPU PCB

ARM Cortex A8/9

Texas Instruments

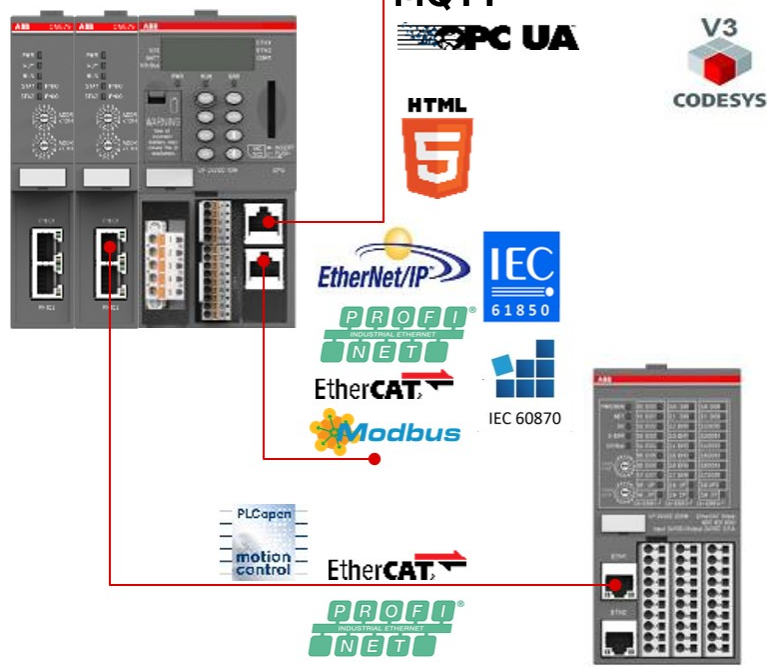
Linux Real-time Linux

New FW

CODESYS V3 RTS

New Terminal Bases

TB56x3-2ETH + CAN
0, 1, 2 & 4 coupler slots



AC500 V3 – update to CODESYS V3 Control

Form-Fit-Function Compatibility with AC500 platform

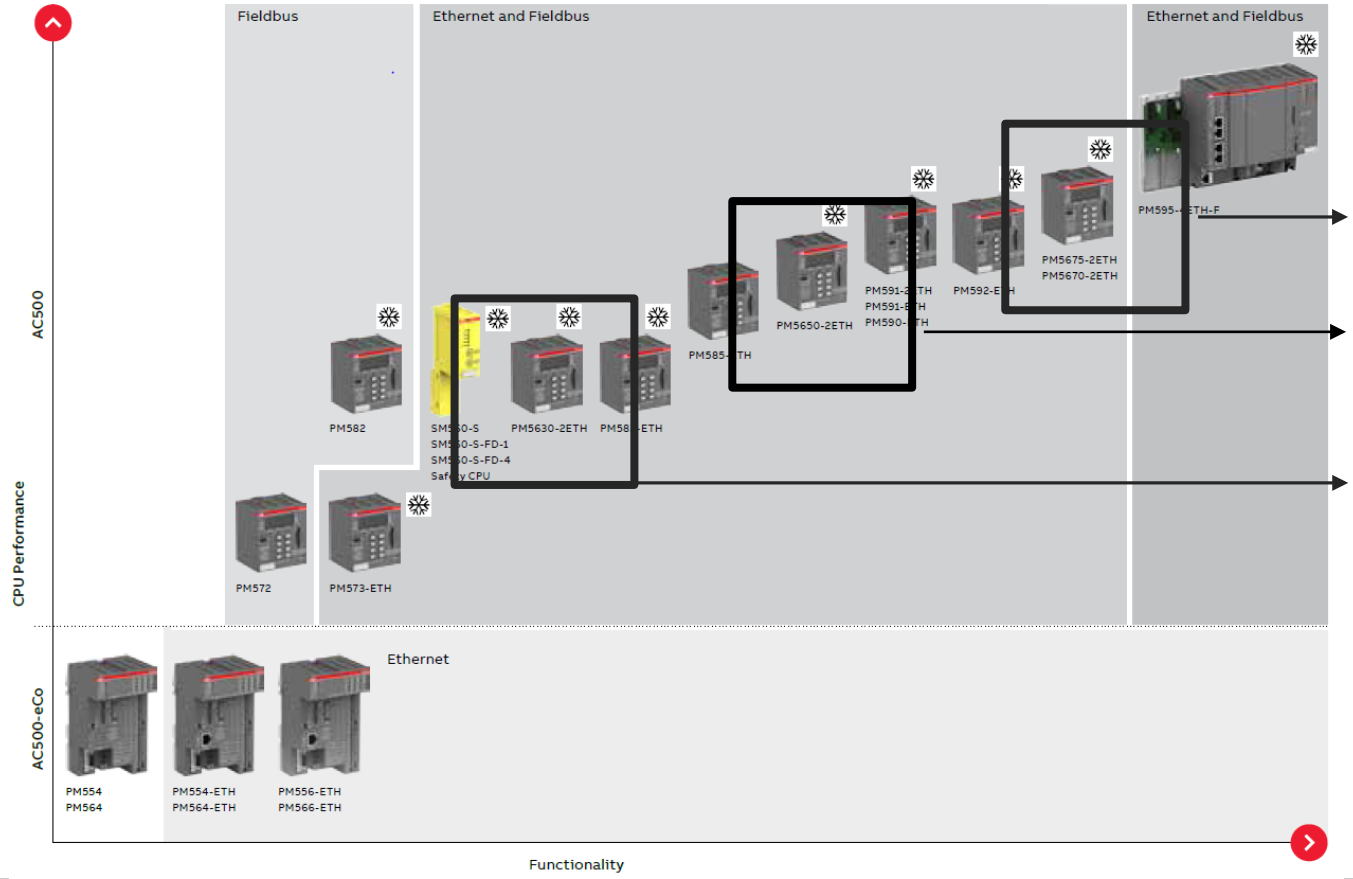
Reuse of platform components

All the existing AC500/S500 components can be reused

- New terminal bases with 0 to 4 CM slots
- New CPU V3 with same housing and footprint
- Same or improved modularity concept with more onboard features

AC500 V3 – update to CODESYS V3 Control

Form-Fit-Function Compatibility with AC500 platform



AC500 V2Type	AC500 V3 Type	Comments
PM595	T.b.d.	Next generation
PM59x	**PM5675-2ETH** **PM5670-2ETH**	**High end machine controller with high performance motion capability and data processing or high communication capability** **CPU 160 MB Program/Data, (8GB Flashdisk), 2 xEthernet, EtherCAT Master/PROFINET IO controller, CAN/CANopen Master/Slave, 1x RS232/45**
PM58x / **PM59x**	**PM5650-2ETH**	**Machine controller with good motion capability (synchronized and interpolation) and high performance in computing or communication** **Also in XC-version, CPU 80MB Program/Data, 2x Ethernet CAN/CANopen Master/Slave, 1xRS232/485, other protocols licensed & loadable**
PM57x / **PM58x**	**PM5630-2ETH**	**For simple machine control or application which need communication and cost optimized applications** **Also in XC-version, CPU 8MB Program/Data, 2x Ethernet, CAN/ CANopen, 1x RS232/ 485, other protocols licensed and loadable**
PM55x, PM56x	T.b.d	Next generation

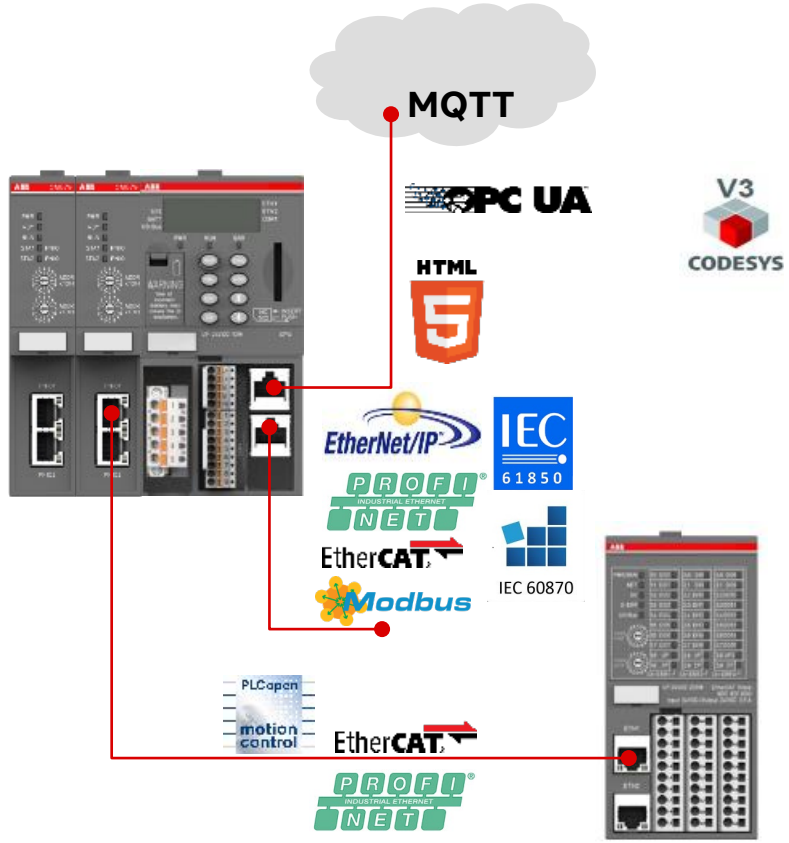
Ethernet enabled
Fieldbus enabled
Ethernet, Fieldbus and High Availability enabled
Ethernet, Fieldbus, High Availability and enlarged memory

eXtreme Conditions version available

AC500 V3 CPU

For what purpose?

- **New features provided with AC500 V3 :**
  - CODESYS V3 editors, object-oriented programming, multi-user engineering, versioning, Virtual Controller, …
  - Onboard communication sometimes licensed: Modbus TCP, EtherCAT (1)(2), IEC61850 MMS and Goose (2), OPC UA server, Ethernet/IP (1)(2), CANOpen master, CAN 2A/2B, J1939, PROFINET IO (1)(2), BACnet (1), KNX (1)(2), …
- **AC500-based Solution for compatibility:**
  - PLCopen motion library based on PS552-MC (1) updated for V3 CPU (1)(2)
  - Improved EtherCAT® communication and configuration features (diagnosis, bus scan (1), debugging, …)
- **Support of existing efficient communication:**
  - Remote I/O over CANopen, PROFINET IO, EtherCAT or ModbusTCP

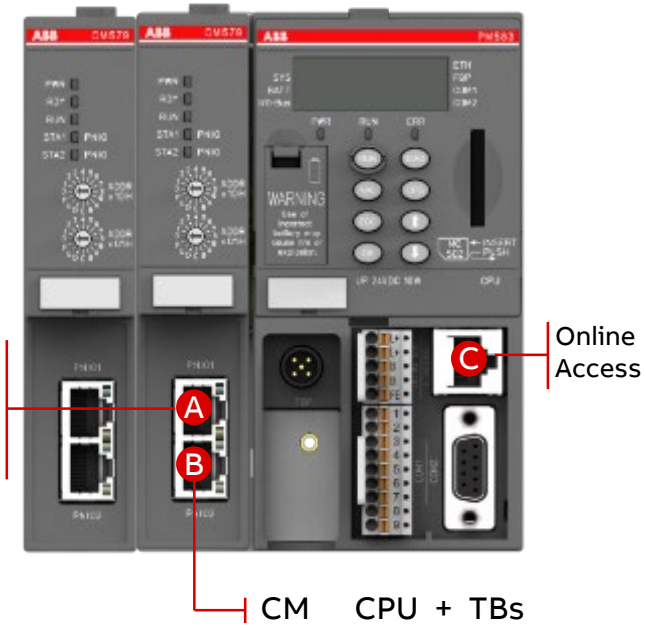


(1) In preparation
(2) licensed

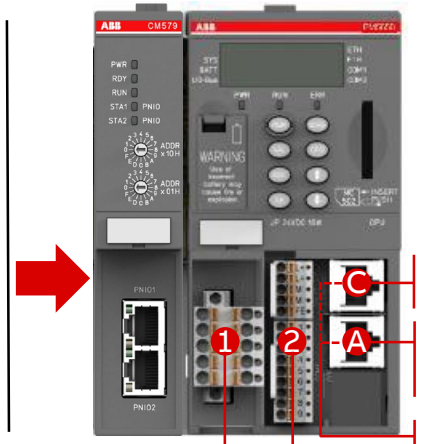
AC500 V3 CPU

Flexible, scalable and higher integrated

TODAY AC500 V2



AC500 CPU V3



Online Access

EthernetIP(1)(2), Modbus TCP, OPC UA, MQTT, EtherCAT(1)(2), PROFINET IO(1)(2), others…

Configurable Switch A/C

Serial RS232/485 interface

CANopen master, CAN 2A/2B, J1939 interface

New CPUs

- From 300 MHz up to 1 Ghz with larger amount of memory
- 2x independent Ethernet connections

New Terminal Bases with 2x Ethernet and CAN interfaces in various versions

- 0, 1 ,2 & 4 coupler slots

IEC 60870

IEC 61850

OPC UA

EtherCAT

PROFINET

EtherNet/IP

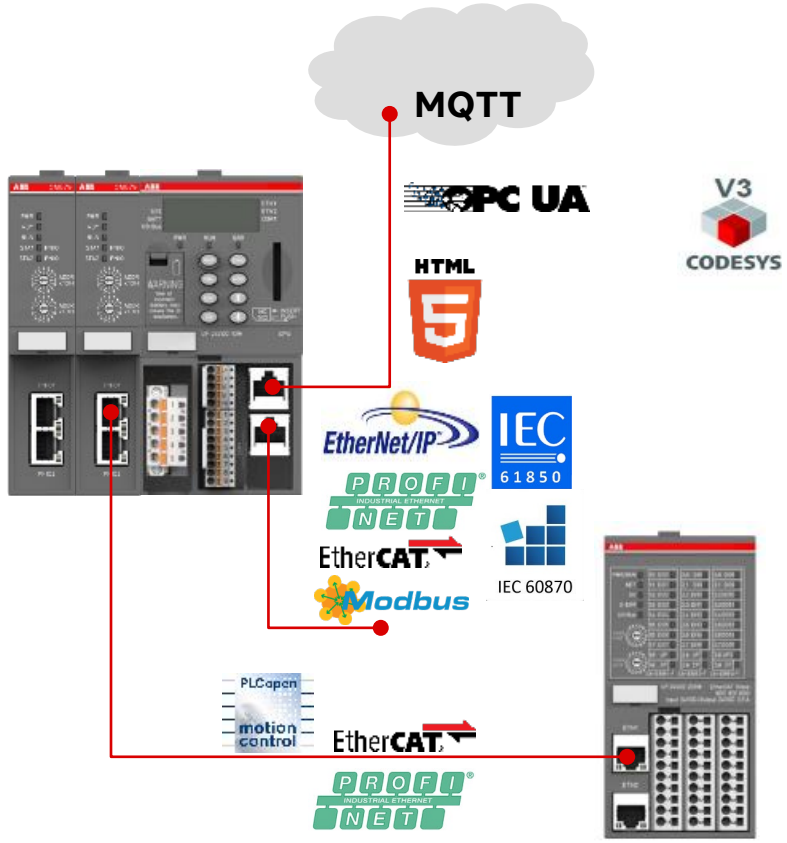
MQTT

(1) In preparation
(2) licensed

AC500 V3 CPU

What are the advantages from these new products?

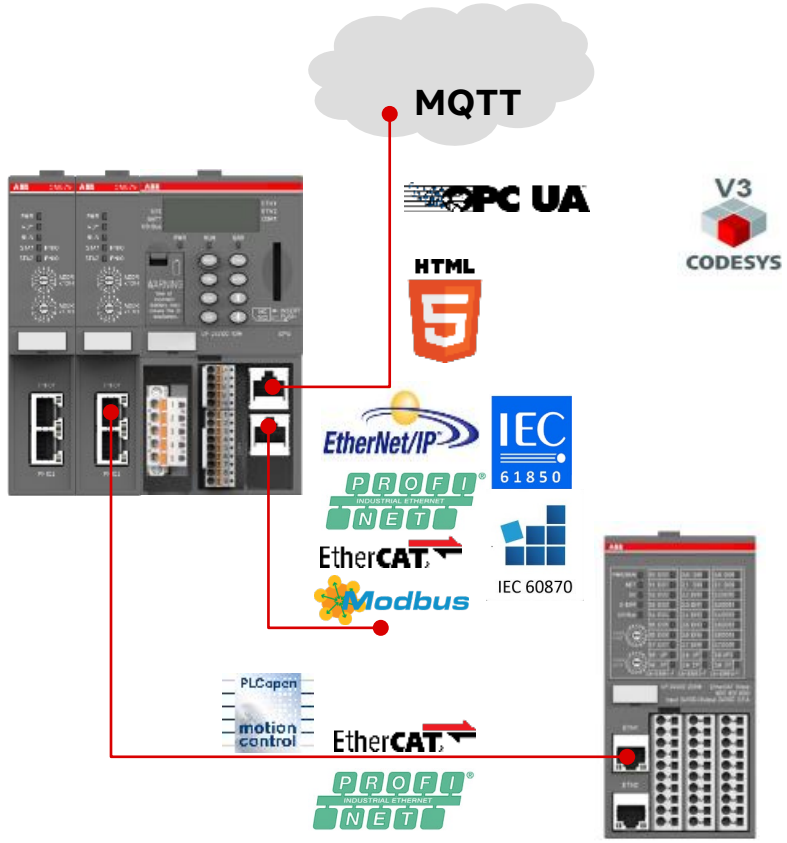
- **Improve application flexibility**
  - Less HW products but more configurable and licensing of feature allow to tailor the product according to the application
  - No more limitation in term of memory due to larger memory and dynamic allocation between User Data or Program
- **Make the customer engineering easier**
  - Due to dynamic memory allocation of the memory, the system adapts itself the configuration according to the needs
- **Protect customer investment with new technology and reuse of AC500 platform product**
  - Reusing lot of AC500/S500 actual products protects your investments and allows easy Update / migration from actual applications to newer technology
  - Use state of the art technology for at least the 10 coming years



AC500 V3 CPU

What are the advantages from these new products?

- **Improve feature set and performance in an affordable way**
  - More powerful CPU with larger memory than actual CPU allows to use less expensive CPU for different kind of application from simple to complex control applications
  - Configurable Ethernet fieldbus protocols running on standard Ethernet interfaces allow to use the CPU without additional external couplers(1)
  - Integrated Ethernet switch simplifies the network architecture, no need of additional external switches. Saves also space into the cabinet
  - Less different HW types due to licensing feature(1) reduces the stock value and increase the flexibility e.g. Communication protocols (1)
- **Reduce cabinet space with more integrated features**
  - Due to integrated interfaces and configurable protocol(1), the CPU size could be reduced and saves place into the cabinet

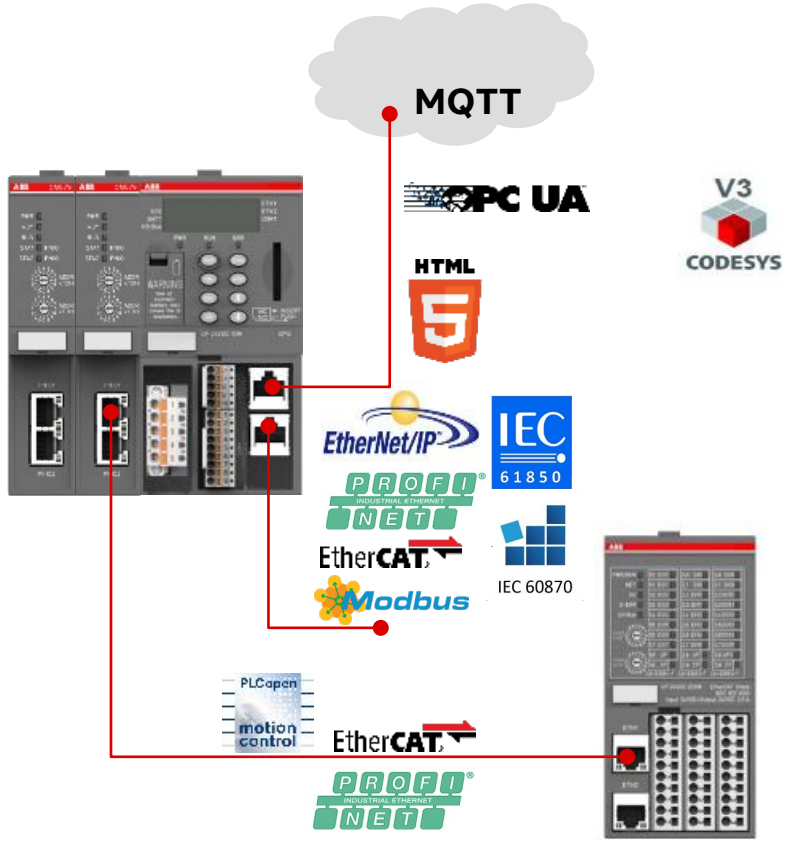


(1) In preparation

AC500 V3 CPU

What are the advantages from these new products?

- **Connection to third party systems in opened architecture**
  - New protocol like Ethernet IP(1)(2) will offer new opportunity of connection to existing applications or third party systems
  - Use of standardized protocols or feature like OPC UA with secured communication save time, cost and makes the connection to SCADA e.g. easier
  - IEC 60870-5-104 to act as remote controller and / or IEC 61850(2) as Intelligent Electronic Device in a power network or smart grid
- **Reliability and security**
  - Reuse of AC500-S safety solution provides state of the art safety feature and reduces engineering time(1)
  - Signed boot projects and FW protects your application from not allowed changes and enforce your protection
  - HTTPs, FTPs secured communication
  - MQTT for IoT application with TLS



(1) In preparation
(2) licensed

AC500 V3

Deliverables

AC500 V3 (2017)

Main features and followed…

Compatibility with AC500 platform

- Form-Fit-Function with CPU and TB's types **PM5630-2ETH, PM5650-2ETH, PM5670-2ETH, PM5675-2ETH, TB5600-2ETH, TB5610-2ETH, TB5620-2ETH and TB5640-2ETH**
- Support of NetX Communication modules CM579-PNIO, CM589-PNIO, CM579-ETHCAT
- Support of Communication interface modules CI501/CI502-PNIO, CI511/CI512-ETHCAT, CI581/582-CN without S500 IO modules
- S500 / S500-eCo I/O modules and HMI and Control Panels
- Security protocol for **HTTPS, FTPS**, secure download or OPC UA
- IEC60870-5-104 protocol with **start/stop** (e.g. for HA applications)
- **SNTP** (Simple Network Time Protocol) client and server
- **Switch-mode** for ETH1, ETH2 for different onboard protocols (e.g. Modbus TCP, …)
- **Modbus RTU** (Master and Slave)
- Set of extended AC500 Product Libraries in PLCopen style guide
- Engineering compatibility

New features

- CODESYS V3 Control and Engineering:
  - Object-oriented programming
  - Functional engineering
  - Automated unit tests for application
- Multi user engineering interface
- **Virtual controller V3** (1)
- **Licensing** (SD card (1), via AB, libraries, onboard protocols, …)
- Onboard CAN with CANopen master, CAN 2A/2B and J1939 protocols
- Onboard Ethernet Communication:
  - OPC UA server and OPC **DA** in addition
  - **IEC 61850 MMS server & Goose Publisher and subscriber**, Modbus TCP client/**server with** start/stop
- Improved AB diagnosis on communication modules PROFINET and EtherCAT
- More web pages for WebVisu
- HTML5 web visualization

Automation Builder with

CODESYS

Linux

(1) In preparation

AC500 V3 (2017)

New products and features

cULus and Class I Div2, marine certifications are available

New Terminal Bases for AC500 V3 CPU

– AC500 V3 CPU needs new Terminal Base and is programmed using Automation Builder V2.x

Ident number	Type designation	Description
1SAP110300R0278	TB5600-2ETH	TB5600-2ETH: AC500, Terminal Base, 0xslot, 2x ETHERNET RJ45, 1x COM, 24 VDC, CAN connector, spring terminals
1SAP111300R0278	TB5610-2ETH	TB5610-2ETH: AC500, Terminal Base, 1xslot, 2x ETHERNET RJ45, 1x COM, 24 VDC, CAN connector, spring terminals
1SAP112300R0278	TB5620-2ETH	TB5620-2ETH: AC500, Terminal Base, 2xslots, 2x ETHERNET RJ45, 1x COM, 24 VDC, CAN connector, spring terminals
1SAP114300R0278	TB5640-2ETH	TB5640-2ETH: AC500, Terminal Base, 4xslots, 2x ETHERNET RJ45, 1x COM, 24 VDC, CAN connector, spring terminals

AC500 V3 (2017)

New products and features

cULus and Class I Div2, marine certifications are available

New AC500 V3 CPU

– AC500 V3 CPU needs new Terminal Base and is programmed using Automation Builder V2.x

Ident number	Type designation	Description
1SAP131000R0278	PM5630-2ETH	PM5630-2ETH: AC500, Programmable Logic Controller 8 MB, 24 VDC, 2x ETHERNET, 1x RS232/485, CAN, SD-Card Slot, LCD Display
1SAP141000R0278	PM5650-2ETH	PM5650-2ETH: AC500, Programmable Logic Controller 80 MB, 24 VDC, 2x ETHERNET, 1x RS232/485, CAN, SD-Card Slot, LCD Display
1SAP151000R0278	PM5670-2ETH	PM5670-2ETH: AC500, Programmable Logic Controller 160 MB, 24 VDC, 2x ETHERNET, 1x RS232/485, CAN, SD-Card Slot, LCD Display
1SAP151500R0278	PM5675-2ETH	PM5675-2ETH: AC500, Programmable Logic Controller 160 MB, 24 VDC, 2x ETHERNET, 1x RS232/485, CAN, SD-Card Slot, 8 GB Flash disk, LCD Display

AC500 V3 (till Q4-2019)

New feature already released or soon

Compatibility with AC500 platform

In addition to previous released versions:

- **Security** (signed boot project, **IoT with TLS**)
- *Functional Safety: AC500-S*[1] *(piloting)*
- **High Availability** with Modbus TCP licensed
- **Hot swap** S500 IO on CPU V3 and remotely on PROFINET IO or Modbus TCP
- **XC versions** from the existing AC500 V3 CPU and TB products
- AC500 Application Library (Motion LIB - V3)
- cULus standard and hazardous location Class I Div 2, Marine certifications
- Support of CAN Master communication module CM598-CN for CAN 2A/2B only
- Licensing SD-Card – since FW V3.1.4

New features

- Onboard Ethernet Communication:
  - **KNX** controller for building automation licensed
  - **OPC UA** enhancement
  - **IoT-communication** (**MQTT** with TLS)
- Improved diagnosis for CPU, IO
- FW-Version management (via web – ABB LIB - partly)

[1] In preparation and definition for next steps

AC500 V3 (Q3-2019)

New products and features

cULus and Class I Div2, marine certifications are available

New AC500 XC V3 versions for eXtreme Conditions

- AC500-XC V3 CPU needs new Terminal Base and is programmed using Automation Builder V2.x

Ident number	Type designation	Description
1SAP310300R0278	TB5600-2ETH-XC	TB5600-2ETH-XC:AC500, Terminal Base, 0xslot, 2xETHERNET RJ45, 1xCOM, 24VDC, CAN connector, spring terminals, outdoor version
1SAP311300R0278	TB5610-2ETH-XC	TB5610-2ETH-XC:AC500, Terminal Base, 1xslot, 2xETHERNET RJ45, 1xCOM, 24VDC, CAN connector, spring terminals, outdoor version
1SAP312300R0278	TB5620-2ETH-XC	TB5620-2ETH-XC:AC500, Terminal Base, 2xslots, 2xETHERNET RJ45, 1xCOM, 24VDC, CAN connector, spring terminals, outdoor version
1SAP314300R0278	TB5640-2ETH-XC	TB5640-2ETH-XC:AC500, Terminal Base, 4xslots, 2xETHERNET RJ45, 1xCOM, 24VDC, CAN connector, spring terminals, outdoor version

AC500 V3 (Q3-2019)

New products and features

cULus and Class I Div2, marine certifications are available

New AC500 XC V3 versions for eXtreme Conditions

- AC500-XC V3 CPU needs new Terminal Base and is programmed using Automation Builder V2.x

Ident number	Type designation	Description
1SAP331000R0278	PM5630-2ETH-XC	PM5630-2ETH-XC:AC500, Programmable Logic Controller 8MB, 24VDC, 2xETHERNET, 1xRS232/485, CAN, SD-Card Slot, LCD Display, outdoor version
1SAP341000R0278	PM5650-2ETH-XC	PM5650-2ETH-XC:AC500, Programmable Logic Controller 80MB, 24VDC, 2xETHERNET, 1xRS232/485, CAN, SD-Card Slot, LCD Display, outdoor version
1SAP351000R0278	PM5670-2ETH-XC	PM5670-2ETH-XC:AC500, Programmable Logic Controller 160MB, 24VDC, 2xETHERNET, 1xRS232/485, CAN, SD-Card Slot, LCD Display, outdoor version
1SAP351500R0278	PM5675-2ETH-XC	PM5675-2ETH-XC:AC500, Programmable Logic Controller 160MB, 24VDC, 2xETHERNET, 1xRS232/485, CAN, SD-Card Slot, 8GB Flashdisk, LCD Display, outdoor version

AC500 V3

New or specific functionalities

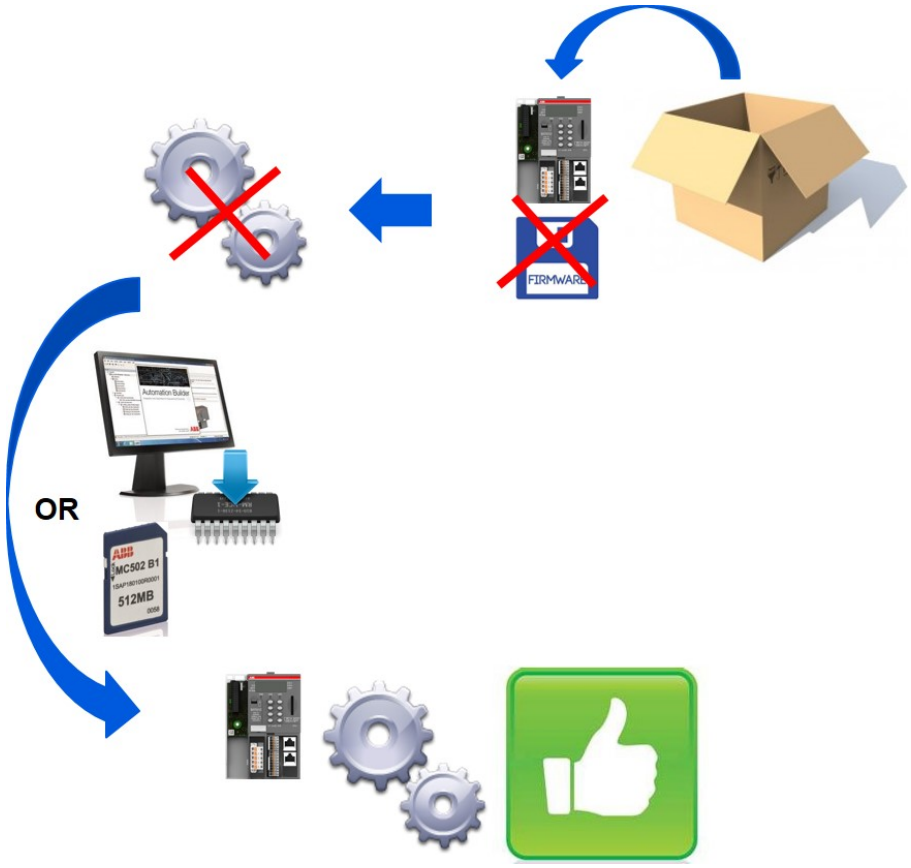
AC500 V3 CPU

FW download and version management

V3 CPU from stock have no FW, difference with V2

The CPU are delivered without system FW and only a boot loader

- By connecting to Automation Builder, the dedicated and up-to-date FW is downloaded into the CPU
- Always the latest FW comes together with AB version
- Always compatibility with AB / Program / CPU FW due to version management



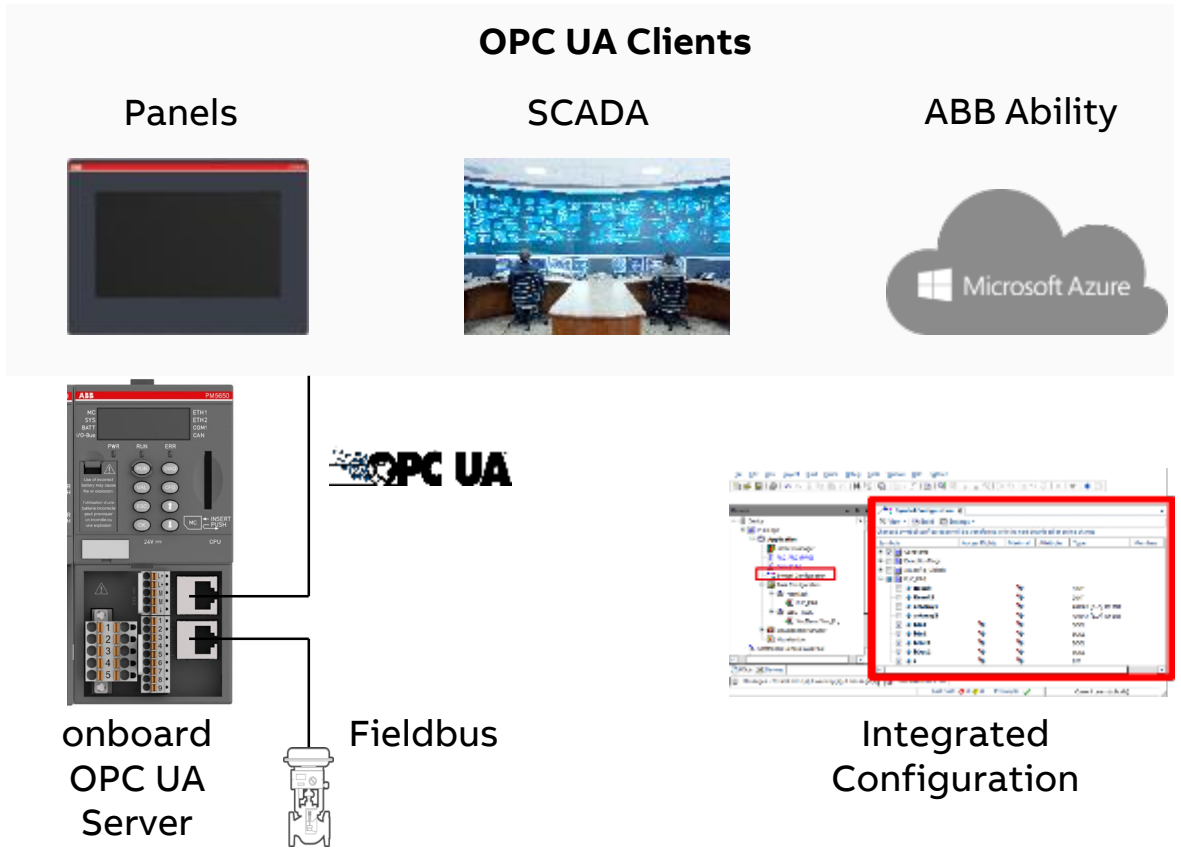
(1) In preparation

AC500 V3 CPU

OPC UA Server – Industrie 4.0

OPC UA Server

- Server on PLC, no separate PC required
- Standard feature of each CPU V3 product, accessible via onboard Ethernet interface
- Easy configuration
- Improved security by integration into user management and certificate based encryption
- Connectivity to ABB Ability



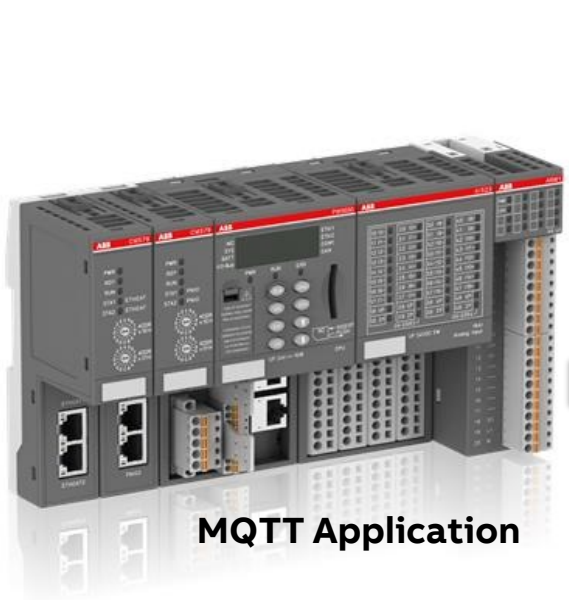
(1) In preparation

AC500 as IoT Controller and cloud connectivity

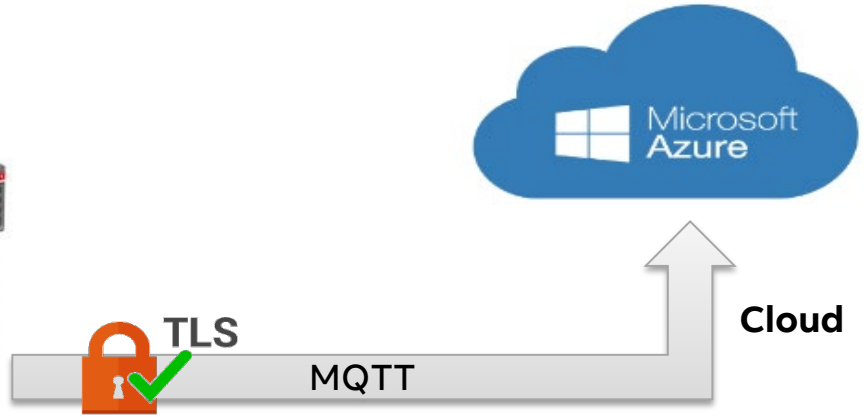
MQTT with AC500

Cloud connectivity features

- Provide MQTT gateway with secure TLS
- Decentralized enhanced data monitoring
- Location independent visualization
- Direct connectivity fieldbus to cloud
- Easy expansion of existing plants
- Establish secure connections to MQTT brokers, e.g. Microsoft Azure or Amazon Web Services
- Publish data and subscribe to topics
- For all AC500 available (with V2.8 and V3.2)



MQTT Application



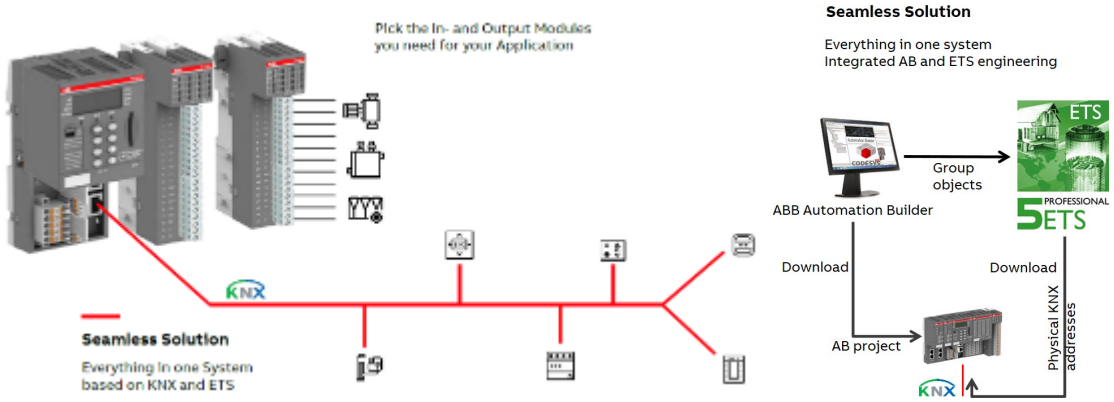
Online dashboard

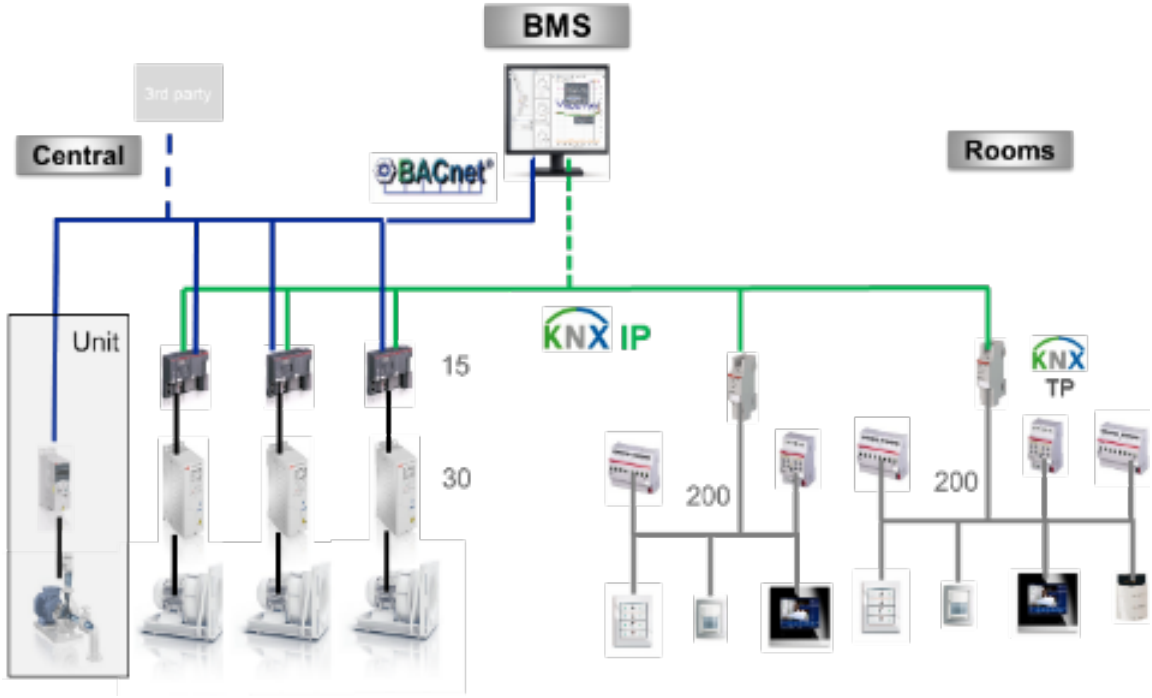
AC500 V3 as Building Controller

Extended Building Automation offering

Easy to engineer

- Enables ABB as only complete KNX supplier incl. PLC in the market
- KNX IP protocol in AC500 integrated
  - Dedicated KNX controller based on AC500 (-eCo) V3
  - Protocol license option for other AC500
  - Automation Builder KNX – ETS5 Tool integration



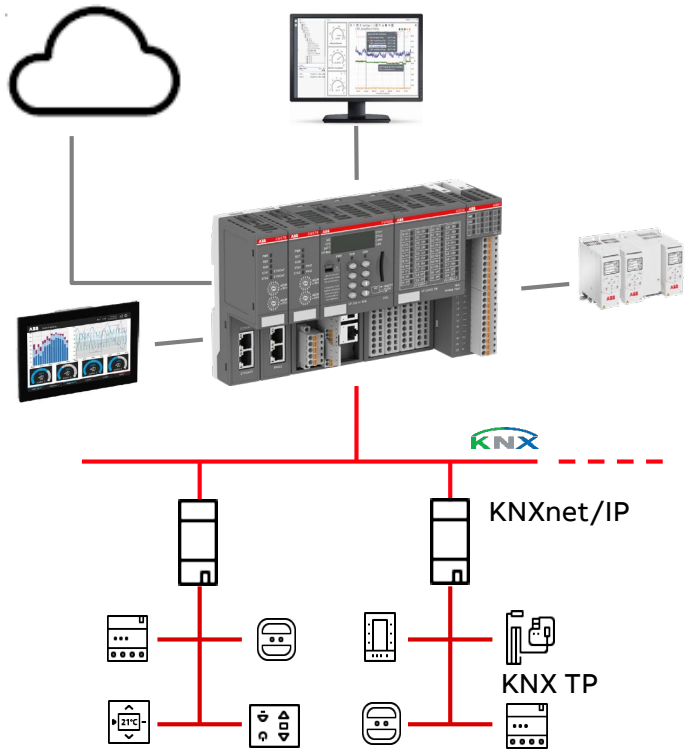


AC500 V3 as Building Controller

KNX integration into AC500 - Q1/2019 – AB V2.2

- Seamless Solution for Automation Controllers linked to room and floor Automation with KNX devices.
- No gateways and integration effort required
- AC500 integrated in KNX / ETS
  - Built-in KNX Interface based on KNXnet/IP (Ethernet) to connect to the KNX IP-Router Backbone
  - The AC500 is a standard KNX Device with Group Objects in ETS and physical KNX Address
  - Direct data exchange between the Engineering Software ABB Automation Builder (AB) and KNX engineering (ETS5)

Ident number	Type designation	Description
1SAP195800R0101	PS5604-KNX	PS5604-KNX: AC500 V3 KNX runtime for CPU, running on onboard ETH, single license



* ETS = Engineering for KNX

AC500 V3 – IEC 61850

Features provided with our solution for IED and configuration

AC500 as IED with IEC61850 Server

AC500 V3 CPU acts as an **IED with IEC 61850 Server edition 1** allowing:

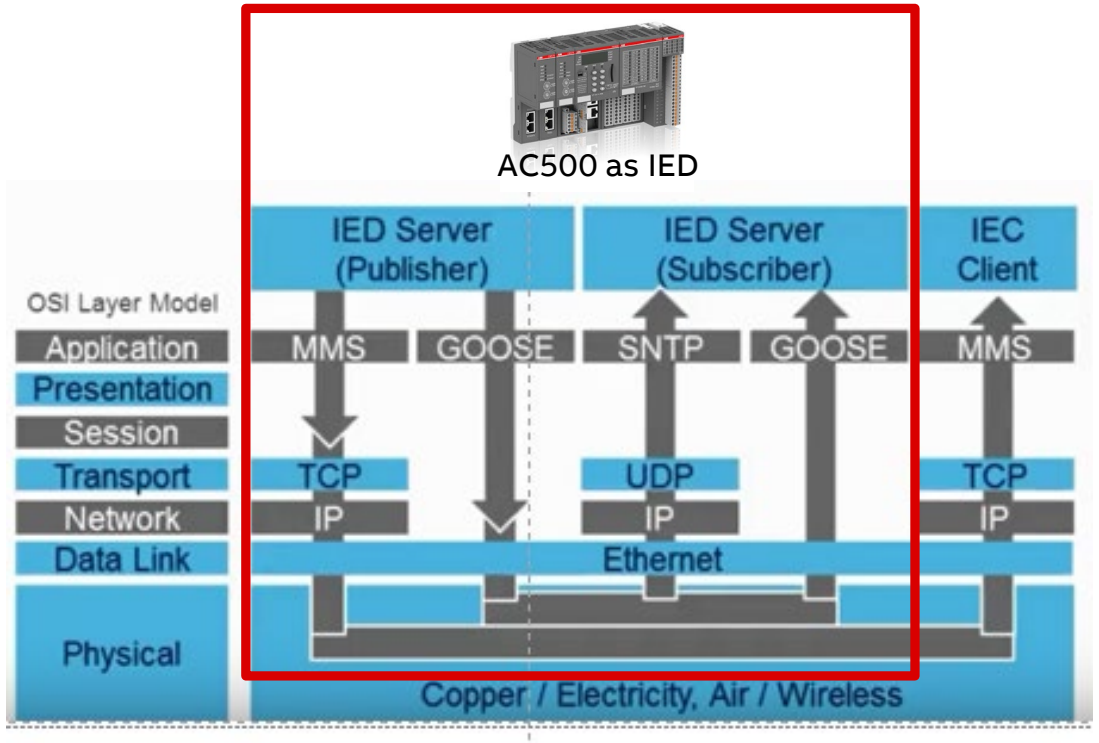
- Sending MMS messages to ensure a safe data communication – no real time support
- Publishing and subscribing GOOSE messages high priority peer-to-peer data exchange between different servers to ensure a data transmission with minimal delay

Automation Builder used as IED configuration tool

- Import / Export of SCL files formats
  - ICD – IED capability description file
  - SCD – substation configuration description file
  - CID – configured IED description file

Basic display options

TüV certification



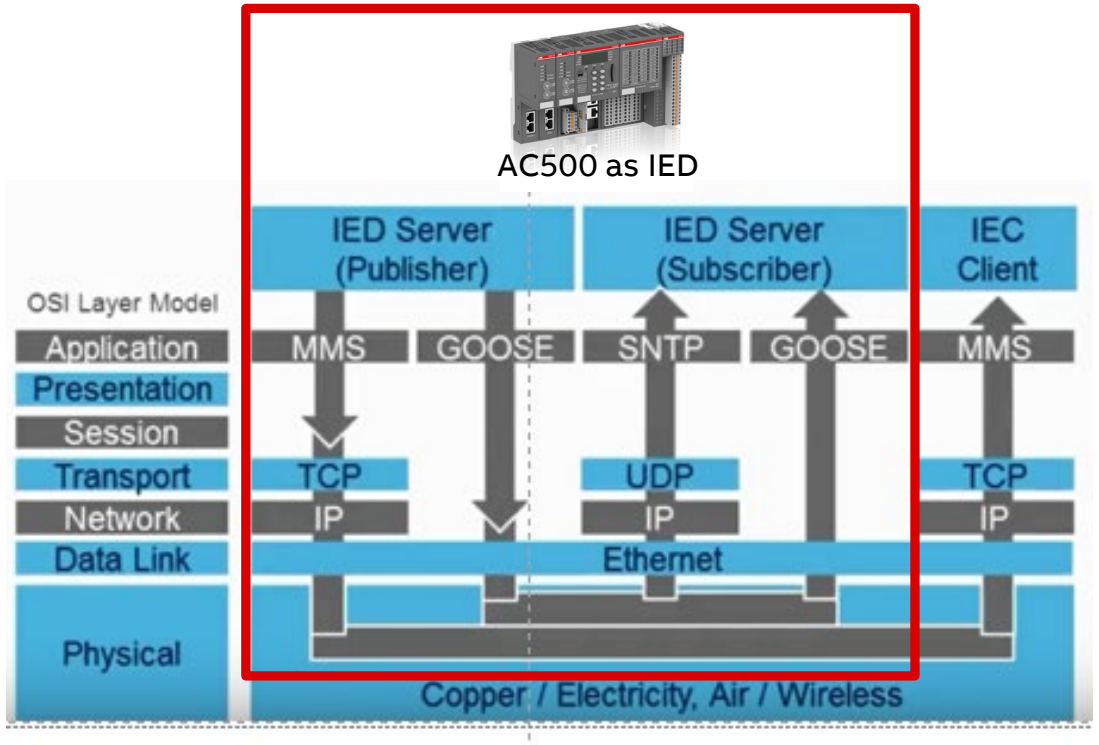
AC500 V3 – IEC 61850

AC500 solution for IED and configuration

As IED with IEC61850 Server

- This functionality is licensed and needs a runtime license to be used
- All the AC500 V3 CPU can use that protocol but according to the load of communication, the PM5650 and bigger are more dedicated for high amount of communication

Ident number	Type designation	Description
1SAP195600R0101	PS5602-61850	PS5602-61850: AC500 V3 IEC61850 protocol runtime for CPU, running on onboard ETH, single license



AC500 V3 CPU

Web visualization and HMI connection

Better support on portable devices with HTML 5 web server technology

- Make the use of the machine and the maintenance easier using portable device like tablet or smartphones
- Enhance the interaction with the machine on proven and easy devices
- Improve the availability using state of the art technology
- Save cost offering a modern visualization feature integrated into programming software
- Use standard browser using HTML5 to display complex visualization page
  - **Support of existing CP600 WEB panels improving lifecycle**
  - **Support of new CP600-PRO**

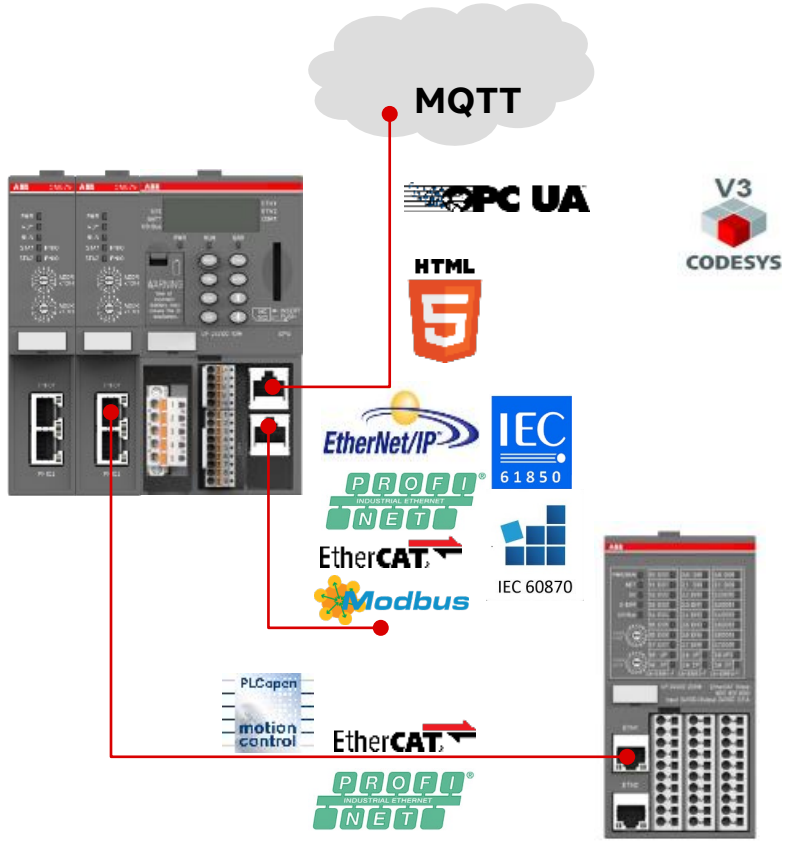
AC500 V3

At the glance

AC500 V3 CPU

At the glance …

- Improve feature set and performance with good price positioning
- Reduce cabinet space with more integrated features
- Improve application flexibility with licensing of feature
- Provide more efficient and easier customer engineering
- Protect customer investment with new technology and reuse of AC500 platform product
- Connect to third party systems in opened architecture with proven protocols like Ethernet/IP (1), OPC UA, PROFINET IO (1), EtherCAT (1), MQTT
- Enforce reliability and security with security mechanisms



(1) In preparation for built-in ethernet interfaces


ABB