ABB Ability™ System 800xA® 6.2
System Guide Summary

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System 800xA® – Introduction
The Power of Integration

The ABB Ability™ System 800xA® System Guide is intended to describe the functionalities and capabilities of System 800xA® 6.2. This summary provides just an overview of System 800xA® and its capabilities.

Extended automation
System 800xA®'s 'xA' stands for Extended Automation and utilizes the system architecture which was built for application integration in a fully redundant, reliable environment. System 800xA® extends the reach of traditional automation systems – beyond control of the process – to increase energy efficiency, asset utilization, energy savings and operator effectiveness.

The Power of Integration
In order to be competitive, various plant entities, departments and personnel have to work as one flexible, integrated, collaborative team. For this to be accomplished, an automation platform with comprehensive connectivity capabilities is necessary. Integration of systems and applications where all actionable information is available for use in the system can be provided to users in a variety of roles.

System 800xA® is an integration platform with unparalleled connectivity to enterprise and plant systems, applications, and devices that improves operations, engineering, control and maintenance and provides a collaborative environment where real-time decision making is a reality.

For more information about System 800xA® please visit our web: **solutions.abb/800xA**

For updated information regarding System 800xA® hardware please also visit our Hardware Selector.

In the HW-selector you can find and compare different communication modules, IO modules, module termination units, AC 800M controllers, network switches and routers, Panel 800, power supplies and voters and also print your own pdf files. Link: **800xahardwareselector.com**

System 800xA® – Introduction
Operator Effectiveness

Operator Effectiveness is the part of System 800xA® that places the operator in focus. The operator needs to have a superior working environment to perform his tasks efficiently and successfully.

There's got to be a better way
Similar control room issues can be seen all over the world. Operators do not have an efficient and user friendly work environment. They are expected to handle larger areas of the plant and they may not get the opportunity to train on critical situations before they occur.

Many operators do not have overview graphics on their HMI's, an ergonomic work environment or sufficient access to necessary data. What they do have is more responsibility and pressure to perform at very high levels.

Global trends across all industries show operators have more responsibility at the same time as processes become more complex. The control room operator is becoming a very skilled and valuable knowledge worker.

In order to get there, companies need to focus on operator effectiveness to address:
• Losses due to poor abnormal situation management
• Ever changing requirements and regulations
• Diminishing knowledge base and operator experience
• More sophisticated control strategies
• More systems, data and information overload

Improving Operator Effectiveness through integrated information
With Operator Effectiveness we touch on more than just operator graphics or alarm management strategies. All aspects that impact operator performance will be addressed to deliver true operator efficiency.
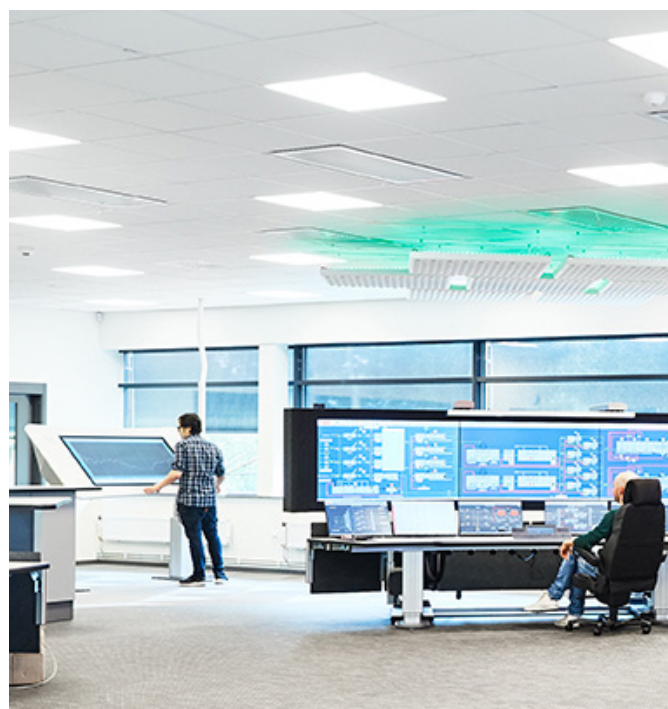
The four pillars of Operator Effectiveness that are addressed by ABB's control room solutions are defined as:
• Integrated systems and applications
• High performance design
• Attention to human factors
• Operator competency

Process Recall
System 800xA's Process Recall is an ideal tool for root cause analysis and incident investigations as it provides users with the ability to replay recorded data on PG2 Graphic displays.

System 800xA® – Introduction
Electrical Control System

Leaders in the process industry have continually expressed the need for reducing costs, improving plant availability and energy efficient operations.

Barriers and past attempts to integrate electrical devices

Electrical integration in the past has been hampered with lack of communication standards and architectural design resulting in high project execution and commissioning costs and high life cycle costs. There are too many protocols used in electrical scada systems. Some are proprietary while others are open standards.

No one protocol has become dominant. As a result, the cost to engineer electrical scada systems is high when multiple vendors supply equipment that uses different communications protocols. The life cycle costs of a system with a hodgepodge set of communication links are also very high.

Electrical Integration is not new. It has been done in the past by hard-wiring signals between the electrical equipment and the process control system, having additional power meters to transfer information to the other system, as well as by building complex software gateways.

The result is still two separate systems but they are awkwardly tied together. This traditional methodology has high integration costs, high project risks, and high life cycle costs.

Organizational barriers among departments within plants and suppliers have also hampered integration efforts. A new approach is needed to overcome these barriers.

What value does System 800xA® provide?

With Automation and Power Integration, ABB's 800xA provides full plant integration. ABB's Electrical Control System is based on open standards. ABB offers a complete portfolio of DCS, Electrical Control System, process electrification, and substation automation solutions which reduces project costs and risks.

Common Operation Environment

System Network

System Servers

AC 800M Controller(s)

Fieldbuses

Instrumentation   MV/LV Swtchgear Drives   Protection & Control IEDs
                           Motor starters

Process Automation   **Electrical System**

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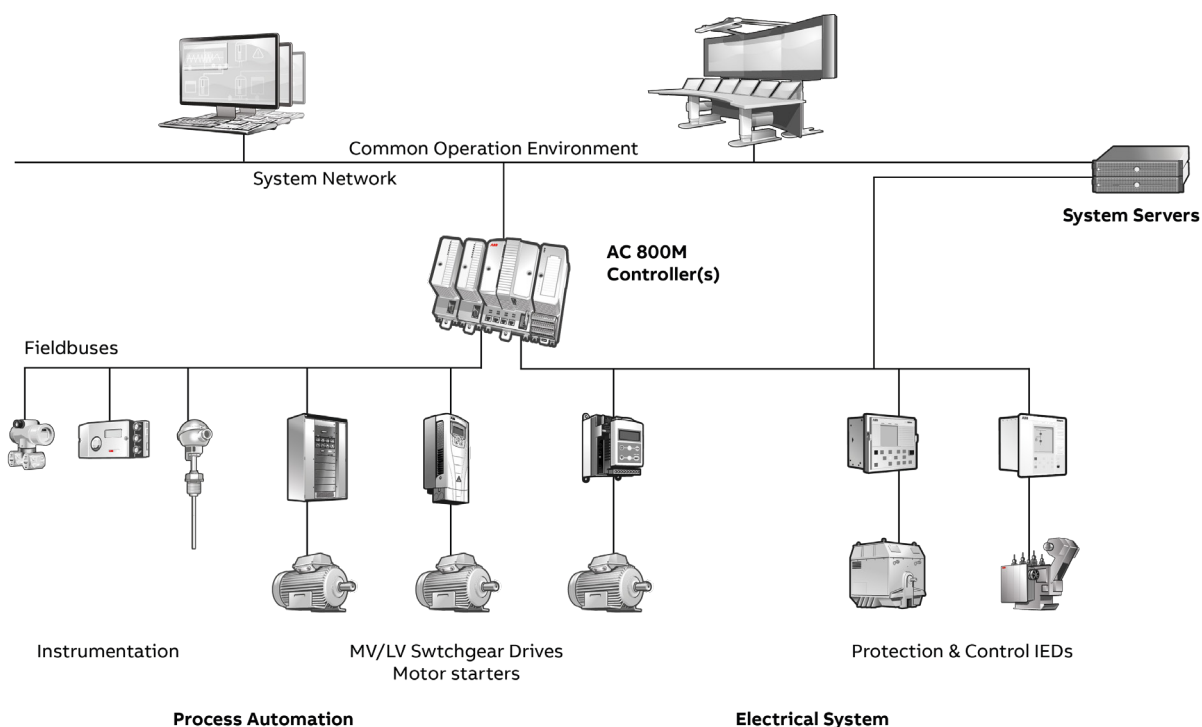
System 800xA® – Introduction
Flexible I/O Solution

Select I/O

ABB Ability™ System 800xA® offers flexible and modular I/O solutions through fieldbus technologies, wireless I/O and hardwired I/O systems such as S800 and S900. The system is now enhanced with Select I/O that allows individual conditioning of each signal coming from the field. Select I/O is Ethernet connected and consists of single channel granular Signal Conditioning Modules (SCM).

Select I/O provides a comprehensive solution for simplified engineering, installation, commissioning and late changes with features such as built-in disconnect function, field loop current limitation and replaceable terminal blocks. SCMs are available for both non-SIL and SIL3 applications.

The Select I/O is designed to provide a compact and rugged solution e.g. supporting operating temperature of -40 to +70 °C, hazardous locations and corrosive gases. The I/O system can be mounted in Zone 2 environment.

The Select I/O reduces the impact of late changes by reducing the amount of re-work required during the project. When an I/O type change is needed, insert a new Signal Conditioning Module (SCM) instead of moving the field wire to a different I/O module. In centralized installations, the number of cabinets can be reduced by up to 50% (depending on signal type).

Since the I/O Module Termination Units can host any signal type in any slot and since the I/O system has built-in features such as disconnect function, field loop current limiting and replaceable terminal blocks, classic marshalling can be eliminated which means that cabinets can be standardized and pre-fabricated. Standardized cabinets will reduce the design work and testing efforts which will lead to decreased project execution time and cost.

The Select I/O offers complete redundancy down to the SCM including redundant Ethernet Fieldbus Communication Interfaces, redundant 24V power and redundant internal architecture.

The Select I/O implements enhanced diagnostic possibilities and self-testing, eg. loop supervision for all signal types.

System 800xA® – Introduction
High Integrity Safety Automation

In the hierarchy of automation, safety automation is a tier above normal process control. Whether the process is continuous, discrete, or somewhere in between, safety automation can be found in most facilities and is critical to protecting people, environment and financial investment in the facility, if the normal process control fail to keep the process within safe operating parameters.

What is safety automation?
Due to these demands, safety automation has special requirements related to how it must be addressed throughout the project lifecycle. IEC, ISA and other standards address the complete lifecycle of safety automation from equipment design and manufacturing to the complete project lifecycle that must be managed by the process owners.

In the past, safety was always considered to be completely separate. Today, "integrated safety" is a hot topic that has many different meanings across both suppliers and customers.

800xA High Integrity
800xA High Integrity is an innovative development in safety automation and is a primary example of ABB's power of integration. 800xA High Integrity provides the opportunity to fully integrate safety automation into the process automation environment in ways unmatched by any other supplier. 800xA High Integrity allows the safety system designer to choose the degree

of integration appropriate for a specific application and control philosophy.

800xA High Integrity can be deployed as a fully segregated solution, integrated at the same plant network level as the process automation, integrated into the process control system but using dedicated safety controllers on the same control level network, or fully integrated with both process control and safety automation executed simultaneously within the same controller hardware. Such as PM857, PM863 and PM867 together with SM812.

800xA High Integrity meets the most stringent requirements of IEC 61508 second edition for products to satisfy and increase the overall safety reliability for the safety integrity level (SIL) applications to a SIL3.

System 800xA® High Integrity can also be used to meet safety requirements under NFPA , EN ISO 13849-1 (formerly EN 954-1) for machine safety, and most other safety standards. No other safety automation solution in the marketplace is more flexible than 800xA High Integrity.

Connectivity and Interfacing Options
In addition to the TÜV certified safety peer to peer protocol, System 800xA comes with certified interference free communications modules for Modbus RS232, Modbus TCP, OPC, Profinet, PROFIsafe, and other ABB protocols.

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AC 800M HI
Simplex: 1oo2D.
Up to SIL3!

System 800xA® – Introduction
Integrated Control and Safety

ABB defines Integrated Control and Safety Systems (ICSS) as those systems that allows the use of a common system infrastructure and HMI to monitor diverse Process Controllers and Safety Controllers, without Data Mapping and/or custom-made communication interfaces. (System infrastructure includes HMI, Alarms, System Diagnostics, Asset Management, and Reporting among others).

ABB has a long tradition in the development of integrated BPCS and SIS (PSD, ESD and F&G) products and solutions and this approach can be traced back to the early 1980s. System 800xA 6.2 now supports SIL communications to PROFIsafe field devices to reduce project engineering and instalaltion costs.

The use of a compatible BPCS and SIS platform while eliminating potential common cause failures is an important principle for this approach as it overcomes the use of multiple systems and removes the need for custom-made or project specific communication interfaces of different systems.

In a typical ICSS implementation, BPCS and SIS use controllers purposely designed for the functionality, application and use.

BPCS
AC 800M (refers to any controller in the family applied for Process Control including PM851A, PM856A, PM858, PM860A, PM862, PM866A and PM891) is the Process controller within the 800xA product platform which is available in several product versions regarding CPU performance, memory size, redundancy, I/O configuration, communication and functionality.

SIS
The AC 800M HI (PM857/SM812, PM863/SM812 and PM867/SM812) is the Safety controllers based upon the AC 800M product platform. This is certified according to IEC 61508 Ed 2 by TÜV SÜD as SIL 3 Capable, for use in Safety Instrumented Functions (SIF).

The 800xA Operator Workplace was extended with the necessary aspects, faceplates and

dialogues needed to display safety system diagnostics and for all operation functions including support for standard authorization and security functionality, allowing the operator quick and easy access to the information from a single environment to rapidly respond to critical information and conditions in the plant.

Certifications
The System 800xA® High Integrity has been certified according to International Safety Standards IEC 61508 and IEC 61511/ISA84 and can be implemented as:

- **Integrated Control and Safety:** process control and safety functions running on physically separate controllers on the same network i.e. PM866 or later for process control and PM857/SM812, PM863/SM812 and PM867/PM812 for safety.

- **Independent Control and Safety (standalone):** the functions are running in totally different systems and they can communicate via interface or gateway.

ISASecure™ Certification for Safety Controllers
The AC 800M HI controllers PM857, PM863 and PM867 with SM812 are ISASecure™ certified.
(System 800xA 6.1.1 LTS versions)

System 800xA® – Introduction
Fieldbus Technologies

Fieldbuses have been around for more than two decades now. One key driver is the digital age; more and faster information. A second, and perhaps more important driving force has been cost reduction from the point-to-point 4-20 mA (or any other "amp" or "voltage" range) solutions that have existed since the beginnings of process instrumentation and automation.

In their quest to lower lifecycle costs while improving productivity, companies have integrated intelligent field devices via fieldbus technologies into their process automation solutions.

Compared to traditional 4-20 mA technology, digital fieldbus solutions integrate and exploit embedded new levels of field device information in order to streamline work processes, improve process and product quality, and maximize availability.

System 800xA® seamlessly integrates intelligent field devices as well as electrical equipment and makes the resident information available in the right manner to the right people and in the right context.

System 800xA®'s power of integration makes information available not just within the control system itself, but throughout the plant. System 800xA® supports users in managing their field devices.

Fieldbuses: many types and purposes
Fieldbuses are available in many types and serve many different purposes and applications. Many of the "older" fieldbuses like MODBUS and DeviceNet are now expanding from their RS232/RS485 origins onto ethernet media.

The digital information that HART has provided for years is now becoming available with a networked infrastructure thanks to WirelessHART!

Simple, low power devices can now be easily installed in hazardous areas with ASi bus.

And high demand, complex requirements can be fulfilled with selections from FOUNDATION Fieldbus, PROFIBUS, PROFIsafe and IEC 61850.

In addition to the international standards, ABB has been addressing special needs throughout our history with proprietary fieldbus solutions for INSUM electrical and Drive integration as well as remote I/O solutions from previous generations of products that greatly simplify the evolution of those previous platforms to today's AC 800M controllers and all of the features available with System 800xA®.

System 800xA® – The Power of Integration
System 800xA® is designed to be the best system at integrating fieldbus solutions to meet the demanding requirements of our system owners.

Each AC 800M controller can mix and match incoming information from any combination of up to 12 direct fieldbuses and with the use of gateways on our native PROFIBUS infrastructure, more can be used if necessary.

Supporting fieldbuses delivers significant value to the end users in the form of both CAPEX savings (wiring, footprint, weight) and OPEX savings (asset management, heating and cooling, design flexibility, maintenance strategy).

What is Ethernet-APL?
A brief overview

In a control and process automation environment, Ethernet is already used to some extent as the physical layer for the collection of data and control of field devices using communication protocols like PROFINET and Modbus TCP.

A mainstay of the IT world for decades, Ethernet underpins other abstraction layers that collectively define interconnection and data flow between different devices and systems. Until now, however, the broader adoption of Ethernet has been hampered by practical constraints that limit its applicability in industrial environments.

Collaborating with other leading vendors and standards organizations, ABB has been contributing to the enhancement of field-level Ethernet connectivity for use in process automation industries.

The result of this collaboration is Ethernet-APL, a new way of quickly transmitting large quantities of data even in hazardous areas up to Zone 0 / Class 1, Div. 1 that have previously presented a bar to the use of Ethernet communications.

Like its IT world sibling, Ethernet-APL uses a familiar twisted pair cable to carry high-speed duplex (bidirectional) data communications as well as power for field devices. Supporting data rates of 10 Mbps – orders of magnitude greater than decades-old HART (1200 bps) and Fieldbus (31.25 kbps) protocols – it enables the fast transmission of greatly increased volumes of data, including process values and diagnostic parameters.

Developed with long cable runs in mind, it accommodates well-known trunk and spur network topologies common in the process industries, with a maximum trunk length of up to 1,000m – far greater than regular Ethernet's 100m limit. Reflecting its intended use in potentially hazardous environments, intrinsic safety is fully integrated into Ethernet-APL. A range of power classes can be specified, including a profile that limits maximum supply voltage and current to prevent electrical sparking in the flammable atmosphere of an oil refinery or chemical manufacturing plant. Complementing these design attributes, a key goal of Ethernet-APL is the realization of cost reduction per sensor through the simplified installation, configuration, and maintenance of instrumentation.

In brownfield sites further savings can also be achieved through the re-use of existing Fieldbus Type A cabling when migrating from older infrastructures.

Based on open IEC and IEEE standards, Ethernet-APL technology brings the proven benefits and economies of scale of high-speed Ethernet communications out into the field and beyond, simplifying direct connection with enterprise-level systems. Streamlining the installation, configuration and maintenance of instrumentation and automation technology, Ethernet-APL drives tangible cost savings and enables plant owners to realize fresh sources of value from their current investments.

System 800xA® – How Ethernet-APL complements PROFINET

PROFINET is a dominant platform for Industrial Ethernet, as the market share of other fieldbus technologies has declined steadily over the last decade. Building on the proven foundations of Ethernet, PROFINET has several features tailored specifically to use in process automation environments, including redundancy, online config., PA-Profile and safety with PROFIsafe.

Already widely accepted and used in remote I/O and electrical integration applications, the appeal of PROFINET is further expanded with the imminent arrival of a new generation of Ethernet-APL devices, and current efforts by instrumentation vendors to implement PROFINET with PA-Profile 4.02.

While the PROFINET protocol provides a way of transmitting data over a network, no actual meaning or structure is applied to that data. Instead, this function is served by application profiles that act as an extra abstraction layer positioned between the device application and the PROFINET networking stack.

This approach simplifies the interface for the application engineer and ensures genuine interoperability among devices from different vendors. When designing control application code, an application engineer can interact with the profile instead of the specific device, enabling the reuse of knowledge, code, and troubleshooting methods irrespective of the device's vendor. Since the device is interfaced using the profile, the device as such can be replaced as long as the new device supports the same profile. An expectation is that some 80 percent of devices will be able to use this generic profile and only 20 percent will require a specific profile. A specific device driver is typically used for more complex devices such as valve positioners and analyzers.

Leveraging other strong PROFINET functionality for online configuration such as online changes, dynamic reconfiguration and automatic device replacement helps to ensure continuous production, minimize downtime, and reduce speed/quality losses.

Additionally, plant modifications and expansions can also be done in a running system. By combining the automatic device replacement with the device interoperability of PA Profile 4.02, plant operators have very powerful system functionality to manage breakdowns or complex maintenance activities at any time of day to ensure nonstop operations.

Another key feature is of course high availability. Here PROFINET provides different levels of redundancy, with the mandatory inclusion of S2 redundancy with PROFINET PA Profile 4.02 devices satisfying the requirements of most real-world process automation applications. Going forward, by also including safety applications using PROFIsafe, one common uniform communication technology for process automation can be achieved that can be applied across a full spectrum of industrial environments.

Features
Ethernet-APL offers a number of key features opening a raft of new possibilities for plant operations, including:
- 10 Mbps data rates, greater than earlier HART (1200 bps) and Fieldbus (31.25 kbps) protocols
- Single twisted pair of conductors within a shielded cable, simultaneously carrying process data, device configuration, diagnostic data and power
- Accommodates trunk and spur network topologies with maximum trunk length up to 1 000 m compared toregular Ethernet's 100 m limit
- Intrinsic safety is fully integrated, including a profile that limits supply voltage and current to eliminate the risk of electrical sparking in hazardous environments
- Simple, robust installation with devices connected through a point-to-point link with the Ethernet-APL switch that can be part of a network ring of many devices providing also media redundancy
- Works with most common industrial Ethernet protocols including PROFINET, OPC UA, and Ethernet/IP

System 800xA® – with OPC UA protocol
For superior connectivity, security, and compatibility

Open Platform Communication Unified Architecture brings many flexibility and compatibility benefits by making communication between various machines easy and efficient. It does not sacrifice performance when dealing with communication between totally different machines with different hardware. By helping raise the level of plant automation OPC UA optimizes communication.

What OPC UA is and what it does
OPC UA (Open Platform Communication – Unified Architecture) is a machine to machine communication protocol for industrial automation, developed by the OPC Foundation. OPC UA is platform independent, thus allowing machines with different hardware setups, different operating systems and on different platforms to communicate with each other.

This wide and flexible connectivity allows traditional PC hardware, as well as cloud-based servers, PLCs and even micro-controllers, to communicate together more easily and more securely. The multilayered architecture offers a "future--proof" framework for UA products while also providing backward compatibility with existing products, thereby alleviating the need for upgrading or replacing older equipment.

Security is the top priority
A key benefit of OPC UA is increased security – protecting your plant, equipment and processes from both internal and external threats that could impede productivity and operations. OPC UA is firewall-friendly and provides a collection of new controls. Messages are now transmitted securely at various specified encryption levels and the recipients can verify both the integrity and place of origin of those messages.

Client and server IDs are authenticated through certificates which provide control over which systems and applications can communicate with each other. All actions and activities taken by both the user and the system are logged, providing a secure access audit trail if needed.

Supporting many typical applications
OPC UA is well suited for supervisory control, which eliminates the need for an intermediate Windows-based system to streamline data transfer from various plant levels.

OPC UA can also be used for machine-to-machine communications between multiple vendor's controllers, giving a common language to use between control devices and sensors. This allows data to be communicated and transferred in a reliable and secure way between systems and subsystems in smart machine applications.

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The new CI874 Communication Interface for OPC UA.

The supported OPC UA standard is version 1.04. Secure communication is supported using X509 application certificates. Alarm and event are not supported in this release.

OPC UA Connect does not contain any ready-made libraries; but all needed object types are automatically uploaded from the server, if missing.

OPC UA Connect requires an approved Introduction Phase Approval (IPA).

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OPC UA protocol in System 800xA® version 6.1.1 and 6.2

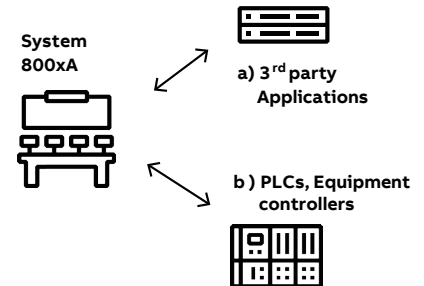Examples of how you can securely improve system, controller and historian connectivity and communications

System 800xA® OPC UA Client Connect (Server)
OPC UA Client Connect enables external OPC UA Clients to connect to System 800xA® in order to read and write OPC DA data from/to System 800xA®. You can also read Alarms and Conditions and historized data.
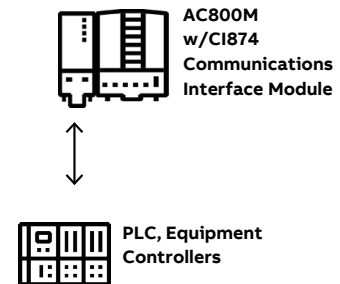
System 800xA® OPC UA Connect (Client)
OPC UA Connect enables external OPC UA servers to be connected and integrated into System 800xA® so that 800xA can read and write OPC DA data from/to them.

System 800xA® AC 800M CI874 OPC UA Client
The OPC UA DA Client for the AC 800M controller family is accomplished via the CI874 communications interface module primarily used in, but not limited to, MDIS subsea applications.

System 800xA® History OPC UA
The embedded OPC UA Server in 800xA History (and MOM) is supporting OPC UA DA, HDA, and AE for 3rd party OPC UA Clients applications to retrieve data.

800XA OPC UA SERVER / CLIENT

System 800xA

a) 3rd party Applications

b) PLCs, Equipment controllers

800XA AC 800M CI874 OPC UA

AC800M w/CI874 Communications Interface Module

PLC, Equipment Controllers

800XA HISTORY OPC UA

3rd party Historian/ Gateway

800xA History

System 800xA

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Secure connectivity between system, controller, and historian – via OPC UA

With System 800xA®, a wide variety of OPC UA connectivity points are available, such as:
• Between client and server on the system level;
• to an AC 800M controller via the new CI874 communication interface module;
• and for historian capabilities via 800xA History.

System 800xA® – Introduction
System Evolution

Our customers are looking to improve overall productivity from their installed system by getting more value from it, extending its useful life, and reducing maintenance costs while improving overall reliability. System 800xA® offers solutions to these challenges and opportunities, but an existing installed system installation faces many modernization challenges which include: maintaining production and profitability, utilizing maintenance budgets rather than CAPEX, and ensuring maximum ROI and protecting assets – both physical and intellectual.

ABB's solution is evolution
Evolution is ABB's guiding lifecycle principle and is embedded within ABB's product offerings, policies, programs, and processes. Evolution allows our customers to achieve their business goals by both sustaining their automation system and extending it with new features and technology.

ABB's lifecycle programs
Our customers need to make informed decisions, better control lifecycle costs, remove uncertainty for predictable budgets, eliminate unplanned upsets and trips due to system interruption. ABB's Lifecycle Management policies fulfill these needs.

They include:
• ABB Lifecycle Policy
• Core Control Commitment
• Product Lifecycle status and history
• System 800xA® Software Support Policy
• Automation Software Maintenance

Evolution without obsolescence
ABB is committed to continually demonstrating that our customers made the right choice by choosing ABB as automation system partner. Our goal is to protect your investment by mitigating customer's ongoing risks, eliminating down-time and maximizing the performance of customer's systems.

ABB's commitment to 'Evolution without obsolescence' provides plant owners with the ability to extend the operating life of their control systems and improve the profitability of their investments through seamless evolution, thus avoiding the costs and risks associated with 'rip-and-replace' upgrade methods.

Lifecycle planning
ABB's Lifecycle Planning process is a powerful method to engage with our customer throughout the system lifecycle. It is a formal and structured process with defined phases, tools and outcome. Its objective is to collaboratively work with the customer to construct a technical and commercial road map 3-5 years out in the future to achieve these objectives. The plan is reviewed yearly.

Read more about our Automation Software Maintenance Program and its many valuable services here: **https://new.abb.com/ control-systems/service/offerings/ service-agreements**

System 800xA®
Operations

The following sections describe System 800xA® capabilities piece by piece, from the different functional areas, over system base functional, to key technical data and deployment alternatives.

Operator Workplace
This is the main work environment for operators, providing them with control and supervision of the underlying processes. Process data, as well as data from systems integrated in System 800xA®, are all presented in the operator workplace.

The Operator Workplace coordinates and manages toolbars, graphic displays, alarm lists, faceplates, etc., to give operators the best possible user experience. Built-in rules make sure that the information required is always visible or easily accessible.

Navigation concepts, mainly the context menu, provide operators with easy access to all information in the system. In addition, the Operator Workplace is highly configurable.

Each workplace can be configured with up to four screens and several Operator Workplaces can be combined to one unit to create even better control possibilities for the operator. Operator Workplace also comes with a predefined layout with details of what to show on each screen and where on each screen the toolbars and displays will be presented.

This predefined layout covers resolutions 1680x1050, 1920x1080 and 1920x1200.

Displays, e.g. graphic displays and alarm lists, can be viewed in a predefined workplace display area or placed on top in an overlap window. The tabbed workplace is a layout of the operator workplace where the views in the display area are organized under tabs that can be used for quick and easy navigation between displays.

Extended Operator Workplace
The Extended Operator Workplace consists of three System 800xA® Operator Workplaces with three screens each mounted in an ergonomic and performance-enhancing environment.

The combination of one workplace feeding three large Full HD screens for overview graphics and two three-screen operator workplaces feeding into a total of six screens gives operators a perfect working environment. In the Extended Operator Workplace, screen resolution is standardized to Full HD (1920x1080).

Process Graphics
Process Graphics is integrated in the Operator Workplace to present graphic displays with live data to the operator. Live data is fetched via OPC and presented to the user in real time. Expressions in the graphic display can be used to calculate live data based on one or more OPC properties.

Graphical libraries will provide standardized graphical elements that can be reused in different graphic displays, contributing to a clean and well thought out look and feel. A set of new High Performance HMI elements based on the best-practice principles in Human Machine Interfaces have been added to the graphics library.

Right clicking on an object in a graphic display will launch the context menu, allowing the operator to navigate within the operator workplace, launch the object's faceplate, acknowledge alarms, etc. Left clicking will launch the default aspect on the selected object – typically the faceplate.

Faceplates
Faceplates are designed mainly for operators to monitor and control a process. Each object can have up to three different sized faceplates, depending on the needs of the object and the user.

The faceplate framework, a part of the operator workplace, helps ensure that product-supplied faceplates are straightforward and intuitive.

Three standard sizes of faceplates (reduced, normal and extended) provide the operator with the number of details required.

Alarm & Event management
Alarm & Event management is supported at several levels throughout the system. Alarms and events are treated in a consistent way (an alarm is an event that alerts the user of an abnormal state and that needs to be acknowledged).

Alarms are always presented to the operator in obvious and clear ways inside the Operator Workplace. In addition to alarm indications in graphic displays and on faceplates, the operator workplace can have:

- fixed alarm bands to provide the number of active and unacknowledged alarms in a summary display
- alarm lists to present current alarms in chronological order
- a sequence bar to present the number of alarms horizontally

An alarm list displays all alarms matching the predefined filter of the alarm list in chronological order. The operator can view details about the alarms and acknowledge individual or multiple alarms from this list. In addition, the operator can analyze the alarms by filtering the alarm list using expressions.

Events are presented in chronologically-ordered event lists (like the alarm lists) but without the possibility to acknowledge. Event lists display all events matching the configured filter for that list. The operator can filter the event list columns with expressions to further analyze the events. Irrelevant alarms that do not require operator interaction can be hidden by using the Alarm Hiding function.

Operators can also choose to temporarily remove standing or nuisance alarms to handle at a later occasion by using Alarm Shelving. Alarms that require a similar response from the operator can be grouped and presented as one alarm. This reduces the number of alarm entries in the alarm list.

Trend display

Trend displays are one of the most important tools associated with operating and analyzing industrial processes. The Operator Workplace addresses this need by presenting the operator with an extensive set of trending features and functions.

Trend Display presents data seamlessly from both run-time and historical data.

A trend display can display several trend traces in the same display, e.g. one trace for the value and another for an alarm limit. Users can modify the time and time resolution on the display when working with the trend. Values can be presented in relation to each other in an XY-plot diagram.

SFC Viewer

The Sequential Function Chart (SFC) Viewer is a display type, that shows the Operator animated sequence overview displays as well as transition and action dialogs. Visualization does not require configuration tools to be started.

The display is implicitly being created and updated by the configuration tools. Integration is available with the controller families AC 800M, Freelance and S+ Control & I/O: Melody.

Process Recall

Process Recall allows the user to view graphic displays with recorded historic data, in a tool called Process Recall Viewer which runs outside of the 800xA workplace. The user can play, pause, fast forward and rewind recorded data in the viewer.

In order to reproduce the data (OPC Properties) in the Process Recall Viewer the user must select which data who should be recorded, by using specific 800xA aspects.

Process Recall supports recording of a maximum of 100 000 static properties and 40 000 dynamic properties with an update rate of 10 000 changes per second in average.

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Process Recall
screen view

System 800xA®
Control

AC 800M – scalable process controller with choice of speed, safety, memory and availability

Through its modular design, AC 800M controllers and associated I/O options contribute to lower costs, higher engineering quality and higher operating efficiency.

Equally effective for small hybrid systems as for large, integrated automation applications, the modularity of the subsystem results in higher return on assets by providing the flexibility to choose the specific functions required to meet actual requirements.

Using the same base hardware, a wide variety of central processing units (CPUs), I/Os,

communication modules, and power-supply options provides flexibility in terms of functionality, performance, and size.

For example, a basic controller may consist of a power supply module, a controller, and local I/O modules. A large system can consist of several AC 800M controllers that communicate over an Ethernet-based control network.

These stations may employ sub-clustered I/O assemblies connected to their host controllers via cable, fiber-optic or wireless industry-standard fieldbuses.
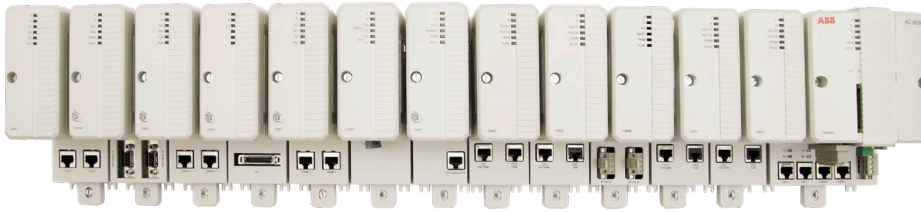
—
AC 800M controller
with 12 communication
modules.

AC 800M Features and Benefits:
- Scalable design for easy expansion. Simple to set up and easy to expand, AC 800M scales up as control needs to grow. Just add the extra modules the application requires.
- From only a handful of I/O points to thousands, installed locally or remotely.
- Full modularity and flexibility for all environments. Many options make AC 800M exceptionally open.
- Fault tolerance gives maximum availability. Robust design and redundancy options in all critical areas of the controller and its components eliminate single-point of failures and secure maximum availability.
- Comprehensive maintenance features reduce downtime.
- Powerful control solutions and reusable libraries. The software offers a wide range of powerful control solutions for the AC 800M process controllers. From basic logic to advanced regulatory control, or any mix of these two.
- Code re-use and libraries of ready-to-use functions promote efficient configuration.
- Low power consumption allows for installation in sealed enclosures without requiring fans, louvers, air filters or other forced cooling techniques.

Scalable design plus full modularity and flexibility for all environments
AC 800M is a modular process controller with a rich set of communication functions as well as full redundancy and support for a large range of I/O systems.

Rail-mounted modules comprise CPUs, communication modules, power supply modules and accessories. Connectivity and expansion options make AC 800M exceptionally open and scalable; easy to connect and easy to adapt according to current control needs.

AC800 M fault tolerance availability
Maximum availability is achieved when redundancy options are implemented. Redundancy is available in all critical areas of the AC 800M, generates maximum flexibility and availability.

These include control networks, fieldbuses, internal buses, power supplies, CPUs and I/O.

If a fault occurs in a primary circuit, bumpless transfer to the back-up ensures uninterrupted operation. Implementing all redundancy options eliminates single-point failures, thus helping secure maximum availability. The end result is seen in increased productivity and greater profit.

For harsh environments, all modules are compliant to G3 severity level of ISA-S71.04, Environmental Conditions for Process Measurement and Control Systems.

The test center performs a multitude of different tests, including port scanning, network flooding, vulnerability scanning and protocol fuzzing.

This is done by using a variety of best in-class testing platforms, such as Achilles from Wurldtech, Mu-8000 from Spirent and Defensics from Codenomicon as well as many complementary testing tools.

CPU Redundancy
The AC 800M CPUs PM858/PM862/PM865/PM866A/PM867 and PM891 can be configured for CPU hardware redundancy. Here, two CPU modules will run in parallel, one as primary and the other as secondary.

If the primary CPU fails, the secondary CPU automatically takes over. The BC820 module makes it possible to place the two CPUs up to 200m apart.

Control Network Redundancy
Network redundancy is based on the ABB RNRP (Redundant Network Routing Protocol). This protocol is designed for rapid detection of network failure and instant switching to alternative paths.

Network redundancy requires two independent IP networks, one primary and one secondary. Whenever the maximum number of lost messages is exceeded, the traffic switches to the secondary network.
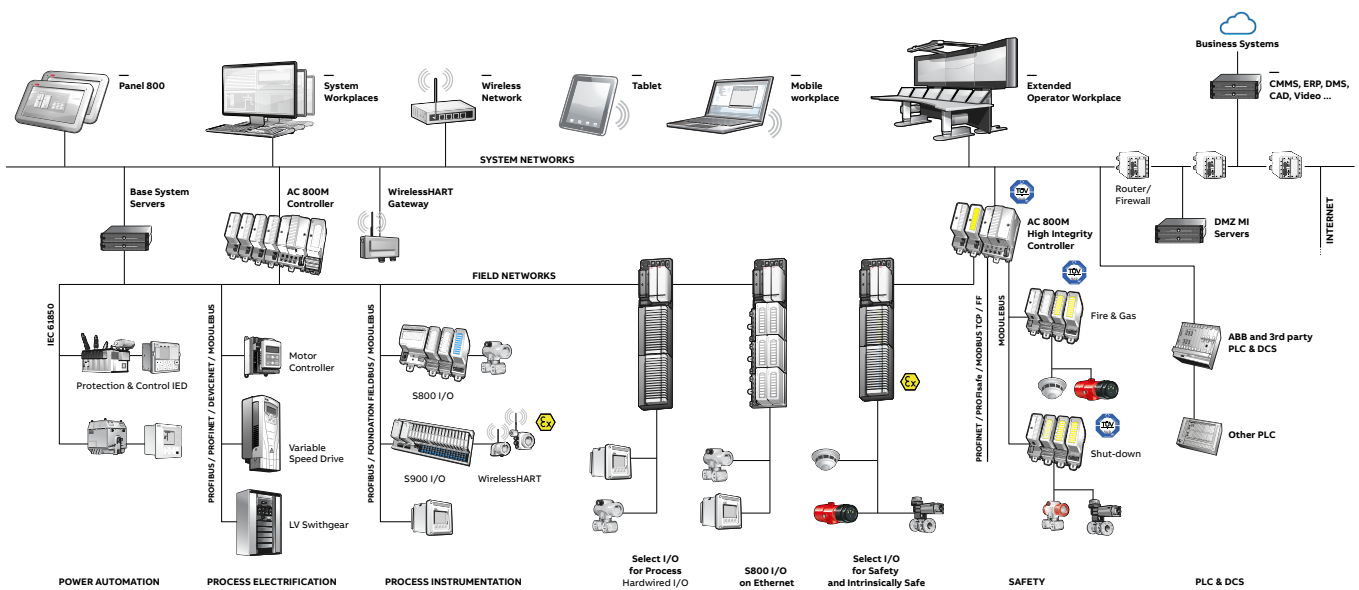
—
ABB Ability™ System
800xA® Configuration

Comprehensive maintenance features reduce downtime
Modules are equipped with self-diagnostics in the software. This reports faults to superior system stations where alarms are raised and forwarded to production supervisors and maintenance engineers. All modules are equipped with LEDs on the front, indicating functions and malfunctions in real time, thus contributing to lower maintenance costs.

Modules can be replaced under power and are keyed to ensure replacement with the proper module types. The application and data can also be stored in a detachable Flash Memory to secure its contents, e.g. after a power failure or during replacement or transportation.

AC 800M also supports online upgrading of the embedded firmware in redundant CPUs and communication modules to avoid downtime. Different controller firmware versions can coexist, so updates can be optimized towards what is actually needed at a certain point in time.

Control modules, applications and hardware settings may be changed online, in real time and under power, resulting in maximum control availability.

The ABB patented 'Load Evaluate Go' function takes this easy handling a step further by supporting actions such as Modify, Download and Evaluate, making it possible to download a new version of the running application to the controller without it interfering with the running version. The modified version is started in passive mode in parallel with the running version and an Evaluation Report tool shows any differences in real time.

Powerful control solutions and reusable libraries
AC 800M supports logical, mathematical and time-based data processing. The functionality range for control applications is wide, from binary control to closed loop control, with advanced functions like auto-tuning and adaptive PIDs, fuzzy control, etc.

Predefined process objects like motor objects, valve objects, etc. are available. It is possible to build user-defined function blocks and hide their content to protect intellectual property.

The AC 800M is fully integrated with the ABB switchgear technologies. MNS iS is an ABB motor control center solution that is used in PROFINET networks.

There are four ways to connect and integrate ABB Drives to the AC 800M controller – ModuleBus, DriveBus, PROFIBUS-DP and PROFINET. Ready-made ABB Drives process objects allow easy and seamless integration.

Time synchronization

System-wide time synchronization of all nodes handling time related data is supported. The accuracy of the distribution to nodes performing the time tagging (controllers) is in the millisecond range (for AC 800M +/- 0.5 ms). The time stamp presentation (alarm and event presentation) has a resolution of 1 ms and an accuracy of 0.4 ms. This means that two events detected by the I/O channels in two different AC 800M controllers can be distinguished in time down to a few milliseconds.

Alarm and event handling

AC 800M handles alarms and events, including detection, notification or definition of alarm conditions. Function blocks monitor signals, both internally and between applications. System alarms and events are created in a particular controller, but can be read and acted upon by the operators.

The alarm or event has its origin attached to it. SOE (Sequence Of Events) is supported from S800 direct I/O. The I/O modules are synchronized to the controller real-time clock with an accuracy better than 1 ms. Events are time stamped on the I/O module, and transferred through the controller, over the communication system, to the Alarm and Event system.

Events on I/O channels in one controller are differentiated down to a millisecond. Alarm and event text from the controllers supports National Language Support (NLS).

Network communication

Control Network is the standard network for AC 800M peer-to-peer communication and communication between AC 800M controllers and the 800xA system.

The control network is based on Ethernet, TCP/IP, and the MMS protocol. All AC 800M controllers use 100 megabit/second switched Ethernet.

Each AC 800M is equipped with two Ethernet ports for communication with other controllers and for interaction with operators, engineers, managers, and higher level applications.

These ports can be configured for redundancy in those cases where availability is of paramount importance. AC 800M is also equipped with two RS-232C ports that can be used for point-to-point communication with programming/debugging tools and with third-party systems and devices.

Inter Application Communication (IAC), uses Communication Variables for cyclic peer-to-peer communication. These variables can exist in the same application, same controller, or different controllers in the network.

System 800xA®
Process I/O

Process I/O is a distributed, highly modularized and flexible I/O-system with an eco-efficient design that provides easy installation of I/O modules, process cabling and connections to drives systems.

By permitting installation in the field, close to sensors and actuators, 800xA I/Os reduce installation costs by cutting the cost of cabling. Thanks to features such as hot swap of modules, on-line reconfiguration and redundancy options, it contributes to keeping production up.

800xA I/Os contribute to lower maintenance costs through a comprehensive set of self-diagnostics. All modules are equipped with front-panel LED displays that show faults and degraded performance.

System 800xA® Process I/O features include:
- Comprehensive coverage
- Flexible configuration and installation
- Easy set up
- Reliability and accuracy
- HART pass-through
- Redundancy also on I/O module level
- High Integrity I/O modules certified to IEC 61508 SIL3
- High accuracy time tagging
- Defined outputs at communication errors
- I/O modules with Intrinsic Safety interfaces
- Ethernet I/O Field-Kit makes S800 I/O and Select I/O on Ethernet to support xStream commissioning

Comprehensive coverage
800xA has an extensive scope of Digital and Analog input/output modules. The I/O system provides a variety of I/O modules, covering analog and digital signals of various types, as well as interfaces for various types RTDs and TCs.

For positioning applications using incremental encoders, special interface units are available comprising a complete positioning loop. This allows flexible configuration and installation plus easy set up.

The I/O system is highly flexible and modular, permitting a virtually infinite number of installation arrangements for any application:
- Small to large
- Step-by-step expansion
- Easy mounting on a DIN-rail

Online Configuration Changes
An S800 I/O station supports Hot Configuration In Run (HCIR). This means that the station can be reconfigured while in normal operation, i.e. without having to switch over to configuration mode.

Hot Swap of I/O Modules
All I/O modules can be replaced in a running system and will automatically be configured and initiated.

Redundancy
Redundancy options in all areas: power supply, fieldbus media, fieldbus interfaces and I/O modules.

High Accuracy Time Tagging
SOE (Sequence Of Events) is supported from S800 direct I/O. The I/O modules are synchronized to the controller real-time clock with accuracy better than 1 ms. Events are time stamped on the I/O module. Following a trip, it is thus possible to determine the exact sequence of events that led up to it – regardless of the physical placement of the I/O signals.

Defined outputs at communication errors
All output I/O modules have an internal watchdog providing logic to set each output to a predefined value in case of communication loss. Each output channel can either be set to keep the current value or a specific value. To support to the application, input modules have similar functionality.

HART pass-through
HART data is routed through the controller. S900 I/O provides specific I/O modules that allow full HART transparency up to the AC 800M, i.e. HART data can be used in the controller application.

Supported ABB I/O systems
AC 800M controller supports the following common ABB I/O systems and families:
- Select I/O, a comprehensive solution for simplified engineering, installation, commissioning and late changes.
- S800 I/O, a distributed modular I/O system for communication via PROFIBUS-DP or directly connected to an AC 800M Controller. This is the most common I/O.
- S900 I/O, a remote I/O system for use in hazardous areas.
- S200 I/O and S200L I/O, two compatible, modular I/O systems (S200L I/O is the compact version)
- S100 I/O, a rack-based I/O system
- Satt 19 inch rack I/O, a rack-based I/O system
- S500 I/O, for each field-bus slave, up to ten I/O modules can be connected

Support for third-party I/O systems
AC 800M can connect to virtually any third-party I/O system on PROFIBUS-DP, PROFINET, DeviceNet and EtherNet/IP. All that's needed is a Device Capability Description File that details the relevant characteristics. A Wizard easily transforms third-party I/O systems into 800xA I/O objects.

The following files are supported:
- PROFIBUS-DP GSD files
- PROFINET GSDML files
- DeviceNet and EtherNet/IP EDS files

System 800xA®
Select I/O

Select I/O is Ethernet connected and consists of single channel granular Signal Conditioning Modules (SCM). The Signal Conditioning Modules are mounted in a Module Termination Unit (MTU) with 16 SCM slots.

Select I/O provides a comprehensive solution for simplified engineering, installation, commissioning and late changes with features such as built-in disconnect function, field loop current limitation and replaceable terminal blocks. SCMs are available for both non-SIL and SIL3 applications.

The Select I/O is designed to provide a compact and rugged solution e.g. supporting operating temperature of -40 to +70 °C, hazardous locations and corrosive gases. The I/O system can be mounted in Zone 2 environment.

Remote and centralized installations are supported via a single or redundant Ethernet Fieldbus Communication Interface with built-in switches. An Ethernet Fieldbus Communication Interface can host up to 192 Signal Conditioning Modules per cluster.

Optimized engineering
Utilizing single channel granular I/O provides, by design, any number of benefits which simplifies the entire engineering process for both large centralized and small remote cabinets.

Since the I/O Module Termination Units can host any signal type in any slot and since the I/O system has built-in features such as disconnect function, field loop current limiting and replaceable terminal blocks, classic marshalling can be eliminated which means that cabinets can be standardized and prefabricated.

Standardized cabinets will reduce the design work and testing efforts which will lead to decreased project execution time and cost.

The Select I/O reduces the impact of late changes by reducing the amount of re-work required during the project. When an I/O type change is needed, insert a new Signal Conditioning Module (SCM) instead of moving the field wire to a different I/O module.

The marshalling concept implies that any controller can access any I/O signal in any Ethernet I/O station. This can be made at a late stage providing full flexibility when designing your control application.

Reduced Footprint and Equipment cost
Built-in disconnect function, field loop current limiting, channel-wise replaceable terminal blocks and the fact that the classic marshalling is no longer needed will significantly reduce the footprint for I/O cabinets.

In centralized installations, the number of cabinets can be reduced by up to 50% (depending on signal type).

The SCM concept is designed to save footprint. A typical 2000 x 800 x 800 mm cabinet with doors on both sides can include up to 672 I/O channels if mounted on a middle plate in the center of the cabinet.

Built-in Redundancy and Diagnostics
The Select I/O offers complete redundancy down to the SCM including redundant Ethernet Fieldbus Communication Interfaces, redundant 24V power and redundant internal architecture.

The Select I/O implements enhanced diagnostic possibilities and self testing, eg. loop supervision for all signal types.

The SCM structure is built to ensure that if one SCM breaks down, its failure will not affect the rest of the system. Select I/O units in combination with a Fieldbus Communication Interface (FCI) form an I/O station.

For SCM capable of redundancy, a second SCM of the exact same type can be used to achieve redundancy for higher availability. This requires the redundant FTB840 variant for a parallel connection to field.

Select I/O stations can be combined with S800 I/O stations in the same system. It is highly modularized and flexible to suit many applications and fit most requirements.

24VDC Power Inlets

Ethernet Adapters
with switch

High Integrity
Module (Safety)

External Field Power
Terminal Blocks

Grounding Bar

Field Terminal
Blocks

Cover/Label Holder

Fieldbus
Communication
Interfaces available as
single or redundant

Generic I/O
Modules (GIOs)
available as single
or redundant

Signal
Conditioning
Modules (SCMs)
available as single
andredundant

Ethernet Adapter
- **Connects to Ethernet I/O Network**
- **Built-in switch**
- **Optionally redundant**
- **Copper (Rj45) or Single-mode (LC-connector) fiber optic adapters available.**

Power
- **24V power inlets**
- **Optionally redundant**
- **Built in power voter and supervision**

High Integrity Module
- **For safety only**

Fieldbus Communication Interface (FCI)
- **Optionally redundant**

Grounding Bar
- **Optional grounding bar**
- **Used for grounding of shield and/or landing spare wires**

Module
Termination
Unit (MTU)

Field Terminal Blocks
- **Replaceable field terminal block with 4 screws**
- **Self learning keying between Terminal Block and SCM**
- **Four types of field terminal blocks are available (IS, non-IS, redundant and 120/230 V)**

External Field Power Terminal Blocks
- **Replaceable external field power terminal block**
- **4 screws for daisy chaining power**

Generic I/O Module
- **Handles communication and processing of signal data for a group of 16 SCMs**
- **Optionally redundant**

Signal Conditioning Modules (SCM)
- **Single-channel I/O module**
- **Choose SCM to match device type**
- **Loop supervision for all I/O types**
- **non-SIL, SIL, and IS SCMs available**
- **Optionally redundant**

Generic I/O Modules

The Generic IO Module (GIO) handles the communication between Fieldbus Communication Interface (FCI) and the Signal Conditioning Modules (SCM). It communicates upstream with the FCI using Modulebus, and downstream with up to 16 SCMs.

HART

The GIO module supports HART Device Variable (HART DV) and can store up to two HART Device Variables for each SCM that supports HART. The GIO reads all enabled HART variables from the SCMs. The FCI can then read the HART variables via the Modulebus.

Redundancy

A second GIO (of the same type) can be used to achieve redundancy. In a redundant GIO configuration, one of the GIO modules will operate in primary mode and the other in backup mode.

If a fault is detected in the primary GIO, there will be an automatic switch-over to the backup module which will then become primary. In case of fault detection, the GIO handles the switch-over without any action from the FCI.

The GIO which is placed in position A will be primary after startup. A GIO configured for single use is only allowed to operate in position A.

Hot swap for GIO

Hot swap of a GIO in a redundant GIO configuration will not affect other modules in the system. In a single GIO configuration it will not affect other modules in the system except for the SCM modules connected to the replaced GIO.

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S800 I/O family

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01 S800 I/O modules

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02 S800 HI I/O modules

The S800 I/O system is closely related to AC 800M, not only in appearance but also in features.
- Comprehensive: The S800 family of I/Os covers virtually all conceivable signal types and ranges, from basic analog and digital inputs and outputs to pulse counters and intrinsic-safety I/O.
- Flexible configuration: S800 I/O may be set up in a variety of ways, from directly connected to the host controller via sub-clusters (using fiber-optic cables), to PROFIBUS connected. Redundancy solutions available at all levels include power supply, communication interfaces and I/O circuits.

Flexible installation
Three mechanical designs are available:
- Compact (plug-in modules with a basic I/O signal termination area).
- Extended (plug-in modules with ample space for I/O cable termination, fuses, jumpering and field power distribution).
- S800L (all-in-one modules and bases with detachable screw terminal blocks for I/O signals) for installations not requiring hot-swap capability.

Easy set up
Once station numbers have been allocated and set, all other settings can be made from a network-connected engineering tool. A pass-through feature makes it possible to configure and examine all HART®-compliant field devices in a similar way.

Reliable
S800 I/O offers availability-improving features such as:
- Input/Output Set as Predefined (ISP/OSP). Each input/output can be set individually to default to a predefined value or freeze in case of communication loss.
- Hot swap of modules. A faulty I/O module can be replaced live, i.e. without powering down the station and without the rest of the station being affected. A hardware key ensures that only modules of the right type can be inserted.
- Hot configuration in run (HCIR). An S800 I/O station can be reconfigured while in full normal operation, i.e. without having to switch it over to configuration mode.
- Redundancy options in all areas: power supply, fieldbus media, fieldbus interfaces and I/O modules.

Accurate
S800 I/O modules can time-stamp events, i.e. input signal transitions, at source with millisecond accuracy. This provides the basis for meaningful sequence-of-events recording by the host system. In tightly interlocked processes, this is essential for finding the root causes of production disturbances.

For harsh environments, all control and I/O modules are compliant to G3 severity level of ISA-S71.04, Environmental Conditions for Process Measurement and Control Systems.

High Integrity
Within the S800 family, SIL3-certified modules can be used for safety-critical applications, see the section 'Safety' for more information.

High Density
S800 I/O saves cost and space by allowing up to 32 digital channels per module.

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01

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02

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S900 I/O family

The S900 remote I/O system communicates with 800xA or other controllers over PROFIBUS. Suitable for applications in the chemical, pharmaceutical, oil and gas industries, S900 I/O can be installed in hazardous areas, thereby reducing marshalling and wiring costs.

Further maintenance savings can be achieved through S900's
extended diagnostics and the use of HART®-compliant field devices.

Three versions of S900 I/O are available:
• S-series for applications in Zone 1 hazardous areas
• B-series for applications in Zone 2 hazardous areas
• N-series for applications in non hazardous areas

Additional solutions for specific applications

Series	Assembly	Field devices/signals	Hazardous area approval
S series	In Zone 1	In Zones 2, 1 and 0 (Intrinsically safe signals)	ATEX Zone 1 (Blue TU921S)
B series	In Zone 2	In Zones 2, 1 and 0 (Intrinsically safe signals)	ATEX Zone 2 (Blue TU921B)
N series	In safe areas	In safe areas	No* (Black TU921N)

* Field devices mounted in Zone 1/Zone 0 can be connected to N-Series with additional IS barriers; a benefit of IS modules of S- and B-Series

• Field housing – for wall mounting and field mounting in Zone 1 installations with system approval fully-certified in accordance with ATEX. The high-grade steel housing is prepared for wall-mounting with facilities for insulated screen rails or terminals.

The S900 components are based on a passive backplane suitable for mounting on a DIN rail or directly in a sub-distribution board. The passive backplane includes internal bus communication, terminals for field circuits, communication, and power supply. The function modules are plugged into the backplane in their appropriate slots.

The redundant backplane has two slots for power supply units, two slots for communication interfaces, and 16 slots for function modules. Digital function modules have up to 8 channels, analog modules up to four.

When using a redundant backplane, therefore, 128 digital or 64 analog channels can be connected per station. In the case of the S and B series, up to ten S900 stations can be connected on a single fieldbus line.

Key S900 benefits include:
• Intrinsically safe – can be installed in Zone 1 and Zone 2 areas.

• Good price/performance ratio because external barriers have been removed and costs reduced in terms of cabling, installation, hardware and maintenance.

• Easy configuration using either FDT/DTM or GSD files, allowing easy integration with System 800xA® process control systems.

• High availability of the plant thanks to redundancy and hot-swap capability of all components during operation.

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03

System 800xA®
Fieldbus Support

Digital serial communication protocols provide access to a wealth of information contained in modern field devices.

Compared to traditional 4-20 mA technology, digital fieldbus solutions integrate and exploit new levels of information embedded in field devices. This streamlines work processes, improves process and product quality, and maximizes availability. The fieldbus components of System 800xA® make this information available to be used for more efficient process control or asset optimization.

The fieldbus protocols supported in System 800xA® cover the broadest range of applications. This is very different from regional preferences or user-specific requirements determining which fieldbus is used. ABB's strength is to offer the freedom to choose what best fits the application needs from following range of protocols:

• PROFIBUS DP and PROFIBUS PA
• PROFINET
• FOUNDATION™ Fieldbus High Speed Ethernet and H1
• HART and Wireless HART
• IEC 61850
• EtherNet/IP and DeviceNet
• Modbus RTU and Modbus TCP
• RS-232C or RS-485
• OPC UA (CI874)

Supporting up to 12 (6 redundant) Communication Interfaces in one AC 800M Controller, data communicated through different fieldbus protocols can easily be mixed in the same application.

For critical applications, fieldbuses must meet the same fault-tolerant standards expected of traditional process control systems. System 800xA® fieldbus options maximize field device availability with scalable redundancy schemes extending from full redundancy at all levels to options with application or media redundancy only, depending on the criticality of the equipment typically connected through the specific fieldbus protocol.

Field instruments are often mounted in hazardous areas. FOUNDATION™ Fieldbus, PROFIBUS PA, and the PROFIBUS DP iS layer extend the reach into the Ex-Zones so that field devices and remote I/Os can be easily deployed and operated in hazardous areas.

Highlights:
PROFIBUS is the most commonly used multi-purpose protocol for connecting field instruments, drives, low voltage electrical equipment, remote I/O, and various types of gateways to sensor/actor buses or proprietary communication. Accordingly, System 800xA® offers a Device Management option to take full advantage of the wealth of functionality embedded in PROFIBUS devices.

With communication speed up to 12 Mbit/s and a scalable redundancy scheme including ABB's RLM01 for connecting non-redundant PROFIBUS devices to two redundant lines, PROFIBUS provides unmatched flexibility for all types of process applications.

PROFINET carries forward the benefits of PROFIBUS to Ethernet-based communication. As a protocol now entering the process automation domain, it currently provides functionality for cyclic communication and redundancy limited to media redundancy. Currently, its main use is connecting low voltage equipment. Additional functionality is continuously being added and more field devices for process applications are becoming available.

FOUNDATION™ Fieldbus focuses on connecting field instruments. As a unique feature, FF provides deterministic scheduling of the bus communication plus the ability to execute control logic on the field devices (control-in-the-field).

The integration of FF into System 800xA® is based on High Speed Ethernet (HSE). Optionally redundant Linking Devices connect the low speed instrumentation bus lines (H1) to the high-speed backbone (HSE), thereby reducing fieldbus cabling and bringing high availability closer to the process.

IEC 61850 is the international standard for Ethernet-based interconnection of Intelligent Electronic Devices (IEDs) for substations and related electrical equipment. System 800xA®'s IEC 61850 communication interface is the basis for integrating the electrical part of a plant with process automation (see also the chapter Electrical Control System).

System 800xA®'s combination of EtherNet/IP and DeviceNet connectivity provides a native interface to simple I/O and electrical equipment like that often used in the Americas. Cyclic data from DeviceNet devices can easily be integrated via the LD 800DN Linking Device.

As more and more devices in this application domain start to support EtherNet/IP, this equipment can also be connected on the same network through the same communication interface.

Modbus (TCP or RTU) is the protocol of choice in cases where no higher-level protocol is available for connecting third-party equipment, e.g. for connecting third-party PLCs. As it is freely programmable, Modbus provides unmatched flexibility to support any kind of application. The Modbus TCP communication interface supports master and slave functionality and module redundancy.

Another option for programmed multi-purpose connectivity is the RS-232C communication interface. It supports serial protocols and the corresponding services and libraries in the controller to set up device-specific data exchange.

The HART protocol is technically not a fieldbus. Nevertheless, HART devices support additional information via digital communication layered on the standard 4-20 mA process signals.

The System 800xA® I/O portfolio and connectivity for HART Multiplexers provide options that also take advantage of this data in Device Management for more efficient commissioning and maintenance. System 800xA® supports the latest version of the HART protocol (HART 7).

With the support of WirelessHART, data from HART devices can now be retrieved and used in Control and Device Management independent of wiring and 4-20 mA signals. This enables temporary ad hoc measurement or measurements on rotating equipment difficult to fit with wired transmitters.

Information on stranded in HART devices not connected to HART-enabled I/O can be effectively retrieved through WirelessHART with the ABB FieldKey Wireless Adapater. The meshed network topology of WirelessHART plus the built-in security features provide reliable communication for process monitoring applications.

System 800xA®
ABB Ability™ Field Information Manager

Device management made easy
ABB Ability™ Field Information Manager is the device mangement tool of choice for configuration, commissioning, diagnostics and maintenance of fieldbus instruments.

The new FIM functionalites includes major feature additions with new client/server architecture, multiuser support, more field connectivity and strengthened Ethernet-APL support.

This results in improved engineering efficiency, reduced time for repair, and optimized plant availability and performance, which ultimately leads to continuous productivity improvements.

Device Management options are available for the most commonly used protocols including HART, WirelessHART, PROFIBUS, PROFINET, FOUNDATION™ Fieldbus, OPC UA, ASi-5 & Ethernet-APL.

More than 1000 devices supported
Basic building block for easy and efficient engineering of field devices is ABB's comprehensive Device Library including more than 1000 tested Objects for ABB and 3rd party field devices. Selecting device objects from the ABB Device Library in Fieldbus Builder delivers all functions for easy configuration of network structures without the difficulty of manually integrating and testing 3rd party devices.

All Aspects needed for managing the field devices throughout their lifecycle are automatically included without additional configuration hassles. The Device Library is maintained through new versions of System 800xA® and continuously expanded as new devices or device revisions are released to the market or users request the integration of additional equipment.

Benefits during engineering
Fieldbus Builders, the integrated fieldbus configuration tools of Device Management, support engineers throughout the planning and configuration phase of a project.

Starting from System 800xA®'s Plant Explorer, all functions for topology design and device configuration are just a few mouse clicks away. Integration with System 800xA® Bulk Data Manager

allows fieldbus topologies to be efficiently created from project databases, device lists, or signal lists. Existing configurations can easily be duplicated and reused.

Device-specific graphical user interfaces, powered by Device Type Managers (DTMs) or Electronic Device Descriptions (EDDs), make device parameterization simple and intuitive. The DTMs and EDDs are provided by the device vendor to optimally support the functionality of the specific field devices. Integration testing during the creation of the ABB Device Library ensures interoperability between the system and the device drivers. As driver integration is based on open standards, integration is possible for basically every device. In cases where specific drivers are not available, System 800xA® provides some generic configuration means like the BasicHART DTM that allows the basic configuration of a device.

The configuration features of System 800xA® Device Management are available in both online and offline modes so that configuration and basic parameter settings can be done before the physical devices become available.

Bus timing and schedules are generated automatically. Device parameters can be displayed and modified individually online, or simply downloaded from the offline configuration database.

The ability to tune device parameters from the control room through the system infrastructure reduces the need for trips to the plant floor and speeds up commissioning significantly. Data stored in the system's database and in field devices can be reconciled. For larger installations, Bulk Data Manager helps compare parameters in field devices with the settings planned in project databases, e.g. to track commissioning status.

When parts of the plant are already running and further fieldbus devices need to be added, System 800xA® supports such additions with minimal impact on the running application and field devices.

Benefits during operations:
During plant operation, operators can take advantage of the fieldbus benefits. Status information coming with process values of fieldbus devices displayed on faceplates gives guidance about signal reliability based on the condition of the field device. Alarms & Events from field devices like that available with FOUNDATION™ Fieldbus help operators detect anomalous situations and take corresponding action immediately.

Maintenance Workplace is the maintenance department's interface to field devices. This workplace allows grouping and structuring of field devices and other plant assets according to maintenance needs, e.g. by device categories or maintenance teams.

All device functionality brought to the system as part of the ABB Device Library is easily accessible via context menus. Users can take advantage of the sophisticated diagnostics functions in the device drivers (DTMs or EDDs) as well as the diagnostics built into the Fieldbus Builders. Diagnostics are first performed from the control room before

the technician has to initiate his work permit and start the trip to the field. The device's manual, linked to the Object from ABB Device Library in electronic format, helps the technician to look up and understand the device's peculiarities.

Combining Device Management with 800xA Asset Optimization, make additional features available. These include displays that assess the plant's health at a glance based on continuous monitoring powered by Asset Monitors.

Asset Monitors quickly help track down root causes of failures by combining information from different sources, grouping this into maintenance-oriented categories according to Namur NE107 recommendations, or even giving hints regarding the potential cause of a problem and suggested actions to take. Asset Monitors enable more efficient planning of preventive maintenance or predictive maintenance schemes by regularly scanning device status and internal parameters to detect upcoming maintenance conditions before a device actually breaks.

In addition to presenting such device health status in maintenance alarm groups on the system workplace, the system's SMS and e-mail messaging service can be used to notify key plant personnel via mobile telephones, e-mail accounts, and pagers in case of critical failures, e.g. during a weekend.

Comprehensive fault reports, including relevant operating procedures, can be created from Asset Monitors and automatically transmitted to a Computerized Maintenance Management System (CMMS) to initiate the work order process. More information about FIM here: https://new.abb.com/control-systems/fieldbus-solutions/fim

System 800xA®
Electrical Control System

Integrated process and power automation, often referred to as Electrical Integration, is a unified architecture that combines process control, process electrification, and power management and distribution into one unified system.

A typical manufacturing plant can be divided into three areas: Process Control, Process Electrification, and Power Management and Distribution:

- Process Control – Includes instrumentation, safety systems and controllers. Devices communicate via a variety of fieldbus technologies, including PROFIBUS, FOUNDATION™ Fieldbus and HART.
- Process Electrification – Includes low-voltage (LV) drives, motors, switchgear and circuit breakers. Devices typically communicate with the control system via PROFIBUS or Modbus and lately PROFINET.
- Power Management and Distribution – Corresponds to Substation Automation (SA) systems. It hosts medium-voltage (MV) and high-voltage (HV) power equipment, including protective relays (also known as Intelligent Electronic Devices or IEDs), transformers, instrument transformers, power meters, drives and motors.

Traditionally, these areas are seen as different domains in a plant, maintained by different departments and monitored by different systems.

In the past, closer integration of these domains has been hampered by lack of communication standards and a common architectural design. There were simply too many communication protocols for substation equipment; integration involved many proprietary gateways or was only possible via hard-wiring certain crucial signals. This resulted in high project execution and commissioning costs, plus high lifecycle costs.

New standards overcome technology hurdle
However, the introduction of IEC 61850 as a global communication standard for power distribution and substation automation overcame this technology hurdle. A wealth of information from substation equipment can now be made available with a standardized, Ethernet-based communication protocol.

Besides that, a new standard emerges for the process electrification side, in a Ethernet-based protocol: PROFINET. With this, all the communication standards now from high voltage to low voltage equipment can be connected to the automation system by Ethernet.

System 800xA® takes advantage of the new future-proof IEC 61850 standard by providing an integration architecture that creates a unified view in all areas of the plant. With medium-voltage and high-voltage equipment integrated into the control system through IEC 61850, and low-voltage equipment integrated through PROFIBUS or PROFINET with Device Management in the same way as smart instruments, the traditional barriers are removed.

True collaboration between all involved departments now becomes possible, which leads to informed decision-making and faster tracking of the root causes of problems. With their new insight into the electrical part of the plant, operators can quickly detect disturbances that actually originate there and immediately issue a clear and correct work order to the relevant maintenance team.

Supports both MMS and GOOSE communication
For different types of applications, System 800xA® supports both types of communication services defined in IEC 61850 (MMS and GOOSE). With the IEC 61850 Connect option, IEDs can be directly accessed through the system servers from faceplates of the Substation Operation Library in
order, for example, to turn on medium-voltage motors or to monitor or retrieve diagnostics data. Virtually all data from IEDs can be made available in the system. Such a wealth of information could never be accessed in an economic way by traditional hard-wiring.
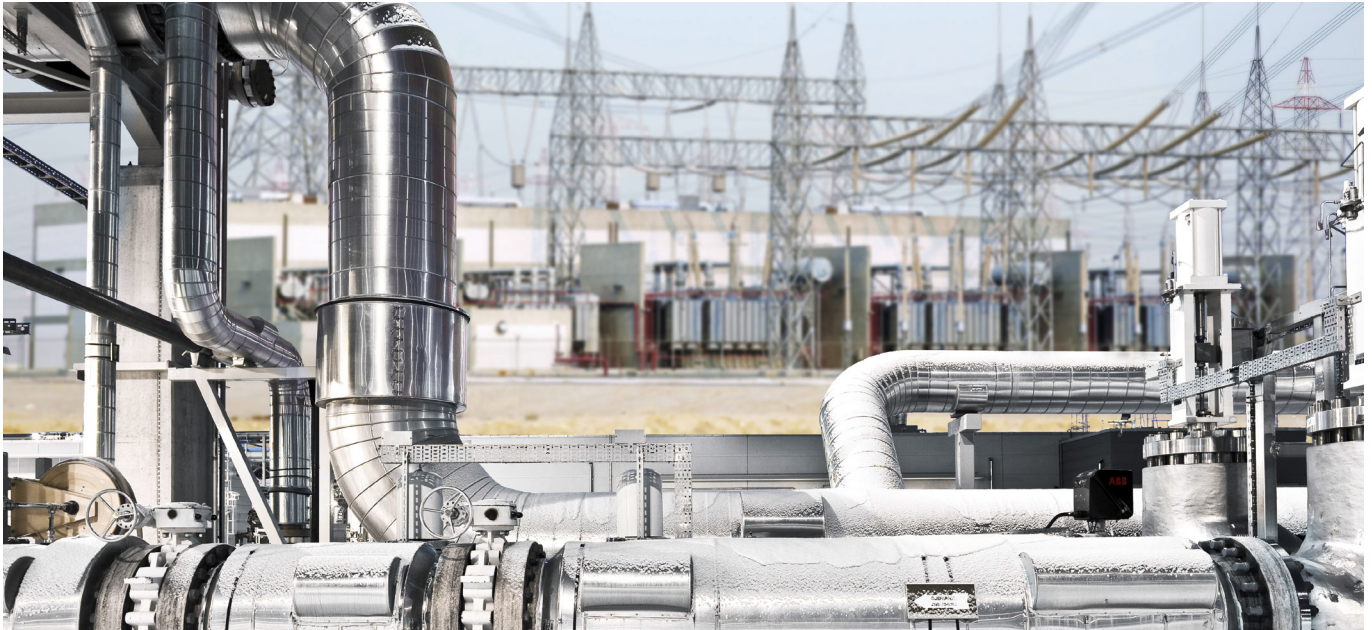
In addition, alarm and events from IEDs can be shown in specific lists for electrical equipment as well as in common sequence of events lists together with all other events in the system. As the operator workplace of System 800xA® is highly customizable, substation-related displays like single-line diagrams can be displayed in a fashion familiar to electrical operators.

A communication interface for the AC 800M controller is available for applications that require controlling IEDs from control logic, e.g. for interlocking medium-voltage motors. Even power management applications that require rapid signal exchange with IEDs can be implemented in the controller, since the interface supports fast GOOSE communication.

Besides that, non-critical information like supervision and operation can be read and written by the AC 800M controller via MMS protocol, or even analog measurements from the IEDs can be collected like this for power management applications, which gives more flexibility to the engineering project.

With up to 12 Communication interfaces per AC 800M acting as independent IEDs, the controller can act as a "Bridge IED", a unique feature in the industry.

Engineering IEC 61850-based integration strictly follows the engineering paradigms as defined in the IEC 61850 standard. The controller's Communication Interface is modelled in the IEC 61850 world as an IED. With the IED description for the Communication Interface (cid-file) easily created out of Control Builder, engineering of the substation can be done with the IEC 61850 tool of choice. The engineering results (scd-file) are later imported into the system so that access to the substation world becomes available without having to check the wiring of single I/O channels.

To fully leverage the benefits of electrical integration, low-voltage equipment also needs to become part of the equation. By combining all information in one system, this can now be monitored from the electrical or supply side, as well as from the traditional process automation side, where motors are the actuators, e.g. for mixers or pumps.

Being connected through PROFIBUS or PROFINET not only makes available data for turning a motor on or off, but for also additional measurements like voltage or current, or even active power. This data can be utilized in power management applications to define load-shedding schemes or other applications to minimize power consumption.

Optimizes maintenance practices
Maintenance teams also benefit from extra diagnostic information. When using Device Management PROFIBUS together with Asset Optimization, for example, they gain additional insight into smart devices like ABB's Universal Motor Controller (UMC) that not only monitors itself but also the connected motor. This way of working optimizes maintenance practices for electrical equipment and instrumentation since the same tools are used in the same way.

Finally, integrated process and power automation architecture reduces costs for maintenance and spare parts by eliminating the need for separate components for electrical and process systems, as well as for extra gateways to interconnect electrical equipment.

System 800xA®
History Services

Secure, reliable and scalable data management is a key cornerstone of any Information Management solution. The Information Management capabilities of System 800xA® secure data and seamlessly present historical information.

System 800xA® History Service capabilities can be categorized into the following areas:
- History Collection & Retrieval Services provide short and long-term data storage needs
- Archive Storage Services, provide offline data management of process data
- Reporting Services provide flexible reporting options for ad-hoc and production reports
- Presentation Services provide information access
- Application Services provide tools for development, data transformation and access

Collection and storage services
History Services are designed for flexibility, scalability and reliability. History data collection begins with a distribute series of short-term collection engines located close to the controller with high data availability for continuous operations.

Short-term data storage is focused on providing operators with the information that they need now. Long-term centralized data storage is based on the short-term data engines insuring all users utilize the same information. Centralized data management allows a single location to management report-intensive applications and offline data management such as archiving.

Seamless retrieval and configuration
Once collected, both short-term and long-term storage is an active part of the data retrieval process. History Services for 800xA provides seamless data retrieval for all system users and offers a wide variety of interfaces for data retrieval, thus insuring high availability for all users.

History Service uses the inherent 800xA system engineering, configuration and administration capabilities and inherits the power of aspect objects. This provides benefits both in terms of initial set-up and lifecycle cost as well as consistency. For example, configurations are properties of objects that already exist in the control system definition.

Changes made in the control system database, e.g. ranges, alarm limits, etc., are automatically propagated to the historical tag configuration since this is an extension of the control system tag configuration. The storage, transformation and presentation functions are unique in their flexibility and offer versatile applications for a variety of industries.

Logs are configured online using the Plant Explorer Workplace, or offline via the Bulk Log Configuration Import Export utility. Plant Explorer Workplace provides a graphical user interface for history configuration. The Bulk Log Configuration Import Export utility lets you use Microsoft® Excel to create a list of object properties, and then match object properties with their respective log templates.

Process data
History Services are configured for short-term storage, typically in System 800xA® Connectivity Servers. Connectivity servers are designed for high availability and support backfill between connectivity server pairs. Typically, connectivity server short-term storage is implemented to support operators and is configured to directly collect the OPC properties from the controllers. Long-term storage is centrally managed and is designed to collect the data stored in the short-term storage. Short-term and long-term storage maybe implemented at different times during a project, with long-term storage added at a later date.

Event data
All alarm and event messages for System 800xA®, including Process, Operator, and audit trail messages, are collected and stored by the System 800xA® Message Server. As with process data, the Message service meets the immediate needs for operations and long-term storage. Management and retrieval of events is managed by the long-term data storage.

Lab data logs for asynchronous user input

Lab data log is a special type of property log. This log type is used to collect Asynchronous data entered manually, or by an external application.

Event-driven data collection

Data collection for property logs may be event-driven. Event-driven collection causes the history logs to collect from their respective basic history trend logs for a time period specified in minutes before and minutes after this action is executed.

Production data storage

When a product is being manufactured, the information relationships are often not time-based and cannot be preconfigured or anticipated. History Services has Production Data (PDL) capabilities built-in for the organization, storage and retrieval of this type of information. PDL organizes critical process data such as operator interventions, alarm and events, equipment usage and task start/stop and duration times. PDLs are history logs that store production data such as batch start/end times, batch variables, and recipe data. PDL supports the collection, storage, and retrieval of this production data for presentation in batch reports.

Archive services
Archive services execute on the long-term history server. The archive function supports permanent offline storage for:
- Numeric process data
- Event messages (including audit trail events) and system messages generated by System 800xA® applications stored in message logs.
- Production data from batch control applications stored in PDLs (Production Data Logs).
- Finished reports

Archiving may be scheduled to occur on a periodic or event-driven basis through the Scheduler or as a result of a batch action. Manual archive operations may also be executed on demand.

Archives are written to hard disk. The hard disk may be partitioned into multiple volumes sized to match DVD media or relevant sizes for mirror network storage. As volumes become full, the archive backup function may be set up to write the contents of archive volumes to ISO Image files. The ISO image files may be burned onto CD-ROM or DVD media for permanent storage. As files are saved on the DVD media, the hard disk file copies must periodically be purged to make room for new archive entries.

As an alternative, you may specify the archive backup function to create shadow copies of filled archive volumes on network file servers. You may use both ISO image files and shadow copies. Archives are secured via Checksums.

Reporting and scheduling services
Manufacturing environments dictate a wide variety of reporting requirements. Typical reporting requirements include:
- Production status reports for managers
- Compliance reports for regulatory agencies such as EPA and FDA
- Status reports for operations
- Ad hoc reports

Reporting services provide scheduling and ad-hoc capabilities to access real-time data, historical process data, lab data, batch information, and event information that can be incorporated into reports created in Microsoft® Excel, Crystal Reports, or other report packages that use ODBC data access.

Operators can view reports from their Operator Workplaces by simply browsing report archives via the Plant Explorer. Other personnel can create reports at their desktops with familiar

applications to extract relevant information from the automation system as they need it. Reports are also viewable via a web browser.

Reports can be automatically scheduled, generated and sent to multiple output destinations:
• Plant Explorer structure (File Viewer aspects)
• Printers
• E-mail distribution lists
• Historical storage
• Local or network disk storage

Scheduled reports can be made on time and on event
Reports can be developed using Microsoft® Excel, Crystal Reports or other third-party reporting packages. When developing reports using Microsoft® Excel, users can take advantage of a series of functions embedded and tightly integrated with System 800xA®.

In addition, they can use standard ODBC SQL capabilities found standard in Microsoft® Excel and Information Management. When developing in Crystal Reports or other third-party reporting tools, ODBC SQL capabilities are provided to allow open data interchange.

Presentation services for historical information
Different users require different means of accessing information. History services for System 800xA® provide seamless views of real-time and historical information. Data is made available integrated into the environment that is most familiar to the targeted user.

For operators, data is integrated within the operator workplace for trending, event presentation and reporting. Ad-hoc using Microsoft® Excel extends the capabilities. For an engineer, manager or maintenance engineer requiring remote access, history services provide thin client desktop tools.

• KPI and dashboard views, including process graphics
• Ad-hoc trending displays
• ODBC data access for external tool integration
• Purpose built add-ins for Microsoft® Excel
• Event viewer and filter capabilities
• Purpose-built production data browsing and batch comparison tools for batch applications

System 800xA®
Batch Management

Increasing competitive pressures have forced batch manufacturers to demand greater flexibility from production facilities

Production managers are being challenged to achieve the seemingly incompatible objectives of increasing output and reducing the risk of regulatory non-compliance while still implementing cost-reduction initiatives. These pressures are driving the evolution of interoperability between distributed control systems, enterprise planning and information systems.

System 800xA® Batch Management meets this challenge with the most advanced batch automation system available in the marketplace.

800xA Batch Management is an extension of System 800xA® control system. Our integrated Batch Manager is built to ISA 88 and IEC 61512 standards. The batch software extension helps configure, scheduling and managing batch operations.

800xA Batch Management provides:
• Recipe Configuration
• Equipment Configuration
• Batch Operations
• Scheduling
• Resource Management
• Batch Production History
• Formulation
• Controller support for ABB and Third-Party Control Systems
• Schedule Interface for Enterprise Systems

Recipe Configuration
Batch procedures are configured graphically using Procedure Function Charts (PFC) based on ISA88 standards. The PFC Editor tool can be enabled to strictly enforce adherence to the procedure levels specified by ISA88, or users can choose to model batch recipes using their own design standards.

The Batch PFC Editor tool lets users configure the following information for each recipe:
• Procedure
• Formula
• Equipment Requirements
• Header and other Information

Equipment configuration
Batch Management supports network, multipath, and single path equipment configuration. This allows for support of complex batch production facilities. The batch manager can be configured with shared-use equipment modules, and exclusive-use equipment modules. Pseudo resources can also be configured and used to identify resources, such as an operator required at specified points in a procedure.

Batch Operations
The batch operation functions of batch management are accessed from the Batch Overview window. This window provides a summary of all the batches in the production schedule and also offers the flexibility to manipulate the batches in the production schedule.

Batch Overview window options include:
• Scheduling a new batch
• Invoking the status window for a batch or sub-procedure
• Displaying the procedure function chart for a batch or sub-procedure
• Responding to pending messages for a batch

The graphically-based recipe procedure is available as a runtime Procedure Function Chart display without any further configuration to graphical displays. During control recipe execution, its progress can be monitored closely by expanding or collapsing the PFC views as needed.

The user has runtime access to message prompts, parameters, and equipment status information. Operational regulatory requirements are met by system security, audit trails, log over, and single and double authentications.

System 800xA® provides unique online recipe editing flexibility during batch execution. Without stopping the batch, you can modify sequence and equipment assignments as well as recipe parameters. All changes made to the control recipe are automatically saved in the production record.

Scheduling

Batch Schedule and Batch Information status windows are accessible from the Batch Overview window. The schedule window enables the efficient addition of batches in a user-friendly manner. Batch Schedule window options include:

- Scheduling a new batch
- Scheduling a campaign of batches
- Duplicating an existing batch

Additionally, the batch manager provides a configurable graphic scheduling aspect. This aspect can be used in user-defined graphics to incorporate and simplify batch scheduling. Combine this with the batch spreadsheet scheduler aspect and you have fully-functional Scheduler and Parameter Manager within the user graphics.

Resource Management

The resource management functions of Batch Management are accessed from the Equipment Overview window. This window displays the status of all batch equipment configured in the system.

At the overview level, the following information is provided:
• Equipment name and status
  (available, busy or reserved)
• Batch, lot and campaign ID
  (if the equipment is in use)
• Operator status
  (normal, disabled, etc.)

Equipment requirements are specified in the procedure through equipment allocation BMAs (Batch Manager Actions):
• Reserve equipment – Reserve one or more pieces of equipment for use within a batch
• Unreserve equipment – Release equipment that was previously reserved
• Acquire equipment – Acquire one or more pieces of equipment for a specific purpose during batch execution
• Release equipment – Release equipment that was previously acquired
• Select equipment – Select equipment from available equipment based on selection criteria and attributes
• Deselect equipment – Release equipment that was previously selected

Production Response Batch History

Production Response (PR) is a broad term for Batch Management Production data and data analysis. It includes functions for collecting, storing, maintaining, viewing, and analyzing Batch Production data (batch events). Production Response includes the following functions:
• PR Batch History (Production Data Storage): Batch Production Data from 800xA History is stored in the PR Database after the Batch accessor is configured. This accessor is configured to read event data from History (RTDB) database in time order. Based on the storage polices, the PR database storage can be extended from PR Online to the Mid Term to the Long-Term storage.
• PR Batch View – PR Batch View is a Batch application to visualize data present in the PR database. This includes Production Data browser, PFC viewer and Batch Trend Association viewer. PR Batch View application can be installed on 800xA client node.
• Batch Data Access – PR Batch history data is stored in Microsoft SQL Server database and can be accessed (e.g reporting application) using Microsoft OLE DB Provider for SQL Server to production response database views, stored procedure, and functions.

Formulation

Simple Batch and Parameter Management offers the user an optional way to schedule batches and manage formula parameter information without the need to access Batch Overview. With Microsoft® Excel, users can add and schedule batch recipe procedures within the batch manager. In addition, formula worksheets can be added to the Excel workbook to manage parameter lists.

Controller Support for ABB and Third-Party Control Systems

Batch Management includes a standard phase interface to AC 800M controllers as well as all of the controllers from the ABB installed base process control systems (e.g. Symphony Plus Melody, Symphony Plus Harmony/INFI90, DCI System Six, Advant MOD 300, AC 870/Melody, Freelance, Advant Master controllers).

Third-Party controllers can also take advantage of the Function Phase Driver. The Function Phase Driver is a user-configurable application that maps batch states, commands and parameters between the batch server and user-defined OPC points representing the interface to an equipment phase in a PLC or other process control system.

Schedule Interface for Enterprise Systems

800xA Batch Management includes a schedule interface feature to facilitate the bi-directional transfer of data between 800xA Batch Management and external applications.

These batch-scheduling and data-transfer functions use standard Microsoft® Web Services that are easily integrated into enterprise resource planning systems, schedule optimization software or similar shopfloor applications.

Standard read function calls can be used to retrieve the following types of information:
• List of all active batches
• Details from any batch listed in the batch overview
• Details from any approved procedure
• Tag key (batch) data associated with the batch recipe
• Details from any batch equipment

Standard write function calls can be used to perform the following operations:
• Schedule a batch, including values for some or all top-level recipe parameters
• Change a previously scheduled batch, including start time, priority, mode, and parameter values
• Change attribute values on batch equipment

System 800xA® Batch Management is aligned with industry standards such as ISA88, ISA95, IEC 61512 and IEC 62264.

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Architectural characteristics

Feature	Characteristic/Value
Structure	Client/server.
System	System extension to 800xA.
Batch server	One primary batch server per 800xA System.
Batch server redundancy	Primary with Mirrored Secondary and Witness, optionally licensed; unshared dedicated hub between batch servers recommended when dual networks are not being utilized.
Historian	Batch-related alarms and events are routed to the 800xA event system. These alarms and events, as well as non-batch server events (including attributes) and numerical trend data, are collected and organized by Information Management. Advanced production history, batch-to-batch analysis, reporting and archiving is enabled via Information Management.

System 800xA®
Plant Asset Optimization

Plant Asset Optimization

System 800xA® Plant Asset Optimization is a plant asset management solution that presents real-time information seamlessly and in the proper context to operations, maintenance engineering, and management.

System 800xA® Plant Asset Optimization provides real-time asset monitoring notification and maintenance workflow optimization of automation equipment, plant infrastructure, plant equipment, field devices, IT assets and production processes.

System 800xA® Plant Asset Optimization brings maintenance management to the operator environment to provide a single window interface for all asset management related operations. For maintenance personnel, Plant Asset Optimization provides a default Maintenance Workplace that supports daily maintenance activities in a most efficient way.

800xA Plant Asset Optimization significantly reduces costly production interruptions by enabling predictive maintenance. It records the maintenance history of an asset and identifies potential problems to help avert unscheduled shutdowns, maximize uptime, and operate closer to plant design limits. Plant managers have the opportunity to collect, compare, and monitor data on field devices and larger equipment to accurately assess equipment operating performance in real time.

As a result, faltering performance can be uncovered before breakdowns occur, and maintenance can be scheduled accordingly.

The 800xA Plant Asset Optimization uses CMMS Integration and Device Calibration Integration to make information within the CMMS system and Device Calibration System database software trans-parently accessible to users in process control, maintenance, and calibration management system environments.

The functionality provided by 800xA Plant Asset Optimization is described below:

Maintenance Workplace and Asset Structure

Asset optimization information can be accessed from any workplace in the 800xA System. The Maintenance Workplace is a default workplace for maintenance personal. It is basically a plant explorer workplace with an alarm band that shows asset monitoring alarms for default asset groups.

The Asset Structure provides the possibility for maintenance personnel to group and arrange plant assets that will facilitate efficiently managing routine work. Control topology constraints can be overcome and even devices with different fieldbus protocols can be grouped together if they require similar maintenance procedures.

Asset Condition Reporting

Asset Health Condition Reporting provides the infrastructure that reports asset status/condition information to notify operators and maintenance personnel when an abnormal condition calls for a maintenance action. Plant Asset Optimization provides asset condition reporting via the Asset Viewer and Asset Reporter. The Asset Tree, visible in the Asset Viewer, shows the status of associated plant objects (assets) based on Plant Explorer hierarchies.

Asset Viewer

The Asset Viewer aspect, when added to an object, allows the Asset Tree to be displayed. Asset Tree severity indicators propagate the most severe condition up the Asset Tree. Indicators distinguish the level of severity using OPC and Asset Monitor severity range (values ranging from 1 to 1,000).

Asset Reporter

The Asset Reporter is a detailed view of all Asset Monitor conditions for an asset. It displays the severity indicator for an object itself. Information available to it from all Asset Monitors and their corresponding current sub-conditions is also displayed. For each condition, the Asset Reporter will provide information about current sub-conditions, severity, Asset Monitor status, and Fault Report availability.

Asset Monitoring

The Asset Monitoring is responsible for retrieving data from and interacting with, multiple data servers, such as real-time data servers, OPC-DA servers, etc., analyzing the data, detecting a problem, and notifying the System 800xA®.

An Asset Monitor is a diagnostic application. It can detect problems that may not affect the process variables, but do affect the maintenance status of an asset or process. The Asset Monitor provides detailed information about the fault conditions and offers correction possibilities.

The broad portfolio of asset monitors in System 800xA® allows you to quickly and easily get started with integrated asset management. The portfolio covers basic functions like valve-stroke count, motor running time, X-Y deviations, flow delta, etc., field instruments (both ABB and 3rd party) like transmitters, control valves, etc., IT network devices, process & equipment monitors like control loop performance, heat exchanger etc. Additionally, you can request asset monitors specific to your needs. Asset Monitoring consists of the following:

- Basic Asset Monitors – Requires licensing for Asset Optimization Asset Monitoring functionality. The Running Time Check Asset Monitor and Counter Check Asset Monitor contain faceplate objects that also require a tag license.

- Process Asset Monitors – Requires specific licensing for Heat Exchanger and Control Loop Asset Monitoring functions. The Basic mode of Control Loop Monitoring requires licensing for Asset Optimization Asset Monitoring functionality. The basic mode provides limited summary diagnosis for each control loop. Heat Exchanger Asset Monitors and Control Loop Asset Monitors contain faceplate objects that also require a tag license.

- IT Asset Monitors – Requires licensing for Asset Optimization Asset Monitoring and PC, Network and Software Monitoring.

- HART Asset Monitors – Requires licensing for Asset Optimization Asset Monitoring and HART Device Management system functionality.

- FOUNDATION Fieldbus Asset Monitors – Requires licensing for Asset Optimization Asset Monitoring and FOUNDATION Fieldbus Device Management system functionality.

- PROFIBUS Asset Monitors – Requires licensing for Asset Optimization Asset Monitoring and PROFIBUS Device Management system functionality.
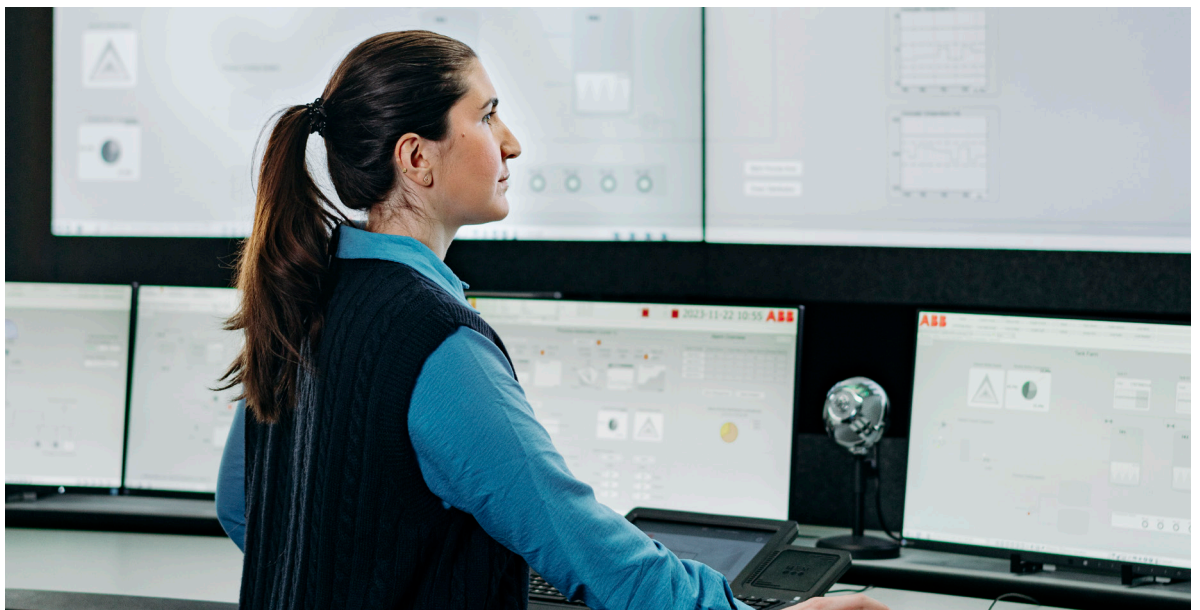
CMMS Integration

CMMS Integration brings maintenance management to the operator environment to give a single-window interface for multiple systems. Context menus on process graphics, the Alarm and Event List, etc. provide access to several views and actions for the specific CMMS item.

This allows plant personnel to collect, compare, and monitor field device data to accurately assess equipment conditions in real time. System 800xA® supports two CMMS; Maximo and SAP/ Plant Maintenance. Only one CMMS integration is supported per 800xA System.

Plant personnel can create work orders in CMMS by submitting the fault report. Details in the fault report are automatically provided by the asset monitor conditions. Plant personnel can view the work order status and maintenance details. The following CMMS Views are supported with both Maximo and SAP integration:

- View Active Work Orders
- View Work Order History
- View Equipment Status
- View Preventive Maintenance Schedule
- The following CMMS View is support only with Maximo integration:
- View Spare Parts

Device Calibration Integration

Calibration Integration is an engineered solution. This solution is based on standard technologies like ODBC, OLEDB, OPC, XML and Web Services. It allows integration between System 800xA® and a variety of third-party calibration systems. The horizontal (breadth of feature) and vertical (depth of feature) level of integration is determined by the openness of the calibration application.

The Calibration Integration solution features the following:

- Access to third-party calibration applications from within System 800xA®
- Mapping between an object in System 800xA® and a device in the calibration system database
- Information exchange such as calibration events between System 800xA® and the calibration system
- Calibration due alarm notification to operator
- Generation of calibration work order

Asset Optimization Reporting

System 800xA® provides two Asset Optimization Report templates. The templates are preconfigured as Microsoft® Excel (.xls) files. The reports require the InformIT – Scheduler function provided by 800xA Information Manager. Reports can be executed automatically according to a certain schedule or on demand. The two reports are described below:

For every asset, Asset Optimization Asset Condition History Report provides a detailed listing of all asset maintenance conditions that have been active over a time interval, and counts the number of faults per condition.

Asset Optimization Asset Condition History Report identifies repeating asset condition offenders and highlights critical assets with high failure rates. This report can be used to define a proactive maintenance strategy.

The Asset Optimization Running Time Report lists all assets in a given structure with a Runtime Asset Monitor. It shows, per asset, the configured runtime limit value, the hours of operation, an indication that the runtime limit is active, and the date of the last Asset Monitor reset.

Furthermore, it calculates the remaining time of operation until the runtime limit is reached based on the current calculated average runtime rate.

System 800xA® – Introduction
Heritage Systems Evolution Support

Providing flexible evolution paths – through seamlessly integrated
controller platforms

ABB's control systems are designed for continuous evolution. It is our goal to protect our customers' intellectual investment; therefore evolution services are available that provide competence and cost effective solutions for evolving the installed base of ABB to ABB Ability™ System 800xA®.

Not only do we provide an active path for all hardware and software, we have continued to invest in developing the libraries and tools that enable our customers to port their control code and graphics directly into the latest System 800xA® controllers and HMI software, at your own pace incrementally, reducing risk and cost while preserving and enhancing your intellectual investment.

Once on the System 800xA® architecture, all of the benefits and functionality of an integration system become available to the user, regardless of controller platform.

Lifecycle Status
The Heritage System product lines follow the Lifecycle Policy defined for ABB control systems, meaning that the support for system products remain until a functional heritage, or better, product is available. Lifecycle planning is an important process and tools are available to support this planning.

ABB's Lifecycle policy is unique in the industry, and provides incredible value and peace of mind to our customers.

Lifecycle Support and Services
To further decrease the lifetime maintenance cost a large number of products and services are available to our Heritage customers. Lifecycle support is defined by a Lifecycle Policy and installations can be economically maintained using the Automation Software Maintenance control system Lifecycle program.

For all our Heritage Systems this program provides an increasing number of capabilities and support for the installed base through the regional Service Centers.

• Reuse of process graphics
• Reuse of control applications
• Reuse of history log data
• Spare part, repair and preventive maintenance kits
• Site analysis and fingerprints
• Support for extended lifecycle based on site analysis
• Minimal loss in production
• Protection of intellectual assets
• Lower project costs

800xA for Freelance
800xA for Freelance is subject to a separate release. Contact the ABB Technical Support for more detailed information. Refer to System Updates for prerequisites and requirements.

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Evolution for Advant Master Products

—
01 AC 450 rack

Covering 800xA for Advant Master, 800xA for Safeguard and 800xA for AC 100
Since the introduction of the earliest versions of System 800xA®, evolution has been a vital part of the roadmap for the Advant Master product line. Starting in the beginning of the 21st century, the integration package to the Advant Controller 400 Series was developed as a "Connect" between System 800xA® and the control network. Integration was introduced for controllers on the Master-Bus 300 (MB300) as well as for controllers on the Advant Fieldbus 100 (AF100) network.

Today System 800xA® is used in more than 1800 Advant Master installations worldwide.

Evolution for Advant Master has developed over time and today comprise also peer-to-peer communication for both MasterBus 300 and Advant Fieldbus 100 using specific communication modules for the System 800xA® controller AC 800M. The AC 800M controller also include connectivity to installed I/O systems providing the possibility for instant switch over using existing field and I/O wiring.

Current portfolio of products for Advant Master customers contains a mix of System 800xA® and Advant products.

- Operations, Information Management, Asset Optimization and Batch as part of System 800xA®
- Console integration to Advant Master control networks using 800xA for Advant Master, 800xA for Safeguard, 800xA for AC 100 and AC100 OPC Server for 3rd party clients
- AC 800M, Advant Controller 450, Advant Controller 160 and Safeguard 400 controllers
- S800, S100 and S600 I/O systems
- Control Builder A with On-line Builder for Advant Master engineering

Operations, Information Management and Asset Optimization
The Advant Master system is integrated into System 800xA® using the 800xA for Advant Master, 800xA for Safeguard and 800xA for AC 100 integration packages. It supports full integration with System 800xA® features and components such as Batch management, Information Manage-

ment, and Asset Optimization along with leveraging the Aspect technology available in the System 800xA® environment. Standard software and hardware interfaces are used to provide a connection into the Advant Master system for view and control. Predefined graphic elements, object displays and faceplates are provided for all the controllers' standard process objects.

800xA for Advant Master may be deployed in parallel with existing Advant Master system installations. Phased introductions of 800xA for Advant Master to existing customers will allow the customer to begin leveraging System 800xA® benefits immediately. 800xA for Advant Master provides the Advant Master installed base the continued evolution of technology, while retaining existing control philosophy.

Key benefits of utilizing Advant Master integration to System 800xA®:
- Complete infrastructure may be retained
- Upgrade can be on a step-by-step basis
- Parallel Advant and 800xA workplaces, enabling minimum downtime
- System 800xA® extended automation

Main features of Advant Master integration to 800xA:
- Faceplates, object displays and graphic elements with Advant look and feel
- Alarm and Event and Trend presentation
- TTD log and configuration support
- Status list and System status
- Drives and Switchgear Integration
- Central Backup function

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02

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03

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02
19" external RTA
unit PU410

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03
Baseplate for S400 I/O
Evolution to S800 I/O

Engineering

Advant Master engineering tools Control Builder A with On-line Builder can be run in the 800xA client nodes using an RTA hardware unit in any of the 800xA Connectivity Servers as well as using a dedicated RTA unit installed in the 800xA Engineering Workplace or as a separate Advant Engineering Station.

Key benefits using latest version of Control Builder A:

- Minimal PC hardware cost with support for 19" RTA unit PU410
- Virtualization support
- Reduced start-up effort with single button install
- Licensing system harmonized with 800xA
- Single DVD media including additional tools and libraries
- Revitalized for extended lifecycle

Control Builder A Version 1.4 main features:
- Support for Windows Server 2016, 2019 and 2022 all Standard/Datacenter
- Support for Windows 10 (IoT) Enterprise 2016 LTSB, LTSC 2019 and LTSC 2021.
- Administration of nodes, Circuits and Type Circuits simplifying project startup and reuse
- Off-line editing with powerful cut/copy/paste
- On-line editing for rapid program modifications
- Target system control for easy testing of installed system
- Module diagnosis
- Expert Utilities with additional On-line Builder commands for extended fault tracing

Control, I/O and communication

An Advant Master system with 800xA can benefit from a various and increasing number of evolution products. There are efficient evolution programs from both Advant Controller 450 and

Advant Controller 160 primarily to the AC 800M controller, which can also be used to evolve from obsolete ASEA/ABB Master products. In an 800xA system the Advant Master controllers can be integrated alongside AC 800M controllers realized with purpose made communication interfaces to AC 800M.

Existing Advant Master I/O system can be integrated with low effort reusing existing I/O installations, including terminations and field wiring. With 800xA version 6.2 the S100 I/O FCI hardware (CI846/TU866) will be supported to connect existing I/O, also in redundant configuration, to the AC 800M Profinet master, the CI871.

Lifecycle Support and Services

To further decrease the lifetime maintenance cost a large number of products and services are available. Lifecycle support is defined by a Lifecycle Policy and installations can be economically maintained using the Automation Software Maintenance lifecycle program. For Advant Master this program provides an increasing number of offerings and support for the installed base through the regional Service Centers.

- Reuse of process graphics
- Reuse of control applications based on ABB Master Programming Language (AMPL)
- Reuse of history log data
- Spare part, repair and preventive maintenance kits
- Site analysis and fingerprints
- Support for extended lifecycle based on site analysis

Details about ABB's Lifecycle Policy for distributed control systems can be found here: **https://new.abb.com/control-systems/service/offerings/service-agreements**

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Evolution for Symphony Plus Harmony (includes Symphony SD-series)

800xA for Symphony Plus Harmony is the integration of the Symphony Plus / Symphony Harmony / INFI 90 control system into ABB Ability™ System 800xA®. It supports full integration with System 800xA® features and components such as Batch management, Information Management, and Asset Optimization along with leveraging the Aspect technology available in the System 800xA® environment. 800xA for Harmony uses standard software and hardware interfaces to provide a connection into the Harmony system for view and control.

Other features include: redundancy, flexible installation options, and high tag count support.

800xA for Harmony may be deployed in parallel with existing Harmony system installations. Phased introductions of 800xA for Harmony to existing customers will allow the customer to begin leveraging System 800xA® benefits immediately. The phased approach should be considered equally to a complete replacement of the current OCS HMI installation.

800xA for Symphony Plus Harmony provides the Symphony Plus / Symphony Harmony / INFI 90 installed base the continued evolution of technology, while retaining existing control logic and application.

Features
The set of 800xA for Harmony features and functions included that are specific to Harmony users are listed below:
• Advanced Harmony Control System Monitoring
• Enables Harmony control network monitors for diagnostic monitoring, reporting, and analysis
• Expanded mixed system support of 800xA for Harmony with other System 800xA® connects
• Harmony Batch integration
• Harmony Uploader Aspect – utility for upload and download of tag data from the S+ Engineering Composer database and/or other 800xA for Symphony Plus Harmony systems
• Harmony System Diagnostic Displays
• Thin Client views of module/block/communication module details, loop/node topology, event counters, resetable event counters, etc.
• Harmony tag types faceplates, point displays, and select Web Aspects (Operating Parameters)
• Hot key support for Harmony tag objects
• PN800, InfiNet, and Plant Loop support
• SOE (Sequence Of Events) reporting
• WEB-based Server Explorer – provides viewing of Harmony Server status and quality

• Multisystem Integration – several 800xA Systems can be operated from a central location
• Support for Alarm Shelving function
• Support for Alarm Hiding function
• Support for Point of Control function

Engineering Workflow
The engineering work-flow begins in S+ Engineering for Harmony (Composer Harmony) and ends in the 800xA Aspect Server and the Harmony Control System. S+ Engineering supports configuring and editing of the project tag database and associated lists for Harmony (tag databases, engineering units, alarm comments, and logic state descriptors). These Composer-based files are directly usable in the 800xA Aspect Directory after being imported using the Harmony Up-loader.

The following can be configured in the Composer project: area, unit, and equipment structures (these will be maintained in the Functional Structure of System 800xA®). Other Composer console data such as Historian servers, group and trend displays are not usable in 800xA for Harmony.

Control, I/O and communication
Full and continued support of all available Harmony Modules (Controllers), I/O, and Communication Interfaces are available throughout your upgrade into System 800xA®. This includes full support of the latest InfiNet interface. IET800, the latest S+ (Symphony Plus / Symphony Harmony) hardware such as the PN800 control network, the HPC800 Control module, and the SPIEB800 bridge that links InfiNet loops to systems on the PN800.

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Evolution for Melody

800xA for Melody provides the following services:

• Object types for all Melody process objects.
• Configuration tools for editing the Melody process objects.
• Support for system status display monitoring.
• 800xA for Melody supports server redundancy as well as network redundancy.

Description
Many features that Melody users are accustomed to having and others that are new for Melody users are available through use of this interface. These include:

• Process graphics with navigation buttons for access to other displays, dynamic representations of multi state devices including indication of alarm states and data quality, and direct call up of faceplates to take control of devices.
• Alarm lists filtered and sorted on various criteria including alarm priority and alarm categories.
• Trend displays with zoom, pan, data at a given ruler selection, X-Y plots, pen color adjustments, and one click trace hiding.
• Security based on user profiles.
• Configurable alarm banner that can remain in view at all times with support for group and sequence alarm bars.
• WAV file annunciation.
• System status display.
• Alarm inhibit.
• Redundant data server connection with automatic reconnection by client workplaces to an operational server.

Engineering
The engineering workflow always starts in S+ Engineering for Melody (Composer Melody) and ends up in 800xA Operator Workplace and the control system. Composer supports bulk data actions and import of data reflecting the basic engineering like tag imports, signal lists, channel assignments and management of typicals to create instances of function charts by list based engineering.

Engineering activities in 800xA Operator Workplace colliding with AC 870P/Melody business rules in means of consistency and integrity will be rejected. The life cycle of a Melody object starts and ends in Composer.

Aspects hosted by other than Melody Aspect Systems might extend Melody objects. When commissioning functionality that has been planned in Composer the 800xA Operator Workplace relevant information will be generated by Composer and automatically uploaded into 800xA Operator Workplace. Versioning of data is done according to the AC 870P/Melody life cycle model.

800xA Batch Integration
800xA for Melody supports integration with 800xA Batch management. It is a natural evolution path for the Maestro UX – SymBatch product. There is no need to modify the controller or control application when migrating from SymBatch to 800xA Batch management.

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Evolution for MOD 300

800xA for MOD 300 enables Advant MOD 300 installations to easily and efficiently draw benefits from the information integration delivered by the 800xA System.

800xA for MOD 300 uses the Operator Workplace for direct and fast access to MOD 300 specific functions. These functions include: preconfigured displays for monitoring and control of the MOD 300 system using familiar CCF, TCL, TLL, environment and system displays and faceplates.

Extended Automation Functions
The following extended automation operations functions are available for 800xA for MOD 300:
- Workplace Setup
- Single and Multiple Screen Setups
- Reports
- Log-over
- Audit Trail
- Digital Signature
- Multisystem Integration
- Server Node Virtualization

The following information summarizes the related 800xA for MOD 300 system functionality and integration.

Controller Integration
800xA for MOD 300 provides the integration between System 800xA® and MOD 300 control network (DCN or eDCN).
- AC 460
- AC 410
- MOD 300 Controller Subsystem (SC Controllers and Model B)
- MOD 300 Multibus

Configurable Control Functions
The CCF runtime support displays are:
- Loop Detail
- Loop Faceplate
- Loop FCM
- Loop Template
- Area Displays (Alarm, Status, and Graphic)
- Group Displays (Trend, Alarm, Status, and Graphic)

MOD 300 "traditional" Displays
Monitoring and control functions are provided in the same "traditional Group and Area" displays familiar to MOD users. This includes the Group Status and Group Trend displays, Group Alarm, Area Alarm and Area Status.

Predefined MOD 300 Objects for 800xA
Predefined object displays and faceplates are included in 800xA for MOD 300.

Taylor Control Language (TCL)
All necessary TCL displays that support monitoring and control functions for TCL are included.

Taylor Ladder Logic (TLL)
TLL displays are used to monitor TLL segments and data structures. All necessary TLL displays that support monitoring and control functions for TLL are included.

I/O Displays
I/O displays contain information that allow you to identify detectable fault conditions, monitor general status and performance, change process outputs directly for testing, and control the status of redundancy. The I/O displays include:
- S800
- S100
- PROFIBUS
- TRIO (SC and AC only)
- Direct I/O (Model B and SC only)

Report and History Services Interfaces for Information Management
Provide the means to:
- STARTBATCH…ENDBATCH: Create a batch file where data for a specific batch is recorded.
- TRENDON…TRENDOFF: Mark the start and end of data collection.
- RECORD Reports: Record the current value of a local variable or parameter to Reports (PDL Interface).
- REPORT: Allows TCL to schedule reports through the 800xA System Scheduler.

Engineering Support
- MOD Tag importer – Used to populate the Control Structure with object configuration using AdvaBuild information.
- MOD Environment importer – Used to populate the Environment Structure using text file created from Environment Builder of MOD 300 CDP.
- MOD Phase Importer – Use information from the MOD 300 Database to populate the Control Structure with MOD phase objects as a child of the MOD Unit.

800xA Batch Integration
800xA for MOD 300 supports integration with 800xA Batch management. Batch management can supervise the execution of MOD 300 Phase sequences.

System 800xA®
Connectivity to third-party controllers

Evolve any plant. Become more successful
A newly-acquired automation system offers the best set of solutions to help your business be successful and stay competitive. That may no longer be the case. Now the risk of unplanned downtime is always present. Lengthy production stops cannot be ruled out. What's more, production gains via mere process control improvements are no longer enough to ensure peace of mind. The real answer lies in evolution of your installation.

Evolve third-party installations
Evolution solutions within ABB help you attain a state-of-the-art control system that seamlessly integrates all your business processes as well. This is true for ABB systems, but also for other, third-party, systems.

ABB Ability™ System 800xA® provides the possibility of integrating the control layer of many DCS systems on the market today. This integration provides not only the possibility to transfer data.

In 800xA terms, this would not even be called integration, just 'connectivity'. Integrating a

third-party controller means the object data from it can be displayed on the process graphic, together with data that comes from controllers, ABB or other. It also means alarms and events end up on the same lists as with any ABB Controller, and it means that face plates for the objects residing in those third-party controllers can be called up and the object controlled from them in the same way and with the same look and feel as if it was an ABB Controller.

Most importantly, a well-conceived evolution strategy protects the major hardware, software and intellectual property investments made when you purchased your current automation system.

You can conveniently modernize the operator environment. Once done, you have the entry point to extend the plant with the full 800xA range of functions and features.

Contact ABB for detailed information about which third-party controllers can be integrated.

System 800xA®
Connectivity to third-party PLCs

PLC Connect integrates ABB and third-party controllers with System 800xA®
PLC Connect is a connectivity option for ABB's System 800xA®. It tightly integrates all ABB and third-party controllers, PLCs and RTUs with the 800xA system, and provides typical DCS and PLC functionality in the same integrated system. PLC Connect enables the remote connection of controllers and PLCs in single as well as in redundant systems.

Uniform integration of different PLCs
PLC Connect integrates individual signals in any connected controller, PLC or RTU with the 800xA system. The operator receives process data in the same graphics regardless of the type of controller or the communication protocol used.

Objects and object types
PLC Connect provides a set of basic object types for PLC signals, as well as configuration tools for creating and editing PLC objects and a set of faceplate templates for PLC objects.

Real-time database (RTDB)
All dynamic process data from connected controllers, PLCs and RTUs is stored in a real-time database. Current values and status are always available and constantly updated, so there is no need to wait for the OPC server to set up subscriptions – values are available directly. A browser interface in third-party OPC servers is not required.

Communication
PLC Connect has a built-in communication server for traditional PLC and RTU protocols, including Modbus RTU, Comli, SattBus, SattBus-TCP/IP and a built-in OPC DA client. PLC Connect includes a dial manager for remote communication with PLCs. Dialed communication with controllers supports Modbus RTU or Comli protocols and includes scheduled dialing and local time stamping of dial-ins, plus local storage of historical data.

Alarm handling
Alarms are generated in PLC Connect when a polled boolean variable from the controller changes state or when a polled analog value passes an alarm limit. The alarms can be time-stamped in the connected PLC.

Open interfaces
A number of open interfaces are available in PLC Connect for access by external applications. Real-time access for reading and writing process values is available through COM Methods. Application-specific pre-treatment calculations can be added for received process values as well as detected alarms and events.

PLC Connect includes a COM interface for integrating an application that is to be executed on an event, an OLE DB provider for accessing logged events and alarms, and a COM interface for initiating and disconnecting calls handled by the dial manager for dialed communication with PLCs.

Engineering
The PLC Connect configuration aspect is used from the 800xA system Plant Explorer to create, organize and edit PLC-type objects in 800xA. Bulk Data Manager in Engineering Workplace can be used to create these objects in an efficient way for large applications. Engineering can be performed online or offline.

AC500 Connect
AC500 Connect for ABB Ability™ System 800xA® provides a set of purpose-built process object types for monitoring and control purpose for typical hybrid applications like Water & wastewater, District Heating, Building automation, Solar etc.

This enables the cost-efficient deployment of AC500 PLC hardware for process automation applications benefitting engineers and operators with full DCS experience and features.

AC500 Connect uses PLC Connect to establish the OPC Connectivity with the AC500 PLC.

OPC UA Connect
The supported OPC UA standard is version 1.04. Secure communication is supported using X509 application certificates.

OPC UA Connect does not contain any ready-made libraries; but all needed object types are automatically uploaded from the server.

System 800xA®
Engineering

Overview

System 800xA® Engineering provides real-time information integration for better and faster access. Working within a common engineering environment, 800xA Engineering supports a consistent information flow from design, through installation and commissioning, to operation and maintenance. It lays the foundation for continuous improvements in lifecycle and operational dimensions of information flow, resulting in efficient engineering and enhanced productivity.

800xA Engineering features:
- Engineering Workplace as a fully-integrated engineering environment for development and reuse of system standards, such as incorporating control logic, operator displays, field devices, asset monitoring and maintenance support.
- Risk mitigation control optimization through impact analysis and user-controlled download by the Load Evaluate Go option.
- Automatic configuration of Control, Graphics, Alarms, History etc, by direct connection to CAE data.

One workplace

The Engineering Workplace is a single workplace for all engineering tasks. For example:
- Graphic display configuration
- Control application design
- Safety application design
- Control system configuration
- Field device and instrumentation configuration
- Control system and field device maintenance
- Trend and history configuration
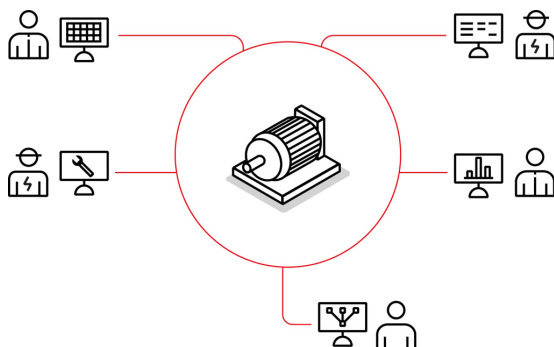
Information at your fingertip

Through the use of patented Aspect Object technology, System 800xA® provides tight integration of plant devices and applications. System 800xA®'s platform provides a common portal to all system information required to install, operate, and maintain the system.

800xA Engineering, coupled with this tightly-integrated environment, is designed to facilitate one-time data entry for all areas within the automation system, from field devices to asset optimization, while ensuring built-in data consistency.

Providing a single source of accurate and real-time plant information results in maximum engineering performance, quality, and reliability. This integrated environment means fewer startup delays, reduced maintenance costs, and more effective engineering practices.

Easy navigation and consistent data

The single, intuitive user workplace brings together all plant information, allowing:
- Easy navigation via context menus
- One-time data entry
- A single source of accurate and current plant information
- Maximum engineering performance
- Better quality
- High reliability

Engineering benefits:
- **Optimized project execution cost by improved engineering efficiency**
- **Higher quality of delivered systems**
- **Improved user experience**
- **Lower support needs**
- **Online training, resulting in reduced training cost and ramp-up time of new engineers**
- **Future product developments focused on improving the main engineering workflow.**

System 800xA®
xStream Engineering

Introduction

System 800xA® Engineering provides real-time information integration for better and faster access. Working within a common engineering environment, 800xA Engineering supports a consistent information flow from design, through installation and commissioning, to operation and maintenance. It lays the foundation for continuous improvements in lifecycle and operation dimensions of information flow, resulting in efficient engineering and enhanced productivity.

Overview

ABB's xStream Engineering methodology is so named for the enabling of project teams to perform multiple ("x") tasks simultaneously in parallel work "streams." Representative of this concept is the System 800xA®'s Ethernet I/O Wizard which can be used in the field to configure and functionally check Select I/O prior to—and independent of—delivery of the application.
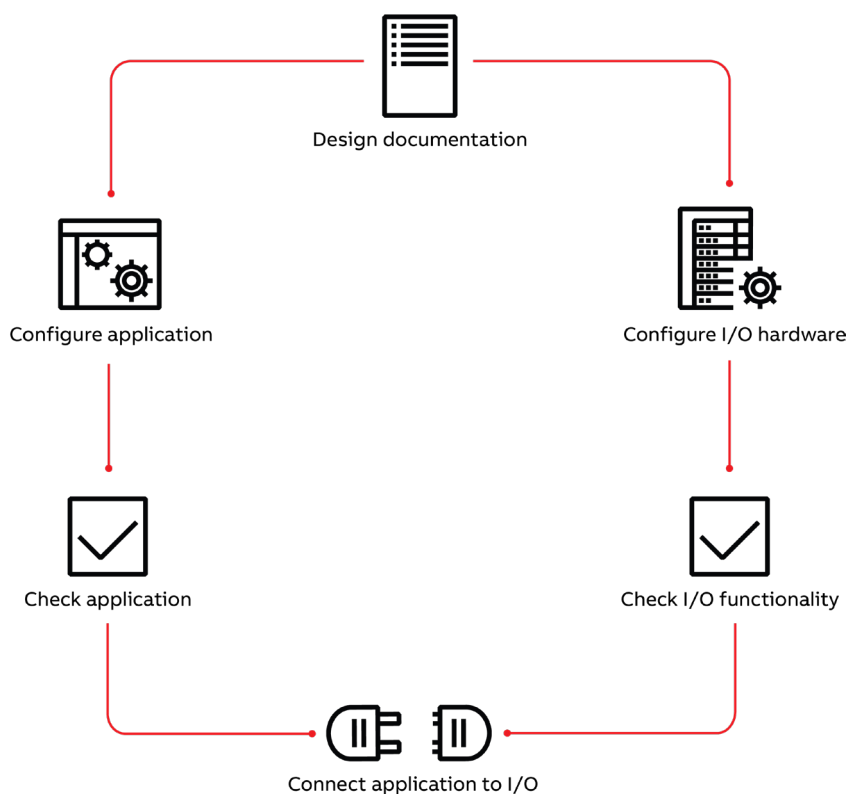
AN XSTREAM ENGINEERING EXAMPLE: CONFIGURE, CHECK, CONNECT

To illustrate how this works, think of two simple work streams. One is the field work that can be done while the application work is being done in another location. In the field, the I/O cabinets can be delivered early in the project and later, just before commissioning occurs:

- **Configure:** On a particular cluster of Select I/O, the Select I/O Module base is populated with the Signal Conditioning Modules (SCMs) that match each channel's I/O type. The technician then connects his mobile device (laptop or tablet with System 800xA® configuration tools) to the Ethernet I/O Field Communications Interface (FCI). The Select I/O is automatically scanned, and that information combined with data from the I/O signal list as well as information contained in any HART devices that are present. A test configuration is automatically created based on the I/O type detected to help in doing functional loop checks.

- **Check:** With the I/O configured and a test configuration running, smart and non-smart field equipment can be functionally checked in the field even as application engineering continues along a separate path and in a different location. Using System 800xA®'s Extended Automation features such as Documentation Manager, field testing and verification documentation is created and stored.

- **Connect:** Once functionality is checked, the established I/O structure can be imported into the master production system that contains the application code. Since they both have been configured using the same unique signal names, the software and hardware are digitally marshalled automatically—no mapping required. The full system—hardware and software— is now ready for final commissioning.

Design documentation

Configure application

Configure I/O hardware

Check application

Check I/O functionality

Connect application to I/O

Engineering for process engineers

Function Designer

Function Designer is a graphical control application engineering tool designed for process engineers. It is intended for engineers desiring a functional approach of the control logic in line with the process graphics and all other aspects of a certain process section. It does not require software programming expertise and is intuitive to engineers in the plant design as well as in the maintenance phase.

Function Designer Configuration Scope
- Logic and control blocks as Functions, Function Blocks and Control Modules for AC 800M
- Sequences with Steps, Transitions and Actions
- I/O Signals representing configuration of devices and hardware channels
- Variables with automatic cross-referencing
- Automatically generated page connectors
- Graphical elements as text boxes and shapes

Powerful cross-referencing and navigation
- Connections between blocks on different pages automatically create page connectors with reference texts so that engineers can navigate between the pages using cursor keys.
- Variable cross-references between diagrams are built up in the background letting users navigate via double-click or selection if more than one reference is available.
- Aspect Objects provide the Engineering Workplace's context menu that can be used to navigate to all aspects of such objects, e.g., Faceplate, Trend, Event / Alarm list.
- I/O Signals hold the configuration of the connected I/O or device channel, show the hardware reference, and allow navigation to the configuration and maintenance dialogs, especially FDT/DTM for device maintenance.

IEC 61131-3 engineering

Control Builder is a powerful tool for creating control and safety solutions including reusable control libraries for the AC 800M controller. It is also used for the hardware configuration. Everything is done in a Windows-based environment, offering a wide range of control functionality for ABB's industrial controller AC 800M. It supports all five programming 'languages' according to IEC 61131-3.

Supported programming languages are:
- Instruction List
- Structured Text
- Function Block Diagram
- Sequential Function Chart
- Ladder Diagram

Object oriented engineering

Control Modules are available for scenarios where the plant design is driven by highly repetitive units. With Control Modules, user-defined types covering a unit like a reactor can be designed and efficiently parameterized and instantiated multiple times.

Control Diagram Editor is a graphical control application engineering tool. It combines the power of IEC 61131-3 languages with innovative and easy to use, user interaction design.

Control Builder also provides editors for object oriented control solutions with Control Modules. It's also possible to combine Structured text, Function Block Diagram and SFC together with Control Modules within Control Diagrams. It combines the power of IEC 61131 languages with innovative and easy to use, user interaction design.

Supported editors are:
- Control Module Diagram Editor
- Control Diagram Editor

Communication variables

Communication variables are available to simplify control application design and to reduce engineering effort. Once declared, those variables can be used in any controller in the system. Communication is automatically built up in the AC 800M compiler.

Test and debug

Beside the availability to execute the control application in a virtual 'Soft Controller' for test and debug, Control Builder offers a set of features for on-line testing, tuning and simulation:
- Status inspection: The status of I/O signals, variables, etc. can be inspected on-line. No manual tagging is required.
- Force: I/O signals can be selected and forced to a chosen state.
- Overwrite: All variables can be overwritten on a single-cycle basis, after which the program takes over again.
- Tasks: Single-scan executions can be selected in the Task Properties window.

Bulk data management

The ability to efficiently manage large amounts of data is a crucial part of any automation system. The 800xA system meets these requirements through a tight integration with Microsoft® Excel. Via a series of Excel add-ins, bulk data management features couple the full productivity benefits of Microsoft® Excel with System 800xA®.

Audit trail and electronic signature

Audit trail events are generated for all changes made during the synchronization process. System 800xA® provides complete audit trail and electronic signature support for those industries that require regulatory compliance.

Documenttation and difference report

Configuration records can be created by printing or by exporting configuration in 'Afw' files. Such files can be archived in configuration management systems and compared to the current system configuration. 800xA difference reports shows differences in configuration, especially for control applications, system configurations and process graphics.

Library and recipes versions

With the 800xA system, users are able to create their own library of user-defined blocks and elements. These libraries need to be maintained throughout the complete lifecycle of the installation. Configuration Management on Libraries is built into the system and supports features such as lifecycle (design, closed, released) and the capacity to have multiple versions online available in the system.
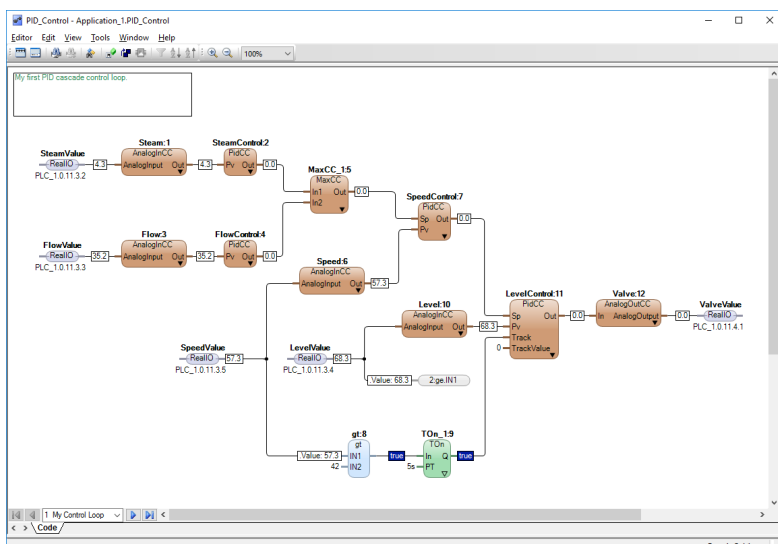
Distributed engineering

In order to work in a globally-distributed environment or to test and debug configuration changes, users can work in independent engineering systems. Such systems allow testing and debugging of configuration changes in a 'sandbox' prior to the deployment of such changes in a running control system.

Configuration Management

Within an automation system, changes to configurations must be carefully controlled to ensure all modifications are traceable; who has changed what, when and where.

If a history of configuration changes is required, the Application Change management can be added to the system. That will enable to save versions of changes the Configuration history Server, such as updated graphic displays, changed templates, updated control logic, edited libraries and so forth.

Application changes with minimal risk

The enhanced online download capability (Load-Evaluate-Go) allows users to evaluate modified AC 800M control application versions without interfering with running application versions.

A modified version of an application can be downloaded to the controller and will be executed passively. The user can evaluate the differences in output variables and alarm conditions prior toggling the active status between the two ver-

sions of the application. Once the application code optimization is proven to guarantee smooth activation the evaluation can be finalized and the session can be closed.

The evaluation tools is designed to be used for control application code optimization during plant uptime. It can be used complementary to simulation and test systems as it focuses on indicating potential changes in output variables at download. Test and simulations systems have a difference focus.

This function provides the following benefits:
- Reduced risk at application changes in continuous processes
- Reduced risk of creating process bumps at download
- Reduced risk of applying erroneous application changes to the process when in production

Ethernet I/O Field-Kit

ABB Ability™ System 800xA®'s Ethernet I/O Field Kit revolutionizes project execution by allowing users to configure and test I/O in the field without control software or process controller hardware. With reduction of man-hours up tp 90% when using automated loop checks.

Nodes with Ethernet I/O Field-Kit function can be run in a single node configuration. In this scenario the Field-Kit node can run the engineering tools needed for configuration and commissioning of Ethernet I/O stations and Smart Devices as well as virtual controller and HMI. An easy to use xStream commissioning app leads technicians through the process of I/O configuration, smart field device configuration and loop check.

The app also integrates data from signal lists, automatically detected I/O and field devices with already configured data. Test results are reported and in pdf files as well as spreadsheets in order to document the commissioning progress.

Engineers can use the same node to optimize the configuration of the I/O station as well as the HART field devices or to perform diagnostic tasks. Field-Kit nodes used in the context of multi node systems allow to configure and test I/O stations and connected HART field devices from a central location.

Easy to use

Outfitted with the Ethernet I/O Field Kit software on a laptop or tablet, and with no experience of System 800xA®, instrument technicians can now configure and commission smart junction boxes (SJBs) that utilize S800 on Ethernet and Select I/O.

System 800xA®
Application Libraries
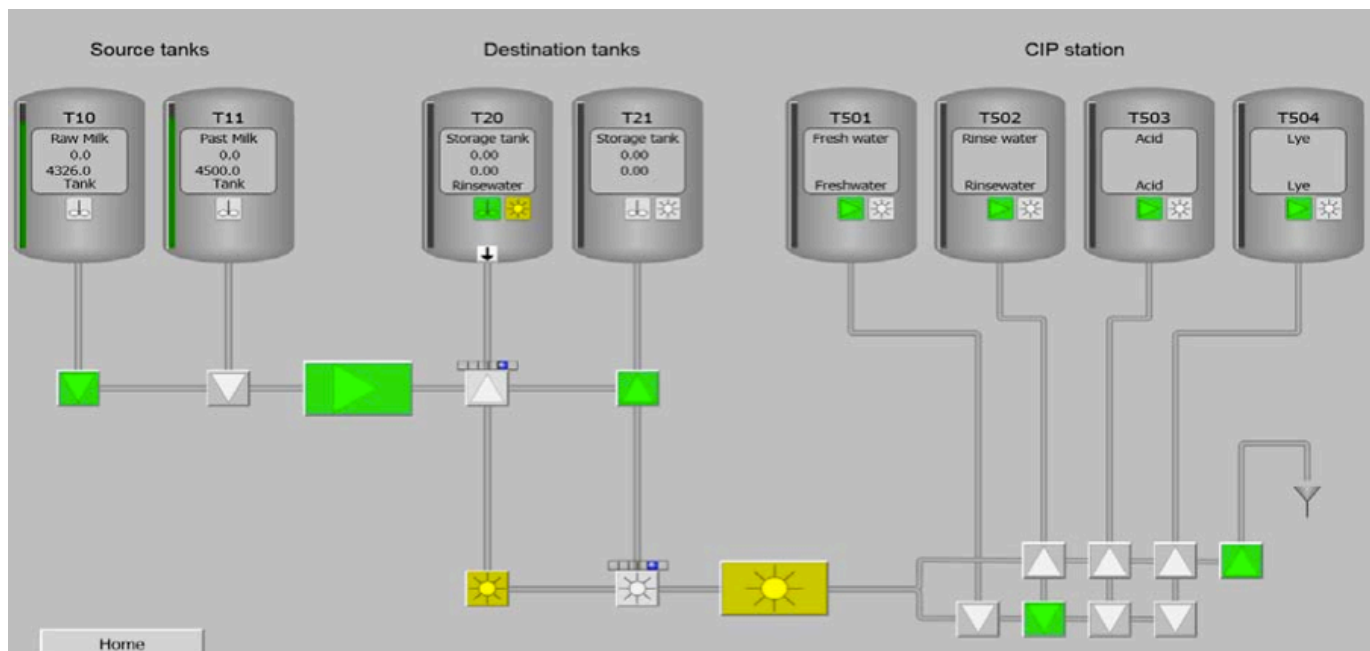
Process Control Device Library

Process Control Device Library (PCDeviceLib/ PCDL) is a comprehensive and proven-in-use application library for System 800xA®. Part of a broad family of 800xA standard libraries, PC-DeviceLib reduces overall project engineering and testing time by providing pre-built configurable control modules, faceplates, graphic display elements, alarm lists and other special aspects for the standard device objects like Valves, Motors, PID Controllers, etc. found in most process industries.

Using PCDeviceLib, automation engineers can create complex control applications and group control sequences simply and efficiently, while engineering to internationally recognized standards.

PCDeviceLib completely automates the customization of faceplates and graphic display elements to match the configured options within the control logic. This ensures consistency of the information displayed to operators while greatly reducing engineering and testing time.

The system searches an application and then automatically builds the dynamic display elements to provide real-time root-cause analysis of trip and interlock conditions, both from the initiating 'cause' and to the 'effect' on the devices. In addition, the Drives, MCCs and Group Control sequence dynamic displays are automatically built. ABB's unique Aspect Objects technology makes this possible.

Controller code is written in IEC 61131-3 Structured Text in a System 800xA® Control Builder control module type. The faceplates are context sensitive; they only show the functionality that is configured. The graphic display elements are ISA style and show the status of the device and whether alarms are active, inhibits are in use, etc. in accordance with EEMUA recommendations.

Each device has operational modes such as auto, manual, group, local and test mode. Additional asset information such as running time, number of starts and current for motors, valve stroke times, etc. is calculated.

Process Control Equipment Library
Process Control Equipment Library (PCEquipmentLib) is a comprehensive application library of generic Phases, Unit and Equipment Module templates, together with a toolkit of components for the Extended Automation System 800xA.

Part of a broad family of System 800xA® libraries, PC-EquipmentLib is designed to optimize the specification and building of Batch Applications utilizing ISA 88 style Equipment Modules and customized Process Units.

Generic phases enable new products to be introduced by developing new recipes only, thus minimizing the scope and complexity of testing. Designed to 'plug-and-produce' with standard PCDeviceLib control objects, PCEquipmentLib shares common terminology, engineering principles, and naming conventions.

This ensures consistency of information displayed to operators while greatly reducing engineering and testing time. PCEquipmentLib also includes Facility Automation functions like Air Handlers, Chillers, Zone Monitoring, Schedulers, Enthalpy Calculation, etc.

Equipment Modules provide a high level of re-use and consistency in control design. Encapsulating devices into Equipment Modules makes the reuse of complex packages of device control simple, accurate and repeatable.

Equipment Modules combine one or more control devices into a common function such as ramp/hold temperature, pull/release vacuum, agitate, add medium, etc.

Philosophy of the approach

Recipie

These in turn can be used across several units to provide a high degree of re-use, ensure operating consistency through the plant, and reduce engineering and testing efforts.

Process Units are configured from PCEquipmentLib templates to represent the physical plant units. These comprise multiple Equipment Modules, associated process measurements and applicable process Phases. The units include the state model for handling process upsets and control device physical errors. They also provide a feature for monitoring quality critical process values.

PCEquipmentLib provides a library of generic Phases that require no code construction, no testing, and no validation. The set of generic Phases was selected to maximize re-use. Parameters define the actions to be taken by a phase to achieve a process action. All generic Phases are available to Operations under Batch Recipe control, and can be supervised by an operator from the Phase faceplate under manual control.

Probase Library
ProBase (Processing Solutions Base Package) is a complete automation solution for System 800xA®. It can be used in any process where products are transported and/or stored or processed in tanks and lines, e.g. in chemical and pharmaceutical plants, tank farms, dairies, breweries, mills,
fodder, powder manufacturing plants, etc.

ProBase includes functionality for advanced product transfer between process units like tanks and lines. Product transfer, called routing, includes all functionality for alarm handling and alarm propagation between different units, queue handling for online production changes, control and supervision of process objects, interlocks and transfer of product, and equipment settings like product codes, unit names and unit states.

ProBase contains all required functionality to handle CIP for industries like dairy and brewery. It includes CIP recipe handling and template objects for CIP lines, CIP circuits and CIP objects.
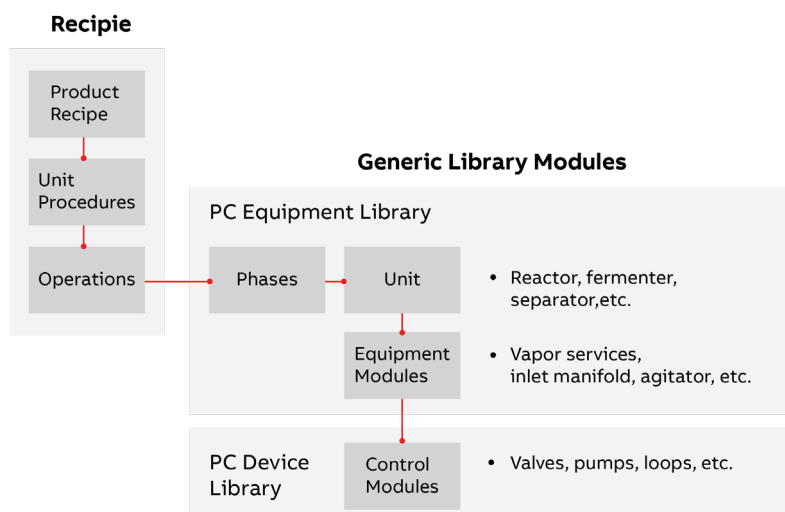
System 800xA®
High Integrity

System 800xA® offers a complete SIS (Safety Instrumented System) solution, complying with the IEC 61508 and IEC 61511 standards and covering not only the 'logic solver' but the entire safety loop, consisting of SIL-rated field instruments, controllers and I/O modules, valve positioners, and actuators. Highly scalable, System 800xA® SIS solutions provide the flexibility to match specific safety functions with actual plant needs.

System 800xA® High Integrity controllers and I/O are highly modular, offering many interconnection options and making them suitable for all safety and business-critical process automation applications, from small to large and single to redundant. Redundant solutions for CPU and I/O will increase the availability.

System 800xA® High Integrity features include:
• Qualified and certified
• Flexible integration
• Common engineering tools
• Extensive set of SIL-certified Library objects
• Access management

Qualified and certified
The AC 800M HI controller is qualified and certified by the German TÜV Süd for use in industrial safety applications. It is compliant with SIL 1-3 requirements in IEC 61508 second edition.

Flexible integration
System 800xA® High Integrity allows the safety system designer to choose the degree of integration appropriate for a specific application and control philosophy. 800xA High Integrity can be deployed as a fully-segregated solution, integrated at the same plant network level as the process automation, integrated into the process control system but using dedicated safety controllers on the same control level network, or fully integrated with both process control and safety automation executed simultaneously within the same controller hardware.

Common engineering tools
AC 800M HI controller is supported by 800xA common engineering tools, human system

interface, historian, audit trail, asset and device management applications, and instruments, thereby improving the overall integrity and reliability of Basic Process Control Systems (BPCS) and Safety Instrumented Systems (SIS) operations. For instance, selecting the SIL level activates the relevant restrictions and limitations, such as only SIL marked elements being allowed to be used in SIL applications. Such an environment offers safe, instant, interaction between applications, which leads to a host of benefits from easier handling, through better technical solutions, to lower costs.

Users can choose between three IEC 61131-3 languages; Function Block Diagram, Text, and Sequential Function Chart.

In addition, the easy to use Diagram Editor is allowed to be used up to SIL3. Diagram is a graphical language that graphically interconnects functions, function blocks, control modules and embedded Structured Text and Sequential Function Chart code blocks on the same page.

Inter Application Communication (IAC), uses Communication Variables for cyclic and reliable peer-to-peer communication up to SIL3. These variables can exist in the same application, same controller, or different controllers in the network. It is easy to set up inter application communication between different SIL, even from lower to higher SIL.

Extensive set of SIL-certified Library objects
System 800xA® includes a comprehensive library of standard reusable components that include extended automation entities such as faceplates, graphic elements, trends, document links, and alarm and events. In addition, ABB provides a broad family of industry-specific libraries that contain pre-configured Control Modules, Function Blocks, and graphic elements. Our Burner Management Library is also available.

These pre-tested proven and SIL-certified libraries significantly reduce the time required to engineer, test and maintain control applications, while minimizing project risks.

Access management

Access management enables project/application-specific configuration of the appropriate level of restrictions regarding operation of the AC 800M HI controllers.

AC 800M High Integrity controller

The processor units (PM857, PM863 and PM867) used for the AC 800M HI controller is physically identical to other AC 800M controllers, which simplifies service and spares support and provides flexibility during the project build phase. Its high integrity functionality is enabled by the addition of SM81x, a diverse co-processor, and SIL-certified software. This enables non-critical control schemes to be upgraded to SIL-certified schemes by adding a plug-in SM81x module, plus selecting the appropriate software. The basic units for an AC 800M HI consists of either PM857 and SM812, PM863 and SM812 or a PM867 and SM812.

Redundancy

AC 800M HI controllers can be configured for PM/SM redundancy to increase the availability. Two PM modules and two SM modules run in parallel, one as primary and one as secondary.

If the primary PM/SM fails, the secondary PM/SM automatically takes over. In addition to the redundant PM/SM, two BC810 CEXbus (Communication module EXpansion bus) Interconnection Units offer a way to section the CEXbus into two independent segments. This improves availability in systems with redundant communication interfaces.

High Integrity I/O

Within the S800 I/O family, SIL3-compliant modules can be used for safety-critical applications. These I/O modules include those for 4-20 mA analog inputs, 24 Vdc digital inputs and 24 Vdc digital outputs. The digital output module provides both Normally Energized (ESD) and Normally Deenergized (F&G) outputs.

Analog inputs support HART routing for easy calibration checking and diagnosis with configurable access, while digital inputs support local time tagging of signal changes for high accuracy sequence-of-events logging.

High Integrity I/Os can be configured on the ModuleBus as single or redundant. Redundancy is only available via the TB840 optical cluster modem and requires redundant MTUs. Each I/O cluster can contain 12 single I/O modules or 6 redundant modules. There is a possibility to use safety SCM from Select IO product family. This add a Ethernet base on the IO bus for Safety Applications. S800 HI modules are not compatible with Ethernet FCI

System 800xA®´s high integrity architechture provides a unified environment for embedded safety and process control.

From version 6.2 onwards, 800xA complies with safety communications protocol for ABB (eg FENA21) and third-party device over PROFINET. This communication is enabled by a layer of communication over the PROFINET that uses black channel communications technology.

Connectivity and Interfacing Options

In addition to TÜV certified safety peer to peer protocol, System 800xA comes with certified interference free communications modules for Modbus RS232, Modbus TCP, OPC, Profinet, Profisafe, and other ABB protocols.

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ABB Ability™ System
800xA® HI configuration
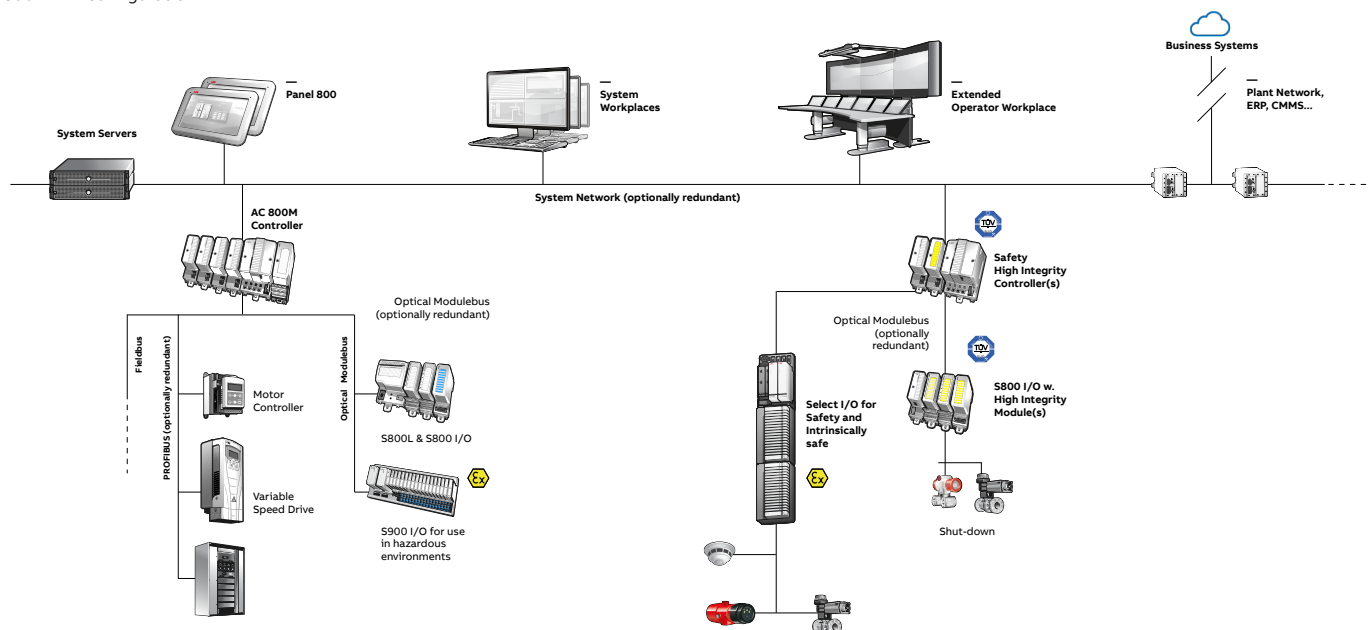
System 800xA® – System functions
System Security

800xA Security overview

The world of power and automation is changing in the face of new opportunities and challenges. ABB remains committed to helping plant owners take advantage of technology advances while minimizing exposure to risk in areas like cyber security.

As a leading provider of control and automation solutions for a wide spectrum of industries, ABB combines its technology strengths and domain expertise to provide a vast range of customer-focused solutions that enhance asset productivity and efficiency. Safety and reliability are given the highest priority in all of our products, systems and services.

Cyber security, which is a key aspect of these efforts, is not viewed as a one-time activity, but as an integral and continuous part of the product lifecycle, from early design and development, through testing and commissioning, to life-time support service and future adaptations.

While in reality 100% security is not feasible, implementation of 'defense in depth' security measures, stringent software update policies and strictly enforced standards will significantly mitigate security risks.

Secure installation and operation of System 800xA® is supported by user documentation and tools. When installed, the system assumes a secure default configuration, including hardening of operating systems, disabling unused functions, and automatic domain controller configuration.

User documentation describes recommended security measures, such as network configuration and use of anti-virus software.

Security features provided in System 800xA® include user authentication, access control, audit trail, protected network communication, and tools for backup and recovery. ABB is continuously working on increasing the integrity, availability and confidentiality of all system functions and help users take pro-active steps to mitigate the risk of unauthorized control system access.

The foundation for System 800xA® user authentication is the Windows user administration. A user is registered in a domain, and can belong to one or more groups.

The user group can be freely selected, but it may simplify user administration if the groups correspond to the IndustrialIT user groups.

Operations and actions in the system can be assigned different required permissions. This assignment defines what permission a user needs to perform the operation or action. Examples of permissions are: Read, Configure, and Operate. To execute a set-point change, for example, Operate permission may be required.

Each attribute of a control object can have a different permission assigned, so that access rights can be differentiated down to a particular operation to an object. At the ultimate level, the above-mentioned functionality gives the administrator the possibility to define exactly who can do what and from where.

The functionality can be applied to each aspect in the system at the same time in order to provide basic security with minimum setup.

Roles control what is visible to a certain user group (here IndustrialIT user groups apply). For example, controller limits in the faceplate can be made invisible for an operator.

User groups can be assigned different permissions relative to substructures down to an individual object. This supports the concept of users/ user groups having different authority for different areas of the system.

Authority is set at an aspect object in an arbitrarily selected structure, such as the functional structure. All subordinate objects inherit this authority. It is also possible to set authority explicitly for any single aspect object.

Advanced Access Control and Regulatory Agency Compliance Support

ABB has a thorough understanding of the regulatory and environmental requirements for regulated industries, including chemical, utility and life sciences, and specifically 21 CFR Part II. System 800xA® regulatory compliance begins with engineering and continues throughout the entire system lifecycle.

System 800xA® Advanced Access Control features include double authentication, reauthentication, log over, advanced security permissions,digital signing, versioning, data retention and inactivity logout.

Audit trail capabilities allow the monitoring and recording of operator actions. The system supports logging of security violations, configuration changes, operator actions, control logic editing and start/stop of servers.

The audit log contains:
• Date and time for the operation.
• Node from which the operation was performed.
• User name of the individual performing the operation.
• Type of operation.
• Object property or aspect affected by the operation.
• Additional information from the involved aspect system.

Digital Signing provides a secure method to insure that an application, configuration or other critical part of a validated application has not been modified.Versioning is another method to insure that application configuration matches what is expected to be executed in the system.

Authentication and Double authentication services for System 800xA® can be used for critical operations such as writes to the control system, batch operations, and configuration changes in order to ensure that only authorized persons can take actions in the 800xA System. This option forces the user to re-enter his user credentials before the operation is executed.

Two different re-authentication forms are supported:
• Re-authentication, which is used to guarantee that an operation is performed by the logged-in person. Reauthentication generates an audit event, and thus also serves as an electronic signature for the operation.
• Double authentication, which may be used for critical operations or when required by regulation. In this case an additional person must sign and thus approve the operation.

User log-over provides the ability to temporarily change user without a complete Windows logon/logoff sequence. This makes it much faster, for example, for another user to log in to perform tasks which require a higher authority level without logging off the current user. The information displays remain available.

Data retention and reporting is the final part of any regulated system. Regulations require that electronic record keeping be reliable and secure. They also dictate how process information, alarms and events and reports must be maintained electronically.

System 800xA® History Services functions provide the reporting and archiving capabilities to insure long-term secure data support.

System 800xA® – System functions
External application interfaces

800xA OPC Client Connection
800xA OPC Client Connection is for use with third-party applications. All run-time data and some configuration data in the system is available for other clients via OPC. The 800xA System acts as an OPC-server for OPC-DA (Versions 1.0, and 2.0), OPC-HDA (1.20), as well as OPC-AE (1.1).

Several OPC-clients can be connected simultaneously to the system to exchange data. The client connection provides an umbrella architecture that allows seamless access to OPC data exposed by System 800xA® regardless of the physical location of the data.

800xA ODBC Client Connections
A set of ODBC data base connectors are provided as an extension to System 800xA® History Service capabilities. ODBC connectors provide a client server connection between System 800xA® and applications that must utilize standard commercial connection types yet do not understand the concepts of OPC. ODBC Clients are typically utilized by standard reporting tools and many third-party systems.

The ODBC Client connection provides access to OPC properties (real-time data) as well as access to Historical process data and events when stored in the long-term storage of System 800xA®.

System 800xA® – System functions
System infrastructure

Time synchronization

800xA System supports time synchronization within the system to provide Sequence of Events (SOE) with a resolution below one millisecond. This enables accurate sequence of event recording. Time stamping is done at the I/O board or in the control application, depending on the accuracy required.

The time source can be internal or external. To achieve the best clock accuracy in the total system, distributing the time 'upwards' from the Control Network to the Client Server Network is recommended. Typically, a controller will act as time master for the Control Network and the rest of the system will be synchronized from this source.

An external time source should be used if it is important that time stamps in the system are to be compared to time stamps from other systems. In this case, the recommended method is to use an SNTP server with a GPS receiver. That SNTP server should preferably be connected to the Control Network and all controllers must be configured to receive the time via SNTP.

Redundancy

System 800xA® provides redundancy at all levels. This includes the following:
- Redundant network
- Redundant field networks
- Redundant servers
- Redundant historians
- Redundant batch servers
- Redundant controllers
- Redundant process I/O
- Redundant power supplies

Redundancy at one place does not require redundancy at any other level. This means the system can, for example, run with redundant networks and redundant servers and have just selected controllers redundant. This gives the possibility to tune costs against availability requirements.

Localization

National Language Support (NLS) localizes the operator interface to the desired language. NLS contains a set of functions that are harmonized with the Windows regional settings to enable a multi-lingual environment for System 800xA®.

The default language in System 800xA® is English, and the system supports translations, mainly of the operator interface and the related operator manuals, in the following languages: Chinese, French, German, Russian, Spanish, and Swedish.

Multisystem Integration

800xA Multisystem Integration makes it possible to connect a subscriber system on top of a number of 800xA systems and supervise and operate several 800xA systems from one central operating room.

The supervising system is called the Subscriber and the supervised system the Provider.

Engineering provider systems is done locally in the provider system. The subscriber system is engineered by uploading objects and aspects from connected provider systems.

Objects and aspects in the subscriber system can be accessed as if they were local in the subscriber system, with data feed from the provider system.

System 800xA® – System functions
Supporting functions

Calculations Services

Calculations can be performed on any object or value in the system and are supported by Windows Visual Basic scripting language. Calculations Service provides the ability to run mathematical expression on any available 800xA aspect pro-perty or attribute. This includes a special set of objects called softpoints. Calculations may also be applied to object types. Calculation operations can be triggered by changes to system point values, or scheduled to execute either cyclically or at a given date and time. In conjunction with Calculations, softpoints extend system capabilities and provide the ability to write a timestamp. A log provided to align calculations along with the inputs ensures they have the same timestamp for retrieval.

A calculation aspect may be applied to any aspect object such as a unit, vessel, pump, or softpoint. Inputs can be any aspect object property, and outputs can be any changeable point in the system. Data quality and alarm generation are supported. Calculation logic is written in VBScript. A Calculation Service Provider can exist in one or two Calculation Service Groups (single or dual configuration) or two providers can exist in one group (redundant configuration).

SoftPoint Services

SoftPoint services allow users to create and configure user-defined object types, and deploy them like any other object in System 800xA®. A softpoint differs from other system signals as it is not directly connected to hardware system I/O or executed in a controller. Softpoints execute on an application or Connectivity Server. Once configured, a softpoint is managed and accessed just as any other point in the system. Softpoint values may be stored in system history, displayed and generate alarms. Data is driven into a softpoint by the use of calculations or other third-party applications.

Scheduling services

Versatile scheduling within the system makes it possible to automate not only repetitive jobs, but also to initiate reactions to exceptional circumstances without the need of manual intervention.

A variety of scheduling techniques are provided:
• Event-driven
• Cyclic
• Time-based
• On-demand

A scheduled job can be anything from report execution in Microsoft® Excel or Crystal Reports to an event trigger calculation or a maintenance backup. Scheduled tasks have a variety of parameters based on the type of scheduled activity and can be used to pass parameters into the scheduled activity. For example, with a report, input parameters can be included for the batch name, the type of report output (PDF, text, etc.), and the destination (file directory or report aspect). In addition, reports can also be mailed to a series of destination addresses.

SMS and e-mail Messaging

SMS and e-mail Messaging provides a method for sending messages based on alarm and event information to user devices such as mobile telephones, e-mail accounts, and pagers. It is possible to control sending messages by configuring a message schedule for each user. SMS and e-mail Messaging employs three methods to notify users of alarm and event information. The notification methods work as follows:

• SMS (Short Message Service)/GSM (Global System for Mobile Communication) – is used to send messages based on alarm and event information to the GSM service provider's SMSC (SMS Center) over a wireless network. The SMSC sends the message to compatible devices of users configured to receive them. This method allows users of the compatible devices to confirm receipt of the message.
• SMTP (Simple Mail Transfer Protocol)/E-mail – is used to send messages based on alarm and event information to an SMTP server over the Internet. The SMTP server sends the message to e-mail accounts, or to compatible devices via e-mail accounts, of users configured to receive them.
• TAP (Telocator Alphanumeric Protocol)/Modem – is used to send messages based on alarm and event information to the pager service provider's CPT (Central Paging Terminal) over a telephone-land line. The CPT sends the message to compatible devices of users configured to receive them.

Live Video integration support for 800xA
The VideONet Connect for 800xA is used to visu-
alize and manage video cameras connected to the
800xA system through the VideONet Server.
This enables the operator to have a live view of
the process within the Operator Workplace.

It is also possible to include live video directly
in Process Graphics and to view recordings. By
associating a camera view with a process object
the operator can easily access the live video
stream via the context menu for the object.

ABB Ability™ Edgenius Operations Data Manager
System 800xA Publisher

A secure and easy to configure System 800xA system extension to help accelerate
digital transformation. Digital solutions are all about leveraging your current data
in your control system and plant devices to become more efficient, predictable,
and more profitable, without adding risk.

System 800xA Publisher is a system extension
that securely connects and digitally publishes
process data and alarm/events to the Edgenius
Operations Data Manager environment removing
complexity and other barriers usually encoun-
tered when implementing digital solutions.

What is the System 800xA Publisher?
The System 800xA Publisher is a system exten-
sion for System 800xA automation systems that
provides easy to configure, secure connectivity
from System 800xA to the Edgenius Operations
Data Manager.

The System 800xA Publisher is all about making
digital transformation easier and more manage-
able. With the System 800xA Publisher system ex-
tension, a digital twin is created on the Edgenius
platform representing selected System 800xA
Aspect Objects. This digital twin and its informa-
tion, combined with other connected data
sources, is then available on the Edgenius
Operations Data Management for use with Edge
hosted or cloud based digital applications.

ABB Ability™ Genix
Industrial Analytics
and AI Suite

ABB Ability™ Edgenius
Control Systems
Connect

System 800xA Publisher
System Extension

**Connected
Devices**

**ABB Ability™
System 800xA®**
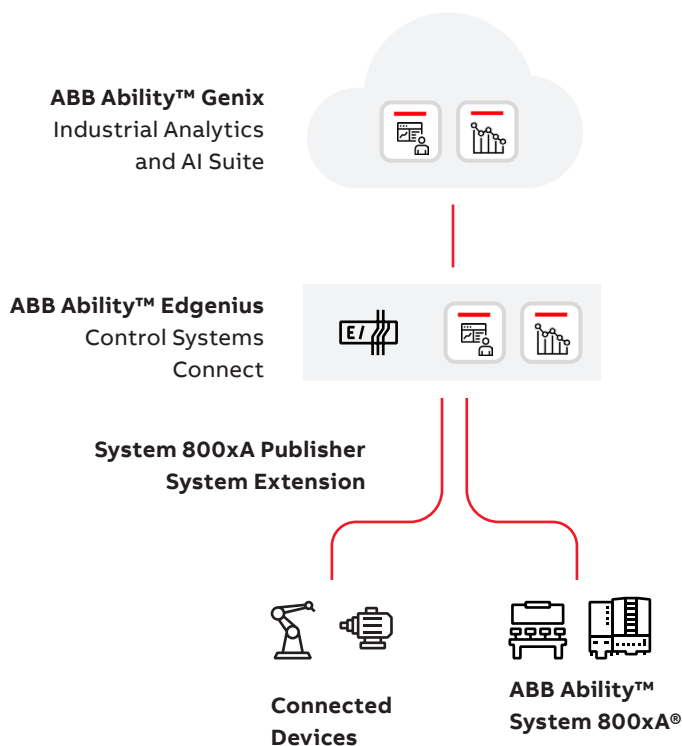
What can the System 800xA Publisher do for you?
- Simplifies digital transformation solution im-
  plementations when using System 800xA®
- Defines a set of Aspects and Services that en-
  ables secure connectivity using MQTT based on
  mTLS.
- Publishes variables (objects/object types),
  structures, as well as alarm/events for use with
  Edgenius and Genix digital applications
- Published data is transformed from aspect ob-
  ject format to the information model used in
  the ABB Ability™ platform
- The System 800xA Publisher system extension
  will be delivered as part of an active Edgenius
  subscription
- The System 800xA Publisher system extension
  is compatible with 800xA systems version 6.0.3
  and later.

System 800xA® – System functions
Lifecycle Services

Life Cycle Policy

We want to maximize the useable life of our customers' system investment and provide our customers with the confidence that there is a well-defined support for, and a path forward for existing ABB systems.

ABB has defined a product support life cycle policy for its process automation control systems and products to help our customers' predict support for their automation assets. This policy then forms the basic lifecycle management foundation for Automation Software Maintenance, our unique control system lifecycle management program. ABB's control systems are designed for continuous evolution. It is ABB's goal to protect our customers' intellectual investment (i.e. application software) beyond the life cycles of the underlying platform products (i.e. hardware and software).

ABB will not "Remove from Active Sale" any product or "family" of products until an equivalent replacement to those products is available. Once a product has been removed from active sale, ABB will continue to support the product for at least 10 years, although exceptions to this may occur if components or technologies needed are no longer available to ABB.

Within this support period ABB will announce a "Last Buy" opportunity at least 12 months prior to the end of manufacturing (except in cases where there is a direct form, fit and function replacement). It is ABB's intention to provide support for as long as there are significant customer needs after the "Manufacturing End" through field service, repair and by making replacement spares (new or refurbished modules) available.
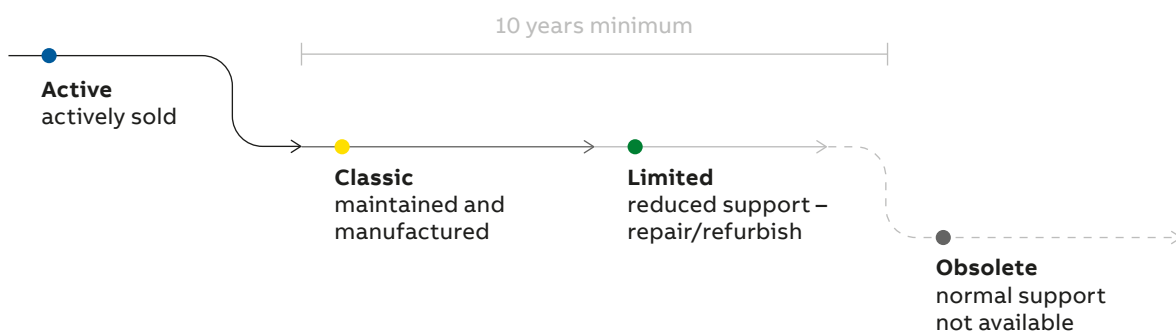
Details about ABB's Lifecycle Policy for distributed control systems can be found here: **https://new.abb.com/control-systems/service/lifecycle-policy**

Please contact your local sales representative for detailed information on the program and on how to order Automation Software Maintenance subscriptions.

Lifecycle Management Model

The life cycle management model divides a product's life cycle into four phases: active, classic, limited and obsolete. Each phase has different implications for the end user in terms of services and support provided.

All control systems effectively remain in Active phase, with individual component products (hardware and software) transitioning through the lifecycle phases of Active, Classic, Limited and Obsolete as they are superseded by new technologies and offerings.

10 years minimum

Active
actively sold

Classic
maintained and
manufactured

Limited
reduced support –
repair/refurbish

Obsolete
normal support
not available

Update and Upgrade

Corrections to 800xA software are made available as system revisions. These releases focus on corrections only, as well as life cycle updates, but do normally not add functionality.

Functions and features are added to a system version during its active life. These functions and features are either released as new minor versions of the system software, or as individual feature additions if they have their own life cycle. A user can choose to install the individual features, while new minor versions will have to be adopted since they normally contain also other updates and error corrections.

Upgrade from one system version to the latest is made when the new functions and features included in a newer system version are desired for use, but should be made at the latest when the installed system version enters Limited life cycle phase. Information about life cycle transition dates is available so that proper planning can be made.

The latest release of System 800xA®® contains functionality to perform a System Installer assisted on-line update with the system continuously controlling the plant. For new orders, expansions and upgrades a physical media box with complete software package will be shipped.

Security updates and virus protection

System 800xA® is continuously verified with the latest security updates. Each time Microsoft® issues new updates, which usually happens every month, 800xA is immediately verified with these new updates. Within days, a compliance message is sent out confirming that the security updates can be installed.

Furthermore, the appropriate set of security updates compliant with 800xA is re-distributed together with an installation tool. This means the only action required is to regularly download the update kit and install it in the system. This keeps the operating system up to date.

System 800xA® is verified with three virus engines – Trellix, Microsoft Defender and Symantec. Not only is it verified with these virus engines at the release of a new version or revision, the system software is also continuously checked against the virus definition files issued by the vendors on a continuous basis.

In practice, this means a verification cycle is run each day where the latest updates, scan engines and virus definition files are verified by ABB for relevance and system compatibility with ABB control system software, primarily so that they

don't find so-called false positives in software code known to be good. This prevents unwanted surprises like system shutdown due to the virus engine understanding correct code as a virus.

Information about the latest validated patches, security updates, scan engine, and virus definition files is provided by ABB. Automation Software Maintenance is the exclusive way for ABB control system users to receive these validated Microsoft security patches and Anti-virus verification reports.

Authorized users can download the relevant files as follows:
- Via web access to My Control System for a manual retrieve and download.
- Via a separate subscription to the ABB Security Update Service for an automated retrieve and download.

License management

System 800xA® software is covered by a software license concept. All software is available for installation, but functions and features as well as size parameters are enabled via licenses. The license file, which matches the capabilities that have been purchased, is downloaded from an ABB server and installed in the system.

It is ABB's desire that licensing shall never prevent plant operation. Hence, enforcement is normally not explicit, i.e. it is possible to provisionally override the current licenses to overcome a problem without contacting ABB, and correct the actual license match later. In addition, enforcement is 'soft' in the sense that license violation messages are issued instead of shutting down or disabling the start of functions not covered by an appropriate license.

Automation Software Maintenance

This is ABB's control system lifecycle management and support program that assists system owners to actively manage their control system lifecycle, support and maintenance. This program allows users to take advantage of the continuous enhancements that ABB makes to system software products. Under this program, users are offered support for their existing software, along with an evolution path to the latest system software and hardware.

The program covers not only 800xA system software, including Operator Workplace and Engineering tool software, but also the Controller firmware code.

The Automation Software Maintenance (ASM) Program offers a range of services to support and extend the life and reliability of your ABB control systems. It offers four levels of support to choose from:

- **ASM Basic.** Set of lifecycle support basic services focusing on the control system security and web access to timely and relevant information via My Control System.
- **ASM Update.** Access to support and corrections of the present software version.
- **ASM Upgrade.** As above plus access to newer versions of the same product.
- **ASM LTS.** As above plus added support of the designated Long-Term support (LTS) version of System 800xA software for a period od up to 10 years from the date of its initial release.
- **ASM Evolve.** As above with the added possibility to evolve installations with previous generation systems to System 800xA®.

Read more about our Automation Software Maintenance Program and its many valuable services here: **https://new.abb.com/control-systems/service/offerings/service-agreements**

Please contact your local sales representative for detailed information on the program and on how to order Automation Software Maintenance subscriptions.

System 800xA® – System functions
Supervision and diagnostics

PC, Network and Software Monitoring
Standard workstations and network equipment are used extensively in automation systems. The optimal behavior of these parts of the system has a significant impact on the performance and reliability of the automation system as a whole. By looking out for indications of impending problems, via continuous monitoring of the equipment, plant personnel can proactively ensure optimum system availability.

The PC, Network and Software Monitoring (PNSM) solution tell users about software and hardware issues before they affect production. PNSM provides a set of predefined IT Assets that represent common devices and system processes associated with System 800xA®, e.g. printers, computers, switches, and software programs. These IT Assets can identify the root cause of problems by assessing the conditions from the simple (e.g. printer out of paper) to the sophisticated (detection of a slow memory leak in a computer). When problems are detected (or anticipated), the software can automatically generate alarms, and inform the user of the problem.

The software integration is available for all IT Assets certified for use with System 800xA® and it is available in the form of a library that can be downloaded from myABB/My Control System. This library includes the object types for servers, workstations, switches, software and other network equipment such as printers, UPS, etc.

Diagnostics Collection Tool
ABB Diagnostics Collection Tool (DCT) collects diagnostic information to use for analysis from a local or remote node in a distributed LAN system. The data is packaged into compressed cabinet (.cab) files that are attached to the reported problem.

The information is primarily used for support and troubleshooting purposes. Analysis of diagnostics data can be done directly in the system where the data is collected. Alternatively, the data can be sent to an ABB support organization for detailed analysis in the event of failure or strange behavior of a system. DCT has support for 800xA products as well as for Microsoft® related functions.

The overall purpose of the tool is to unify and make consistent information gathering process for all ABB control system products at end-user sites. This will help speed up problem resolution.

System 800xA® –
Technical data and deployment
Key technical data

System 800xA® Capabilities	
Tags	120 000
Total number of Clients, normal or remote (nodes with one or several workplaces)	80
I/O channels	From a hundered to over 1,000 per controller depending on CPU type and application.
Operator screens per system	160
Operator screens per Operator Workplace	4
Operator Workplaces, normal or remote	80
Engineering Workplaces	20
Remote Engineering Workplaces	5
Information Management Workplaces	80
Desktop Displays for trends and events	150
Batch Workplaces	40
Nodes in one control network segment (excl. domain server and controllers)	100
Aspect Services redundancy	1 (single, redundant 1oo2 or 2oo3)
AC 800M Connectivity services	8 (16 if redundant)
AC 800M controllers per connectivity services	48 (Application dependent)

System 800xA® Capabilities	
PROFIBUS Connectivity services	8 (16 if redundant), 2,500 devices per server
HART Connectivity services	8 (16 if redundant), 2,500 devices per server
Foundation Fieldbus Connectivity services	8 (16 if redundant), 4,000 devices per server
PLC Connect services	12 (24 if redundant), 50,000 signals per server
Asset Optimization services	4
Multisystem Integration Subscribers	2
Multisystem Integration Providers	20
Connectivity servers, total	12 (24 if redundant)
Application servers	10
Batch servers	1 (single or redundant 1oo2)
Information Management servers (used as single, redundant or consolidating servers)	6
Supported Fieldbuses	Foundation Fieldbus, PROFIBUS, PROFINET, HART
Electrical Control System	IEC 61850
Standard Serial Protocols	RS232C: MODBUS RTU/TCP, 3964R, Comli
External application communication	OPC, OLE-DB, ODBC
Network	Ethernet TCP/IP Redundant
Network device supervision	SNMP
Operating System	Server: Windows Server 2022/2019 Standard/Datacenter (64 bit US English Version)
	Client: Windows 10 2021/2019 LTSC IoT/Enterprise (64 bit US English Version)

Performance and capacity	
Graphical displays	Unlimited (depending on available hard disk space)
Display exchange time	Standard Main Faceplate: ≤1 second Graphic display with 100 objects: ≤1 seconds
Command response time (order to indication)	<2 seconds
Reports	Unlimited
Alarm and event lists	100
X-Y plots	Unlimited
Active Batch Phases	300
Asset Monitors	20,000
History Logs per system (Information Manager)	180,000
History Log disc space per value (Information Manager)	21 bytes
Stored OPC Messages (Information Manager)	12,000,000
History Logs per server (800xA History)	180,000
History Log disc space requirements (800xA History)	40 bytes
Stored OPC Messages (800xA History)	Time/Disc space limited
Event burst capacity	1000 alarms/second for 3 seconds plus 10/s for 15 minutes
Event storage disc space requirements	Storage per message: 6k bytes
Alarm/Event throughput/sec	30
OPC DA throughput (items per sec) per AC 800M Connectivity server	30,000
Max number of softpoint signals	25,000
Max number of soft events	10 /second
Scheduling Service capacity	Max. 200 simultaneous jobs per scheduling server
Calculation Services	10
Calculations/second	100
Write transactions/second	The Calculation server can write up to 10 values/second to process (AC 800M) objects
Calculations that may be queued waiting to be executed	1000 calculations per Calculation server

This table is an extract and may be changed without further notice. Note that a combination of functions may impact the total capacity, and that conditions may apply for certain parameters. For explanations and further details, refer to the System 800xA® System Guide Technical Data and Configuration.

System 800xA®
Extended Warranty - Hardware

Extended warranty time for hardware products/articles can be ordered for 1, 2, 3 or 4 years.
The Extended Warranty can be ordered using the Wizard 800xA for the following 800xA parts:
• AC 800M controllers
• S800 I/O
• S900 I/O
• Select I/O
• Fieldbus components

Included product classes (type of products) are:
– Power supplies
– Central units
– Communication Modules
– I/O modules

Extended Warranty time is not available for:
– Batteries
– Panel

System 800xA®
System deployment and Networks

System deployment

System 800xA® can be deployed very differently depending on the size of the application. The options available are determined by the number of operator workplaces needed, the size of the control application, as well as the required functions, for example history logs, batch plant needs, asset management, the amount of data required for external clients, etc.

A central concept in determining the size of a system is tag count. A tag equals a control object in the system, and is usually referable to a real object in the plant, such as a valve or a pump. In other words, the valve or the pump is represented in the system as a tag. A tag can have from a few up to tens of attributes. When dimensioning a system, the tag count is an important size parameter, but equally important is how much data is requested, subscribed, from the control layer.
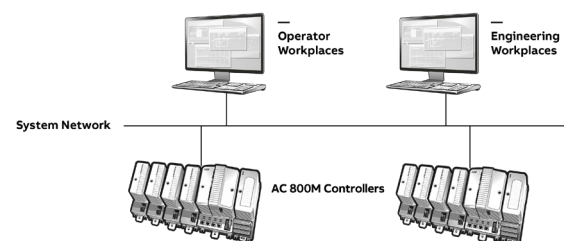
This is determined by the number of operator workplaces, the amount of logs and their log interval, and the volume of external subscription required.

Generically, System 800xA® consists of operator workplaces, engineering workplaces, controllers, and server nodes. Smaller systems (up to 20,000 tags and 16 clients) can be built with all server functionality running in the workplace nodes. In other words, the node count equals the number of workplaces needed.

Larger systems require server functionality to run in separate server nodes. Depending on the actual size, server functionality can be combined in different ways to optimally use the computer capacity. Each 800xA service reffered to as a system function, and there are rules defined how many of these system functions that can run smultaneously in one physical server node.

Fieldbuses are connected through specific communication modules to the controllers. Normally the application run-time data is communicated to and from the control application through this interface. In particular for Foundation Fieldbus and IEC 61850 communication, acyclic data and service and configuration data is communicated through a connectivity function that bypasses the controller, and hence is installed in the server

layer of the system. Data needed for object face plates, device configuration and asset management is routed through this communication. Workplaces and Servers run on Windows operating system.

A System 800xA® installation can be configured either as a Windows Domain or as a Windows Workgroup. When configured as a domain, the Domain Controller and DNS can be installed either in separate Domain Servers or in an 800xA server node according to specific rules. For redundancy, two domain servers are used.

For installation as a production system, we recommended that the system forms its own domain. It should not be part of a larger domain, such as a corporate network domain.

A workgroup becomes increasingly difficult to administrate as the number of users and computers grows. Therefore, workgroups should be considered only for small systems with few users.

Workplaces are installed on workstation PCs. The 800xA server functionality can run either on workstation operating system and hardware, or server OS and server hardware, depending on system size.

Depending on Microsoft® licensing rules, system size is limited when workstation OS is used for any server node, which means that larger systems always run server functionality on a server operating system.

Plant Network

Clients server Network

Control Network

Field Network

—
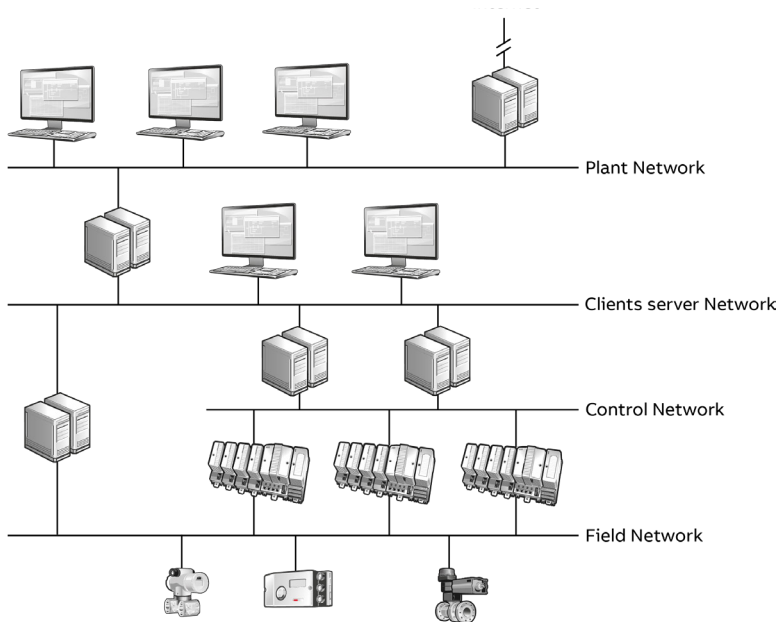
Auxiliary Clients

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 An 800xA system
with auxiliary clients

Main system with traditional topology   Auxiliary Clients
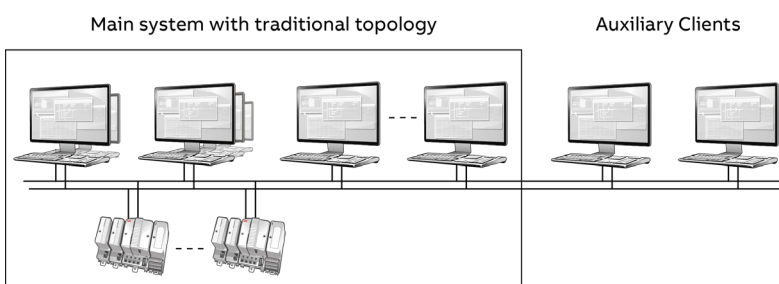
An 800xA system can be amended with up to two additional auxiliary clients (operator workplaces) from which the plant can be operated in case of a complete server breakdown of the main control system.

This configuration is for use cases where operational availability is a concern, and in particular concern with the client server architecture, where data and operational commands pass through an intermediate server layer. The number of aspect servers and auxiliary clients must be an odd number.

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Geographically distributed plants

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Example topology
with Multiple Aspect
Servers

Location 2

Location 1

Location 3

Location 4
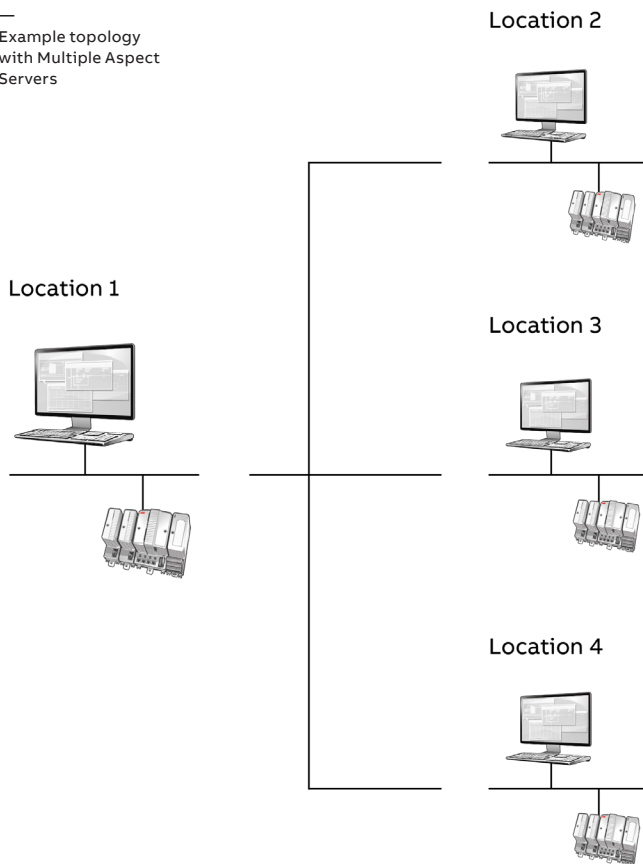
Very distributed plants where each part is self-contained with respect to its control and operation functions can be built using System 800xA®, still keeping the complete installation as one system.

For example pipe lines, mines, district heating, water/waste water, or plants where segregation between parts is needed (e.g. power plants with several units). In this system topology there are controllers and operational clients dedicated to and physically located at each respective part (location) of the plant.

The maximum numbers of aspect servers is 11, and it has to be an odd number.

The alternative solution supported by System 800xA® is Multisystem Integration (MI). While MI support good integrity between parts, it still requires management of different systems that are connected. Sometimes this is an advantage from a life cycle perspective, while in other cases there is a wish to have one single system.

—
Virtualization

Virtualization can be used to combine multiple 800xA features onto a single VMware ESXi host computer. The total number of physical computers required in an installation may then be reduced, but further the management of the system may be facilitated. This also reduces the required space for computers, hardware acquisition costs for computers and cabinets, and operating costs (such as energy expenditures).

Operator workplaces can also be virtualized. There are always limitations, in which case the System 800xA® workplace runs virtualized and the physical workplace is implemented by dedicated hardware, so-called thin client hardware.

Virtualization can be used for engineering systems as well as for production systems. Essentially the same configuration and dimensioning rules, as well as technical specification for an 800xA system, apply when the system is installed in a virtual environment.

An engineering system is intended for engineering functions only, with no production or control operations. The same basic configuration rules apply to an engineering system as to systems intended for production.

Engineering results produced in an engineering system are transferred to the production system, or to other engineering systems, such as an on-site engineering system, using the Export/Import function.

Microsoft Hyper-V
Microsoft Hyper-V is the hypervisor for virtual machines in the Microsoft Windows operating system. This user guide refers to the latest version of Hyper-V in Microsoft Windows Server 2022 and 2019. Microsoft Hyper-V is an additional role that was added in Microsoft Windows Server 2019.

There is no license requirement for adding the Hyper-V role to the server. Each virtual machine running in Hyper-V will require its own Microsoft Windows license. Hyper-V includes a Hyper-V Manager for managing the Hyper-V server. Some of its functions are the creation, editing, execution of virtual machines, and the configuration of the Hyper-V server such as creating virtual switches.

The advantages of using Microsoft Hyper-V are:
- There is no additional software layer with its own life cycle.
- Hyper-V is part of the Windows Server Operating System license, hence no extra cost.

Existing Virtual Infrastructure
It is important to synergize with the existing technologies prior to planning an 800xA deployment. Customers who have already standardized their virtualization environments on Hyper-V may require Hyper-V for their 800xA systems.

However, customers who have standardized on VMware ESXi may not want a new technology such as Hyper-V to be introduced to their environment.

Standardization on software/hardware reduces training, purchasing and maintenance of computer systems. A customer that has invested in a VMware ESXi base infrastructure may not want to have a 800xA system delivered in a Hyper-V configuration. The same applies to customers that have standardized on Hyper-V and do not wish to add VMware ESXi to their administration and maintenance duties.

How to use Microsoft Hyper-V with System 800xA®
Microsoft Hyper-V virtualization is used in conjunction with ABB System 800xA® to consolidate the 800xA nodes into a smaller number of servers. Typically, there are a number of primary 800xA servers and secondary 800xA servers.

To maintain the physical server redundancy, at least two physical virtual host servers are used. The primary 800xA nodes are configured as virtual machines on one physical server, and the secondary 800xA nodes are configured as virtual machines on the second physical server.
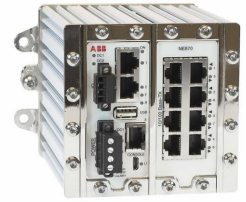
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System Networks

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01 NE810

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02 NE840

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03 NE870

The engineering system is used stand-alone in, for example, an engineering office. There are four alternatives regarding the domain membership:
- The engineering system can be added to an existing domain (in an office network domain).
- The engineering system can be defined as a new domain added to an existing Domain Controller.
- The engineering system can be defined as a new domain in a separate Domain Controller (isolated engineering system).
- The engineering system can be defined as a workgroup.

System communication in System 800xA® is based on Ethernet and TCP/IP networks, which are functionally and, in most cases, also physically built in levels.

The different levels in the network are a logical definition of the different levels of communication. In an installation, several protocols can share the physical media, depending on how the system is deployed.

System networks
The Plant Network can be dedicated for process automation purposes or be part of the plant intranet already available on a site.

The Client/Server network is used for communication between servers and between client Workplaces and servers. This is a trusted network zone that should be protected by firewalls. It is a private IP network that uses static addresses.

The Client/Server Network supports network redundancy using the RNRP protocol (Redundancy Network Routing Protocol) and redundant Ethernet switches.

The Control Network is used for communication between Controllers and between Controllers and Connectivity Servers. Similar to the client/server network the Control Network is a trusted network

zone that should be protected by firewalls. It is also a private IP network that uses static addresses.

The Control Network is based on Ethernet using the MMS protocol on top of a TCP/IP protocol stack, plus additional services for time distribution, redundancy management, etc. The Control Network supports network redundancy using the RNRP protocol and redundant Ethernet switches. Controllers connect to the control network via dual built-in network ports.

Building a system is done using the System Installer. This is a tool that allows the user to specify the various nodes and their function throughout a system. The system software, which is delivered on a software media, is loaded on the nodes using the Node Preparation Tool.

The resulting system configuration that the user has built is used to install the appropriate software on each and every node throughout the system, all managed from a single location. The System Installer also does basic configuration of Windows as well as the 800xA software in order to facilitate the set-up.

Network equipment
System 800xA® Network equipment provides pre-configured industrial network equipment verified with System 800xA® to ensure top quality performance and protection against cyber threats.

Wired switches include a set of rack and DIN mounted switsches. Redundant Network Routing Protocol 8RNRP) routers and a wide range of modular transcievers (SFP) specifically developed for use in System 800xA®.

The ABB Network Configuration Tool (NeCo) is a configuration tool which enables users to effeciently configure and maintain 800xA Network Equipment from one central location.

ABB Ability™ System 800xA®
References

System 800xA® References	
[1]	System 800xA® 6.2 System Guide, Technical Data and Configuration, 3BSE041434D6200, rev A
[2]	System 800xA® 6.2 System Guide Summary, 7PAA007862, rev A
[3]	System 800xA® Engineering Overview, 3BDD013082, rev G
[4]	System 800xA® Operator Effectiveness, 3BSE059723, rev H
[5]	System 800xA® 6.2 Product Catalog, 7PAA010273, rev A
[6]	For more information about System 800xA® please visit: **solutions.abb/800xA**
[7]	For more information about 800xA hardware please visit: **800xahardwareselector.com**
[8]	For information and support about Distributed Control Systems, please visit: **solutions.abb/controlsystems**

System 800xA® Hardware Selector
Choosing the right hardware made easy

When planning your new project or expansion, finding the right hardware can be a challenge. Check out the new web based tool that helps you find the hardware you need in a few clicks:
- Quick filtering according to your needs
- Compare different units at a glance
- Find matching termination units
- Download the outline of all modules pdf or export individual data sheets for each item.

Start using the System 800xA® Hardware Selector now at: **800xAhardwareselector.automation.abb.com**

Notes

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