



# PlantPAx Distributed Control System

System Release 5.20



**Allen-Bradley**  
by ROCKWELL AUTOMATION

Selection Guide

The PlantPAx® system provides a modern approach to distributed control. The system shares common technology (Integrated Architecture® system) with all other automation disciplines in the plant. This approach creates a seamless information flow across the plant for optimization opportunities and enables a Connected Enterprise®. Our scalable platform provides you with the flexibility to implement a system appropriate for your application.

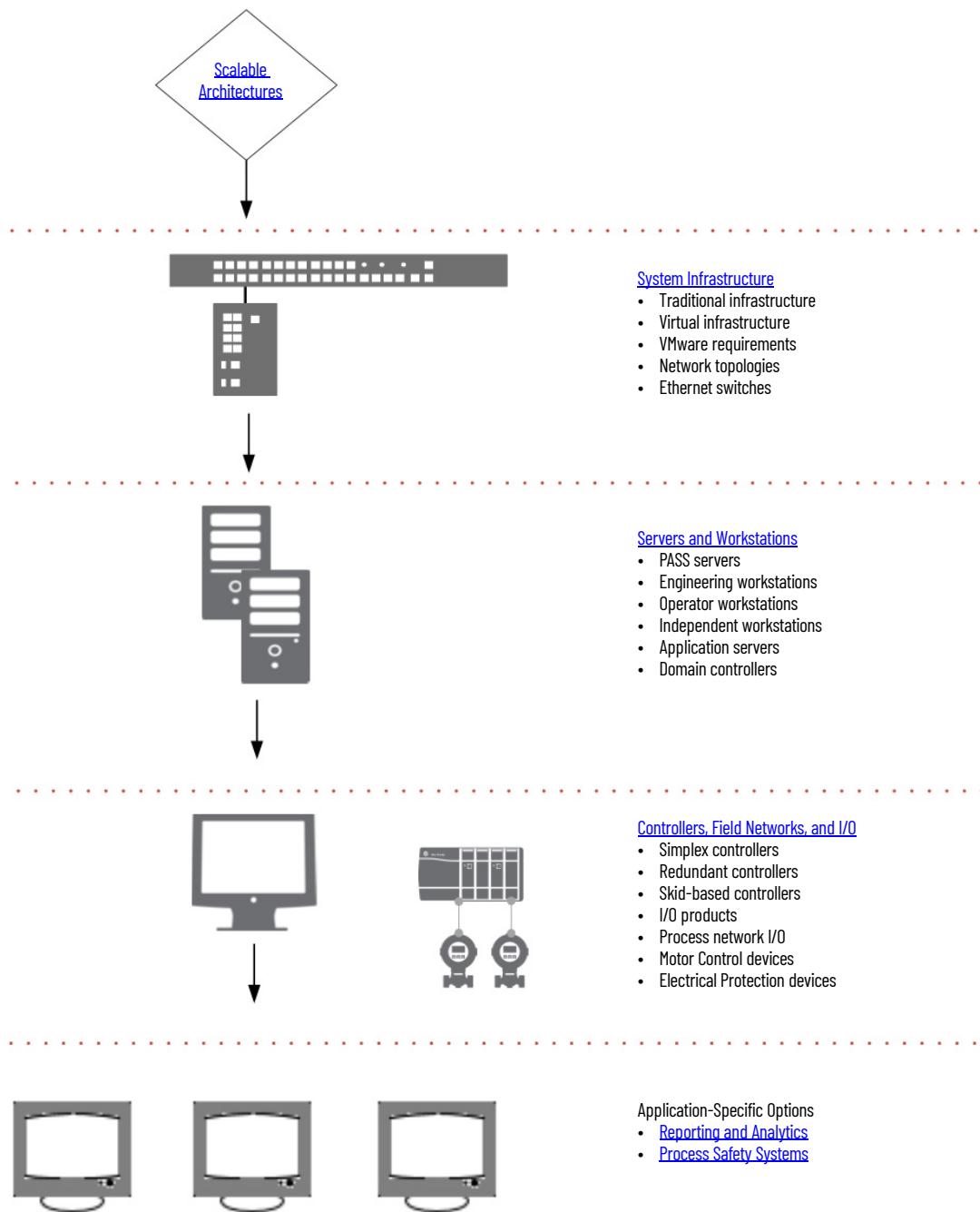
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## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
PlantPAx Distributed Control System Configuration and Implementation User Manual, publication <a href="#">PROCES-UM001</a>	Provides procedures to configure infrastructure components for your PlantPAx system.
Rockwell Automation Library of Process Objects, publication <a href="#">PROCES-RM200</a>	Provides information on how to use the Process library, including the PlantPAx Instructions and display elements.
FLEXHA 5000 I/O System User Manual, publication <a href="#">5015-UM001</a>	Provides information on how to use FLEXHA 5000™ I/O
PlantPAx Hardware Specifications and Certifications, publication <a href="#">PROCES-SR027</a>	Provides information on PlantPAx system hardware specifications and certifications.
Process Automation System Training Curriculum, publication <a href="#">PROCES-CA001</a>	Describes the courses that are available for a better understanding of the PlantPAx system.
<a href="https://www.rockwellautomation.com">https://www.rockwellautomation.com</a>	Provides general information about Rockwell Automation process capabilities. From the menu bar, select Products> Distributed Control Systems.
<a href="http://www.migratemyprocess.com/webinars">http://www.migratemyprocess.com/webinars</a>	Features prerecorded webinars on the DCS migration program and capabilities for process customers.
Product Compatibility and Download Center at <a href="https://compatibility.rockwellautomation.com/Pages/home.aspx">https://compatibility.rockwellautomation.com/Pages/home.aspx</a>	Website helps you find product-related downloads including firmware, release notes, associated software, drivers, tools, and utilities.
<b>Infrastructure</b>	
PlantPAx Template User Manual, publication <a href="#">9528-UM001</a>	Describes the catalog numbers and details for using virtual image templates to configure virtual machines.
Stratix Ethernet Device Specifications Technical Data, publication <a href="#">1783-TD001</a>	Contains product specifications, certifications, and catalog numbers for Ethernet switch devices.
Converged Plantwide Ethernet (CPwE) Design and Implementation Guide, publication <a href="#">ENET-TD001</a>	Provides information on Ethernet security and firewalls.
Product Compatibility and Download Center at <a href="https://compatibility.rockwellautomation.com/Pages/home.aspx">https://compatibility.rockwellautomation.com/Pages/home.aspx</a>	Website helps you find product-related downloads including firmware, release notes, associated software, drivers, tools, and utilities.
<b>Field Device Integration</b>	
Rockwell Automation Library of Electrical Protection Devices, publication <a href="#">PROCES-RM011</a>	This manual describes how to configure the Add-On Instructions and visualization objects to integrate electrical protection devices by using IEC 61850 or EtherNet/IP™ connectivity within the PlantPAx® System.
<a href="#">Integrate E+H Instruments in a PlantPAx System Integration Document</a> , publication <a href="#">PROCES-SG003</a>	Provides pre-engineered, pre-tested, supported, and maintained integrated solutions for plant-wide diagnostics and lifecycle management.
<a href="https://www.endress.com/">https://www.endress.com/</a>	Products from Endress+Hauser.
<a href="#">Technology partners</a>	Provides information on connected cabling systems and infrastructure management from Technology partners.



Welcome and thank you for choosing the PlantPAx Distributed Control System. The PlantPAx system is an integrated control and information solution that provides Plant-wide Optimization for a wide range of industries. This single-platform system is built on open industry standards to help support the seamless integration of system components, and to provide connectivity to high-level business systems.

A PlantPAx system consists of these system elements.

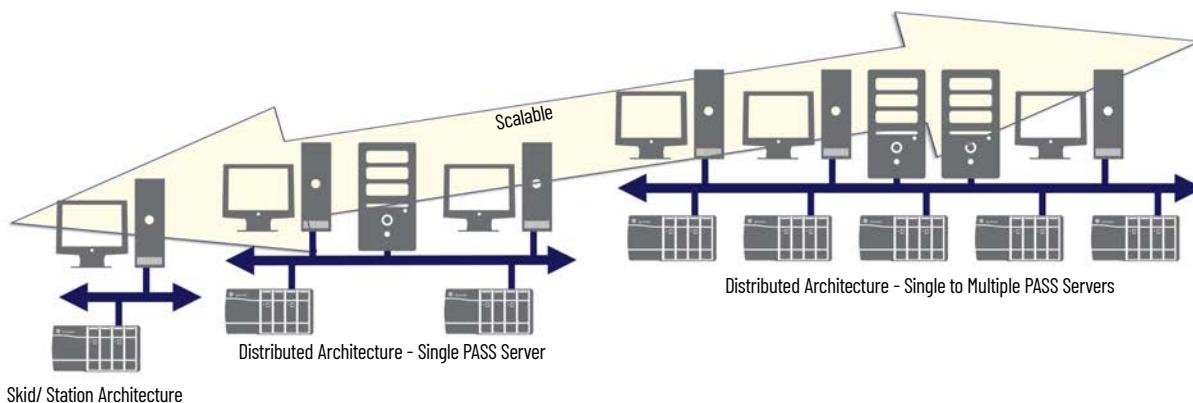
**Table 1 - System Element Descriptions**

System Element	Description
Process Automation System Server (PASS)	The PASS is a required system element that can host displays, alarms, and data connections to controllers. Multiple PASS servers can be used to provide additional system capacity or to create logical segregation of application content that is based on the process. For smaller systems, the PASS - C (consolidated PASS server) supports functions that otherwise would be hosted on application servers.
Operator workstation (OWS) and Application server (AppServ-OWS)	The OWS and AppServ-OWS provides an interactive graphical interface to monitor and control the process. The AppServ-OWS uses Microsoft® Remote Desktop Services (RDS) technology to serve multiple instances of the OWS as thin clients from one server. The technology provides for FactoryTalk® View SE thin clients that run applications and process data on a remote computer.
Engineering workstation (EWS) and Application server (AppServ-EWS)	The EWS and AppServ-EWS provides a central location for configuring the system and monitoring/maintaining system operation. The AppServ-EWS uses Microsoft Remote Desktop Services (RDS) technology to serve multiple instances of the EWS as thin clients from one server. The technology provides for FactoryTalk View SE thin clients that run applications and process data on a remote computer.
AppServ-Asset management	The asset management server acts as a centralized tool for managing automation-related asset information (both Rockwell Automation and third-party assets). The asset management application server includes capabilities for asset inventory, source control, audits, change notifications, reporting, and security.
AppServ-Batch	The batch application server provides comprehensive batch management, including unit supervision, recipe management, process management, and material management. The batch application server can be linked with visualization elements on the OWS and configuration clients on the EWS.
AppServ-Info	Data management storage can include a Historian or Microsoft SQL server. There are two different types of AppServ-Info servers depending on the function that is being provided: FactoryTalk® Historian software and the Microsoft SQL server.
Controllers	The ControlLogix® and CompactLogix™ controllers support continuous process and batch applications. These controllers also support discrete and motion applications.
Independent workstation (IndWS)	The independent workstation acts as a PASS, EWS, and OWS for single-station systems (independent class).
Domain controller	A domain controller is a server that manages security authentication requests within the Windows® server domain. PlantPAx uses a domain controller to store user account information, authenticate users, and enforce security policies.

## Scalable Architectures

Rockwell Automation characterizes the PlantPAx system that is based on its size or architecture class. A 'characterized' (system-tested) classification yields system performance data and recommended hardware and software configurations. The classes of PlantPAx architecture offer system scalability while organizing Integrated Architecture products consistent with process industry expectations.

The architecture classes include the following:

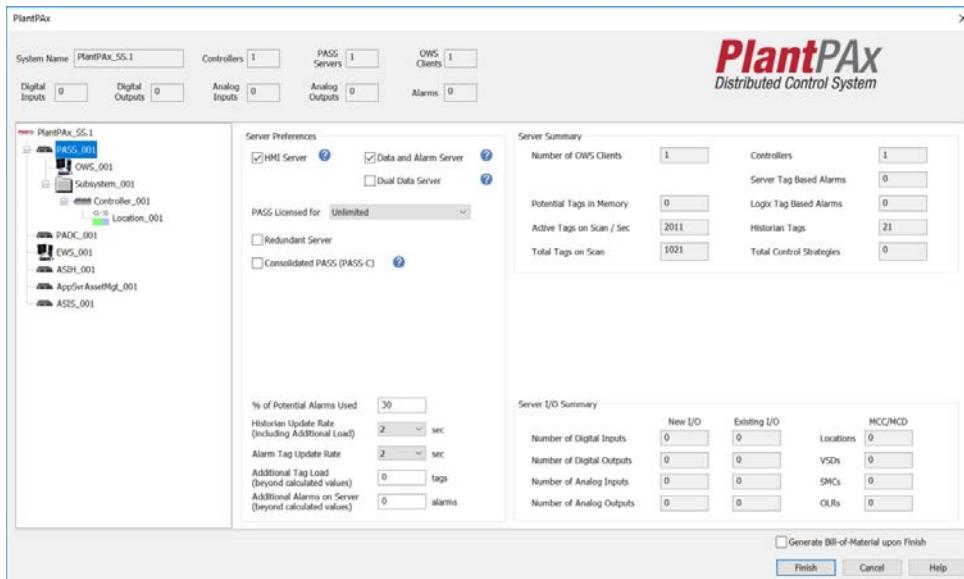


Consideration	Skid Station Architecture (FactoryTalk SE Station) (small <2000 I/O)	Distributed Architecture (single PASS (consolidated)) (small <2000 I/O)	Distributed Architecture (single to multiple PASS servers) (medium= 2,000...10,000 I/O)	Distributed Architecture (single to multiple PASS servers) (large = 10,000+ I/O)
FactoryTalk Directory	Local FactoryTalk Directory for SE Station applications	Local FactoryTalk Directory	PlantPAx recommends that the FactoryTalk Directory is placed on a standalone server.	PlantPAx recommends that the FactoryTalk Directory is placed on its own PASS(server).
FactoryTalk Activation Server	-	Local FactoryTalk Activation Server	PlantPAx recommends that the FactoryTalk Activation server is placed on the Factory Directory server.	PlantPAx recommends that the FactoryTalk Activation server is placed on the Directory server.
Process Automation System Server (PASS)  Note: If redundancy is required, a secondary PASS is needed.	Single SE Station serves as PASS and OWS in an independent workstation.  Note: PanelView™ products require PlantPAx 4.10 Library or earlier.	For smaller systems, one PASS-C is required that typically includes the following: <ul style="list-style-type: none"><li>• FactoryTalk Directory server</li><li>• HMI server</li><li>• Data server</li><li>• Alarm and Event server</li><li>• EWS / OWS</li></ul> The PASS-C supports functions that would otherwise be hosted on separate application servers. The PASS-C single computer also includes the following in a single workstation: <ul style="list-style-type: none"><li>• FactoryTalk Historian</li><li>• FactoryTalk AssetCentre</li><li>• Microsoft SQL Server</li><li>• FactoryTalk Batch</li></ul> <p><b>IMPORTANT:</b> An additional PASS-C is required for redundancy.</p> <p>Note: Licensing per application is separate from the PASS-C template.</p>	One PASS required that typically includes the following: <ul style="list-style-type: none"><li>• HMI server</li><li>• Data server (Up to 2 Data services per PASS)</li><li>• Alarm and Event service</li></ul> <p>Note: Optional redundancy is available.</p> <p>Note: Additional PASS Servers can be deployed to accommodate additional data and alarm requirements. No additional FactoryTalk licensing is required.</p>	
Engineering Workstation (EWS)	1 EWS required. Provided separately	Included within PASS-C image	1 EWS required. AppServ-EWS as needed	1 EWS required. Can have as many as 5 active and in use EWSs AppServ-EWS as needed
Operator Workstation OWS (Clients)  Note: PanelView™ products require PlantPAx 4.10 Library or earlier.	Provided separately via independent workstation or thin client.  FactoryTalk View SE Station license can transition to FactoryTalk View SE Client for DCS integration.	Max 10 OWS clients  Note: PASS-C requires additional machines outside of PASS-C image.	Can have as many as 120 OWS clients. AppServ-OWS as needed.	
Controllers	1...5 Compact or ControlLogix	1...5 Compact or ControlLogix	ControlLogix Architecture  Actual count varies depending on application requirements. There's no hard limit to the number of controllers. The number of controllers that can be supported per PASS (data server) depends on controller selection, controller loading, and number of OWS.	
Application Server - FactoryTalk AssetCentre	Not applicable. If attached to PlantPAx DCS, confirm FactoryTalk AssetCentre can access the skid's asset details.	Included within the PASS-C image	AppServ-Asset (FactoryTalk AssetCentre) is a required component for the PlantPAx DCS.	
Application servers	Not applicable. In chassis historian and in controller batch capabilities are available. Can be also integrated with a distributed architecture.	Included within the PASS-C image	AppServ-Batch as needed. AppServ-Information Management (FactoryTalk Historian or AppServ-Information Management)	AppServ-Batch as needed. AppServ-Information Management (FactoryTalk Historian) as needed.

Consideration	Skid Station Architecture (FactoryTalk SE Station) (small <2000 I/O)	Distributed Architecture (single PASS (consolidated)) (small <2000 I/O)	Distributed Architecture (single to multiple PASS servers) (medium= 2,000...10,000 I/O)	Distributed Architecture (single to multiple PASS servers) (large = 10,000+ I/O)
Application Servers Info - SQL	Not applicable. If attached to PlantPAX DCS, confirm that FactoryTalk AssetCentre can access.	Included within PASS-C image	It's recommended that AppServ-Info (SQL) is placed on its own server.	It's recommended that AppServ-Info (SQL) is placed on its own server.
Recommended Reference Architecture	Simplex / DLR	Simplex / DLR (Mix)	Simplex / DLR / PRP (Mix)	Simplex / DLR / PRP (Mix)
Recommended Compute Platform	ASEM™ 6300P PC  Note: PlantPAX approved ASEM 6300P running FactoryTalk View SE Station requires the following: Intel-i5, 8 GB RAM, 128 GB SSD	Traditional server hardware or Stratus zTC 250i	Rockwell Automation's VersaVirtual™ Appliance Stratus zTC 250i (Up to 5000 I/O)	Rockwell Automation's IDC

## PlantPAX System Estimator

Rockwell Automation offers the PlantPAX System Estimator tool as part of the Integrated Architecture Builder software. The System Estimator tool lets you define your PlantPAX system and verifies that your architecture and system elements are sized properly.



The System Estimator tool provides helps you select system elements and size the system. The sizing guidelines are based on the rules and recommendations from PlantPAX system characterization to achieve known performance and reliability.

The following items are created based on your inputs:

- Supervisory Ethernet network with all servers, operator, and engineering workstations and controller chassis
- List of required software catalog numbers
- List of network components per subsystem
- List of controllers, I/O, and process devices

After selecting the system elements as defined in this guide, use the PlantPAX System Estimator tool to modify their properties. You can then create a bill of materials (BOM) with the Integrated Architecture Builder software. The BOM includes controllers, I/O, networks, drives, devices, and software products that comprise your Distributed Control System.

To access the Integrated Architecture Builder software to use the PlantPAX System Estimator tool, download the [Product Selection Toolbox™](#).

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## Software Release Information

Performance guidelines are based on the use of the software versions listed. For new PlantPAx systems, we recommend that you use these versions of software.

- Studio 5000 Logix Designer® application, version 35
- Studio 5000® Application Code Manager, version 4
- FactoryTalk® View software, version 13
- FactoryTalk® Batch software, version 15
- FactoryTalk AssetCentre software, version 11
- FactoryTalk Historian software, version 8

For the latest compatible software information, see the [Product Compatibility and Download Center](#).

## Antivirus

PlantPAx recommends the installation of antivirus software on servers and workstations running industrial automation software. Although all FactoryTalk software is expected to be compatible with the antivirus protections on the market, PlantPAx has tested Windows Defender and Crowdstrike antivirus packages. These antivirus packages had no adverse effect on the performance of the PlantPAx Distributed Control System when used with the default configurations.

Proper configuration, management, and updating of antivirus software is required. Any antivirus protection can impact operation if the configuration of firewalls, network threat protections, and access controls is too restrictive.

## CIP Security

PlantPAx recommends the use of CIP Security within the reference architectures for class 3 communications. PlantPAx tests found that CIP Security has minimal impact on system performance while using Integrity protection for Class 3 communication between the plant servers and controllers.

PlantPAx also recommends using the Trusted Slot setting with the controller properties. Communication from the controller to other devices, such as remote I/O modules and other controllers, are not impacted by using the Trusted Slot setting. When using the Trusted Slot setting, configuration changes to the controller can only be made through selected networks (EN4TR with CIP security).

## PlantPAx System ID

The PlantPAx System ID is a unique identifier that helps simplify the management of your system over its lifecycle. The System ID creates a record of the installed products in your system and provides a dashboard that shows the hardware lifecycle status, notifications of updates and patches, and compatibility information. Use this information to:

- Plan spare and replacement parts to better size inventory
- Define the boundaries of the system

- Plan when and where to implement system upgrades



Your system integrator uses the Asset Inventory Agent within a FactoryTalk AssetCentre project to generate a system inventory file. Before delivering your system, your system integrator registers your System ID with Rockwell Automation and provides you directions on how to access your MyEquipment portal.

The System ID is **only** available if you purchase a PlantPAX PASS Bundle. The PlantPAX PASS Activation serial number is the System ID.

## PlantPAX Bundles

### PlantPAX PASS Large 25 Client

This software bundle provides everything that you need to run a PlantPAX DCS system with 25 HMI client stations. Included in the bundle is an HMI server with unlimited displays, 25 client stations, and unlimited browser-based HTML client connections. Core asset management and a PlantPAX System ID are integrated into the bundle. Additional assets can be added under recommended products.

Support / License Options	Catalog Number
8 x 5 Support / Subscription License	9528C-PASS25T11
8 x 5 Support / Perpetual License	9528M-PASS25T11
24 x 7 Support / Subscription License	9528C-PASS25T12
24 x 7 Support / Perpetual License	9528M-PASS25T12



The catalog numbers in the previous table are for Electronic Software Delivery. To order software in media format, append the catalog number with "M".

For example: 9528C-PASS25T11M

### Included in the Bundle

Description	Subscription License	Perpetual License
FactoryTalk View SE Large Bundle: Unlimited Display Server™ with 25 Clients	9701-VWSVBDL25T1T	9701-VWSVBDL25T1TPE
FactoryTalk View SE Large Bundle: Unlimited Display Server with 25 Clients Update	9701U-VWSVBDL25T1T	9701MU-VWSVBDL25T1T
FactoryTalk View SE Large Bundle: Unlimited Display Server with 25 Clients Support	RSSPN-VWSVBDL25T11 (8 x 5 Support) RSSPN-VWSVBDL25T12 (24 x 7 Support)	RSSPM-VWSVBDL25T11 (8 x 5 Support) RSSPM-VWSVBDL25T11 (24 x 7 Support)
FactoryTalk AssetCentre Base	9515-FTACT2T	9515-FTACBASEPE
FactoryTalk AssetCentre Base Update	9515U-FTACT2T	9515MU-FTACT2T
FactoryTalk AssetCentre Base Support	RSSPN-FTACT21 (8 x 5 Support) RSSPN-FTACT22 (24 x 7 Support)	RSSPM-FTACT21 (8 x 5 Support) RSSPM-FTACT22 (24 x 7 Support)
FactoryTalk AssetCentre Inventory Agent	9515-FTACTIAENT	9515-FTACTIAENTP

<b>Description</b>	<b>Subscription License</b>	<b>Perpetual License</b>
FactoryTalk AssetCentre Inventory Agent Update	9515U-FTACRT7I	9515MU-FTACRT7I
FactoryTalk AssetCentre Inventory Agent Support	RSSPN-FTACRT7I (8 x 5 Support) RSSPN-FTACRT72 (24 x 7 Support)	RSSPM-FTACRT7I (8 x 5 Support) RSSPM-FTACRT72 (24 x 7 Support)
My Equipment Portal Subscription		9300-MYEQUIP
Activation	9528-PAXPASSCLI	9528-PAXPASSCLIP

## PlantPAx PASS Medium 10 Client

This software bundle provides everything that you need to run a PlantPAx DCS system with 10 HMI client stations. Included in the bundle is an HMI server with unlimited displays, 10 client stations, and unlimited browser-based HTML client connections. Core asset management and a PlantPAx System ID are integrated into the bundle. Additional assets can be added under recommended products.

Support / License Options	Catalog Number
8 x 5 Support / Subscription License	9528C-PASS10T21
8 x 5 Support / Perpetual License	9528M-PASS10T21
24 x 7 Support / Subscription License	9528C-PASS10T22
24 x 7 Support / Perpetual License	9528M-PASS10T22



The catalog numbers in the previous table are for Electronic Software Delivery. To order software in media format, append the catalog number with "M".

For example: 9528C-PASS10T21M

### Included in the Bundle

Description	Subscription License	Perpetual License
FactoryTalk View SE Medium Bundle: Unlimited Display Server with 10 Clients	9701-VWSVBDL10T2T	9701-VWSVBDL10T2TPE
FactoryTalk View SE Medium Bundle: Unlimited Display Server with 10 Clients Update	9701U-VWSVBDL10T2T	9701MU-VWSVBDL10T21
FactoryTalk View SE Medium Bundle: Unlimited Display Server with 10 Clients Support	RSSPN-VWSVBDL10T21 (8 x 5 Support) RSSPN-VWSVBDL10T22 (24 x 7 Support)	RSSPM-VWSVBDL10T21 (8 x 5 Support) RSSPM-VWSVBDL10T22 (24 x 7 Support)
FactoryTalk AssetCentre Base	9515-FTACT2T	9515-FTACBASEPE
FactoryTalk AssetCentre Base Update	9515U-FTACT2T	9515MU-FTACT2T
FactoryTalk AssetCentre Base Support	RSSPN-FTACT21 (8 x 5 Support) RSSPN-FTACT22 (24 x 7 Support)	RSSPM-FTACT21 (8 x 5 Support) RSSPM-FTACT22 (24 x 7 Support)
FactoryTalk AssetCentre Inventory Agent	9515-FTACTIAENT	9515-FTACTIAENTP
FactoryTalk AssetCentre Inventory Agent Update	9515U-FTACRT7T	9515MU-FTACRT71
FactoryTalk AssetCentre Inventory Agent Support	RSSPN-FTACRT71 (8 x 5 Support) RSSPN-FTACRT72 (24 x 7 Support)	RSSPM-FTACRT71 (8 x 5 Support) RSSPM-FTACRT72 (24 x 7 Support)
My Equipment Portal Subscription		9300-MYEQUIP
Activation	9528-PAXPASSCLI	9528-PAXPASSCLIE

## PlantPAx PASS Small 5 Client

This software bundle provides everything that you need to run a PlantPAx DCS system with five HMI client stations. Included in the bundle is an HMI server with unlimited displays, five client stations, and unlimited browser-based HTML client connections. Core asset management and a PlantPAx System ID are integrated into the bundle. Additional assets can be added under recommended products.

Support / License Options	Catalog Number
8 x 5 Support / Subscription License	9528C-PASS05T31
8 x 5 Support / Perpetual License	9528M-PASS05T31
24 x 7 Support / Subscription License	9528C-PASS05T32
24 x 7 Support / Perpetual License	9528M-PASS05T32



The catalog numbers in the previous table are for Electronic Software Delivery. To order software in media format, append the catalog number with "M".

For example: 9528C-PASS05T31M

### Included in the Bundle

Description	Subscription License	Perpetual License
FactoryTalk View SE Small Bundle: Unlimited Display Server with 5 Clients	9701-VWSVBDL05T3T	9701-VWSVBDL05T3TPE
FactoryTalk View SE Small Bundle: Unlimited Display Server with 5 Clients Update	9701U-VWSVBDL05T3T	99701MU-VWSVBDL05T31
FactoryTalk View SE Small Bundle: Unlimited Display Server with 5 Clients Support	RSSPN-VWSVBDL05T31 (8 x 5 Support) RSSPN-VWSVBDL05T32 (24 x 7 Support)	RSSPM-VWSVBDL05T31 (8 x 5 Support) RSSPM-VWSVBDL05T32 (24 x 7 Support)
FactoryTalk AssetCentre Base	9515-FTACT2T	9515-FTACBASEPE
FactoryTalk AssetCentre Base Update	9515U-FTACT2T	9515MU-FTACT2T
FactoryTalk AssetCentre Base Support	RSSPN-FTACT21 (8 x 5 Support) RSSPN-FTACT22 (24 x 7 Support)	RSSPM-FTACT21 (8 x 5 Support) RSSPM-FTACT22 (24 x 7 Support)
FactoryTalk AssetCentre Inventory Agent	9515-FTACTIAENT	9515-FTACTIAENTP
FactoryTalk AssetCentre Inventory Agent Update	9515U-FTACRT7T	9515MU-FTACRT7I
FactoryTalk AssetCentre Inventory Agent Support	RSSPN-FTACRT71 (8 x 5 Support) RSSPN-FTACRT72 (24 x 7 Support)	RSSPM-FTACRT71 (8 x 5 Support) RSSPM-FTACRT72 (24 x 7 Support)
My Equipment Portal Subscription		9300-MYEQUIP
Activation	9528-PAXPASSCLI	9528-PAXPASSCLIE

## PlantPAx PASS Upgrade

This software bundle provides a pathway for existing customers to get a PlantPAx System ID when modernizing their existing PlantPAx systems. The PlantPAx System ID is integrated into this bundle with the same lifecycle management available in the standard PASS bundles. Additionally, it provides a subscription to asset management software.

Support Options	Catalog Number
8 x 5 Support	9528C-PAXUPGT11
24 x 7 Support	9528C-PAXUPGT12



The catalog numbers in the previous table are for Electronic Software Delivery. To order software in media format, append the catalog number with "M".

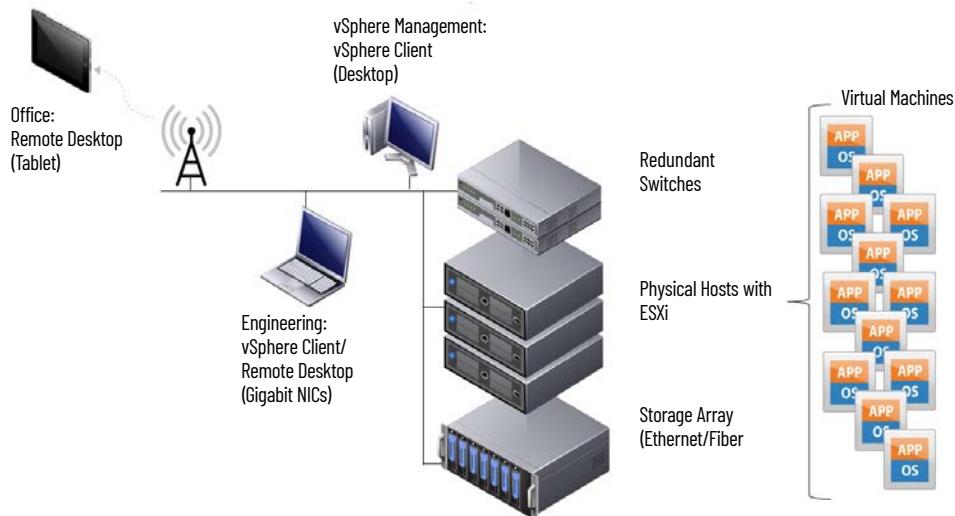
For example: 9528C-PAXUPGT11M

### Included in the Bundle

Description	Subscription License
FactoryTalk AssetCentre Base	9515-FTACT2T
FactoryTalk AssetCentre Base Update	9515U-FTACT2T
FactoryTalk AssetCentre Base Support	RSSPN-FTACT21 (8 x 5 Support) RSSPN-FTACT22 (24 x 7 Support)
FactoryTalk AssetCentre Inventory Agent	9515-FTACTIAENT
FactoryTalk AssetCentre Inventory Agent Update	9515U-FTACRT7T
FactoryTalk AssetCentre Inventory Agent Support	RSSPN-FTACRT71 (8 x 5 Support) RSSPN-FTACRT72 (24 x 7 Support)
My Equipment Portal Subscription	9300-MYEQUIP
Activation	9528-PAXPASSUPGE

## Virtual Infrastructure

Virtualization breaks the dependency between operating system and physical hardware. Multiple virtual machines (VMs) can run different operating systems and applications from various locations on the same server. You can upgrade hardware without stopping your operation or replacing the operating system on the server or workstation system elements, thus reducing downtime and maintenance costs.



A VM behaves exactly like a physical computer because the VM contains its own 'virtual' CPU, RAM, hard disk drive, and network interface card. The VM runs as an isolated guest OS installation.

**Table 2 - Virtual Infrastructure Components**

Model Type	Description
Industrial Data Center <ul style="list-style-type: none"> <li>E-2000 supports 2 host servers</li> <li>E-3000 supports 3 host servers</li> </ul>	<p>The Industrial Data Center (IDC) is a centralized hub for hosting virtual servers and workstations. The IDC pre-assembled unit includes on-site commissioning of your system by a Rockwell Automation representative.</p> <p>Each IDC is in a cabinet (19 in.) that includes host servers and the following:</p> <ul style="list-style-type: none"> <li>Rockwell Automation support</li> <li>1 management server</li> <li>Software defined storage</li> <li>VMware vSphere standard</li> <li>VMware vCenter standard</li> <li>Redundant server access switches</li> <li>Virtual machine backup solution</li> </ul> <p>Optional items:</p> <ul style="list-style-type: none"> <li>Expands up to 10 physical servers</li> <li>UPS or redundant UPS</li> <li>Thin clients</li> </ul>

**Table 2 - Virtual Infrastructure Components**

Model Type	Description
VersaVirtual™ Appliance • VersaVirtual 1000 supports 1 host server • VersaVirtual 2000 supports 2 host servers	<p>For purchase information, contact your local distributor or Rockwell Automation sales representative. Provide the representatives with a list of applications that you plan to deploy in an IDC.</p> <p>For more information, see the Industrial Data Center Product Profile, publication <a href="#">GSMN-PP001</a>.</p> <p>The VersaVirtual Appliance is a hyperconverged (computing, networking, and storage) appliance for entry-level virtualization in a managed environment. One server can run multiple operating systems. The appliance can support as many as 15 applications.</p> <p>Each application includes the host servers and the following:</p> <ul style="list-style-type: none"> <li>• Rockwell Automation support</li> <li>• Pre-engineered and configured virtualization software</li> <li>• 1 management server (VersaVirtual 2000 only)</li> <li>• Software defined storage (VersaVirtual 2000 only)</li> <li>• VMware vSphere standard</li> <li>• VMware vCenter foundation</li> <li>• 2x10G copper uplink ports</li> </ul> <p>For more information, see <a href="#">VersaVirtual Appliance</a>.</p>
Stratus ztC Edge • Stratus ztC Edge 250i	<p>ztC Edge from Stratus brings the benefits of virtualization and fault-tolerant computing to the industrial edge. Rugged, hot-swappable nodes can deploy on DIN rails inside the control cabinet. Run a PASS-C with additional capabilities on the ztC Edge to form a solution-in-a-box for smaller locations.</p> <p>For purchase information, contact your distributor.</p> <p>For more information, see <a href="#">ztC Edge</a>.</p>

Rockwell Automation offers virtual image templates as an option to deploy the PlantPAx distributed control system. The PlantPAx Virtual Image Templates deliver the core system elements as pre-configured, drop-in templates. For ease of operation and to help reduce cost, each single virtual image template can be reused.

**Table 3 - Virtual Image Templates on USB Devices**

Virtual Template	Cat. No.	Description
PASS	9528-PASSVTENM	USB device contains the virtual image template for the PASS. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated.
PASS-C	9528-PASSCVTENM	USB device contains the virtual image template for the PASS-C. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated.
EWS	9528-EWSVTENM	USB device contains the virtual image template for the EWS. The End User is responsible for acquiring the appropriate Microsoft OS license for Windows 10. All required Rockwell Automation software is pre-installed but not activated.
OWS	9528-OWSVTENM	USB device contains the virtual image template for the OWS. The end user is responsible for acquiring the appropriate Microsoft OS license for Windows 10. All required Rockwell Automation software is pre-installed but not activated.
AppServ-OWS, AppServ-EWS	9528-APPXWSENM	USB device contains the virtual image template for AppServ-OWS and AppServ-EWS. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated. You must purchase the appropriate Windows CAL from a Microsoft distributor. <b>IMPORTANT:</b> Each client needs an RDS CAL license.
AppServ-Info (Historian)	9528-APPHISENM	USB device contains the virtual image template for AppServ-Info (Historian). The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated.
AppServ-Asset	9528-APPASMEMN	USB device contains the virtual image template for AppServ-Asset. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated.
AppServ-Info (SQL)	9528-APPSQLENM	USB device contains the virtual image template for AppServ-Info (SQL). The End User is responsible for acquiring both the appropriate Microsoft OS license for Server 2019 and Microsoft SQL Server.
AppServ-Batch	9528-APPBATENM	USB device contains the virtual image template for AppServ-Batch. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. Most required Rockwell Automation software isn't activated. The FactoryTalk Batch software is not pre-installed for your convenience.
Domain controller	9528-PADCVTENM	USB device contains the virtual image template for a Domain controller. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. You must purchase the appropriate quantity of Windows CALs from a Microsoft distributor.

Each template USB device includes one OS system for each applicable type. If you're considering virtualization, we suggest that you visit the [Rockwell Automation Industrial Networks website](#).

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## **Template Distribution**

Obtain PlantPAx virtual image templates by the following methods:

Media - Order a physical copy of the virtual image template. Only the latest virtual image templates are available via physical media. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019 or Windows 10.

Electronic Software Delivery (ESD) - You must purchase licensed media before downloading an electronic copy of the virtual image template from the Product Compatibility and Download Center (PCDC) website. The latest and previous versions of the virtual image templates are available for download from the PCDC.

For additional information, see the PlantPAx Template User Manual, publication [9528-UM001](#).

## **VMware Component Requirements**

The VMware vCenter server provides a centralized platform for managing your VMware vSphere environments. The virtual desktop and virtual server require resources from the physical infrastructure to operate. When you purchase hardware, consider future expansion plans by adding an additional 20...30% of resources. VMware makes it simple to scale the system size upward by adding servers in the future to provide additional resources.

Remember to divide the total system requirements by the minimum number of servers that are required to run the system at any given time. For example, with a three-server system that uses VMware fault tolerance or high availability, you divide by two. This type of calculation makes sure that the system can continue to run with two servers if one server fails.

## VMware Sizing

Virtual Machines are limited by the CPU megahertz of the physical core. A common misconception is that a VM can use as much CPU megahertz as needed from the combined total available. One vCPU VM never uses more megahertz than the maximum of one CPU/core. If a VM has two vCPUs, it never uses more megahertz than the maximum of each CPU/core.

**Table 4 - CPU and PlantPAx Resource Requirements**

Server and Workstation Type	vCPU	vRAM (GB)	vHardDisk (GB)
Process Automation Domain Controller (PADC)	1	4	40
Process Automation System Server (PASS)	4	16	60
Process Automation System Server - Consolidated (PASS-C)	4	32	120
Operator Workstation (OWS)	2	4	40
Engineering Workstation (EWS)	2	8	100
Operator Workstation Application Server (AppServ-OWS)	8	16	60
Engineering Workstation Application Server (AppServ-EWS)	4	16	100
Information Management Application Server Historian (AppServ-Info Historian)	2	4	120
Information Management Application Server SQL (AppServ-Info SQL)	2	4	120
Asset Management Server (AppServ-Asset)	2	4	60
Batch Management Server (AppServ-Batch)	2	4	60
VMware vCenter Server <sup>(1)</sup>	2	12	600
System Reservation (specify percent to be reserved)	10	—	—

(1) These requirements are for vCenter version 7.0. Depending on the version of vCenter used, these requirements may change. Verify the requirements with VMWare.

## Reference Network Topologies

PlantPAx reference topologies take advantage of converged architectures, that support:

- Access to device webpages throughout the architecture
- Access to the data in smart process devices from outside the local network

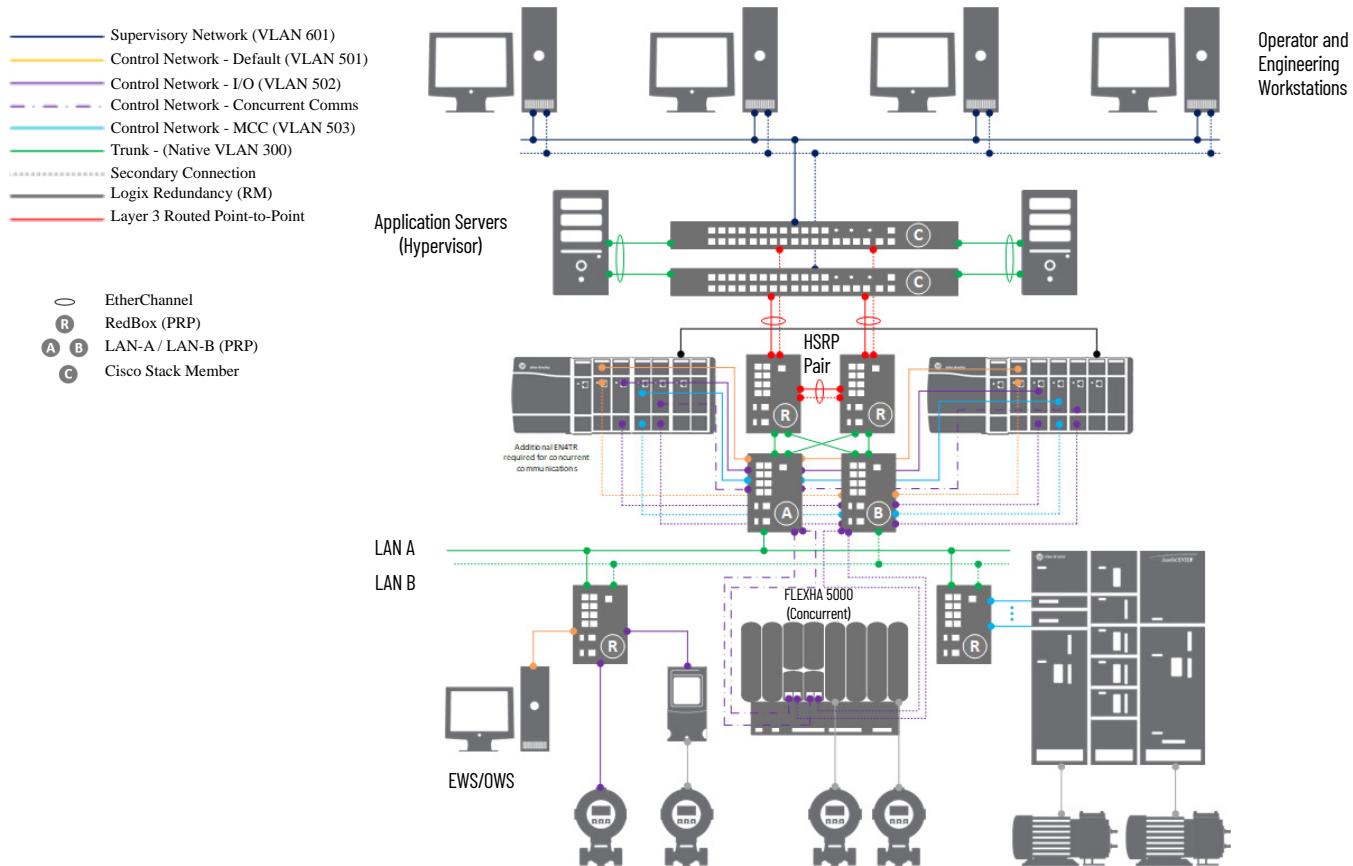
These reference topologies include:

- [Example 1: Redundant PRP Topology](#)
- [Example 2: Resilient DLR Topology](#)
- [Example 3: Simplex - Star Topology](#)
- [Example 4 A: PRP Skid and MCC Lineup](#)
- [Example 4 B: DLR Skid and MCC Lineup](#)
- [Example 4C: Simplex Skid and MCC Lineup](#)

## Example 1: Redundant PRP Topology

Redundant PRP topology is used for critical operations, and includes infrastructure duplication, multiple fault tolerance capability, zero recovery time within the PRP zone, and minimal recovery time for traffic leaving the PRP zone. Redundant PRP recommendations include:

- 10 controllers per topology (pair of redundant Redboxes)
- In a redundant Redbox configuration, do not connect anything other PRP and uplink ports
- Ports in the PRP channel group can't be configured for other resiliency protocol, such as DLR or Resilient Ethernet Protocol (REP).



**Table 5 - Properties of Example 1 Architecture**

Redundant PRP Topology	
Why would I select this architecture?	Most robust option for operations that require high availability. PRP requires double the cabling and components to establish no single point of failure. For a true no single point of failure capabilities, PlantPAx recommends redundant power sources along with separate physical paths for media.
What protocols does it use?	<ul style="list-style-type: none"> <li>• Implementation of EtherChannel for hardware redundancy between servers and workstations</li> <li>• EIGRP (Enhanced Interior Gateway Routing Protocol) provides Layer 3 routing capabilities</li> <li>• HSRP provides redundant PRP 'RedBox' functionality</li> <li>• PRP provides dual connectivity between two devices</li> <li>• RedBox (redundancy box) is a switch with PRP technology that connects devices without PRP technology to both LAN A and LAN B</li> </ul>
What components do I need?	<ul style="list-style-type: none"> <li>• Cisco® Catalyst® 9300 or 3850 stack switches</li> <li>• Redundant application servers via physical or virtualized environments</li> <li>• Pair of Layer 3 PRP enabled Stratix® switches:             <ul style="list-style-type: none"> <li>- Stratix® 5410 (used if GPS, multiple PRP channels, rack-mount format, or AC power is required)</li> <li>- Stratix 5400</li> </ul> </li> <li>• Duplicate LAN A/B Layer 2 infrastructure switches:             <ul style="list-style-type: none"> <li>- Stratix 5400</li> <li>- Stratix 5700</li> </ul> </li> <li>• Non-PRP devices require Stratix 5400 switch to enable VDAN support</li> <li>• 1756, 5015 and 5094 I/O families support PRP</li> </ul>

## Example 2: Resilient DLR Topology

Resilient DLR topology helps prevent communication loss between devices if a fault occurs. Multiport devices (embedded EtherNet/IP™ ports) equipped with DLR technology connect directly to neighboring nodes and form a ring topology at the end devices. If a break in the network is detected, the network provides an alternate forwarding path for the data to help recover the network. DLR recommendations include:

- 10 controllers per topology
- In a dual gateway configuration, do not connect anything other DLR and uplink ports
- Maximum of 50 switch nodes per ring
- Single VLAN per ring
- PlantPAx does not recommend DLR trunking or DLR DHCP
- Place at least 1 meter of cable between each DLR device
- Additional EN4TR required for concurrent communications

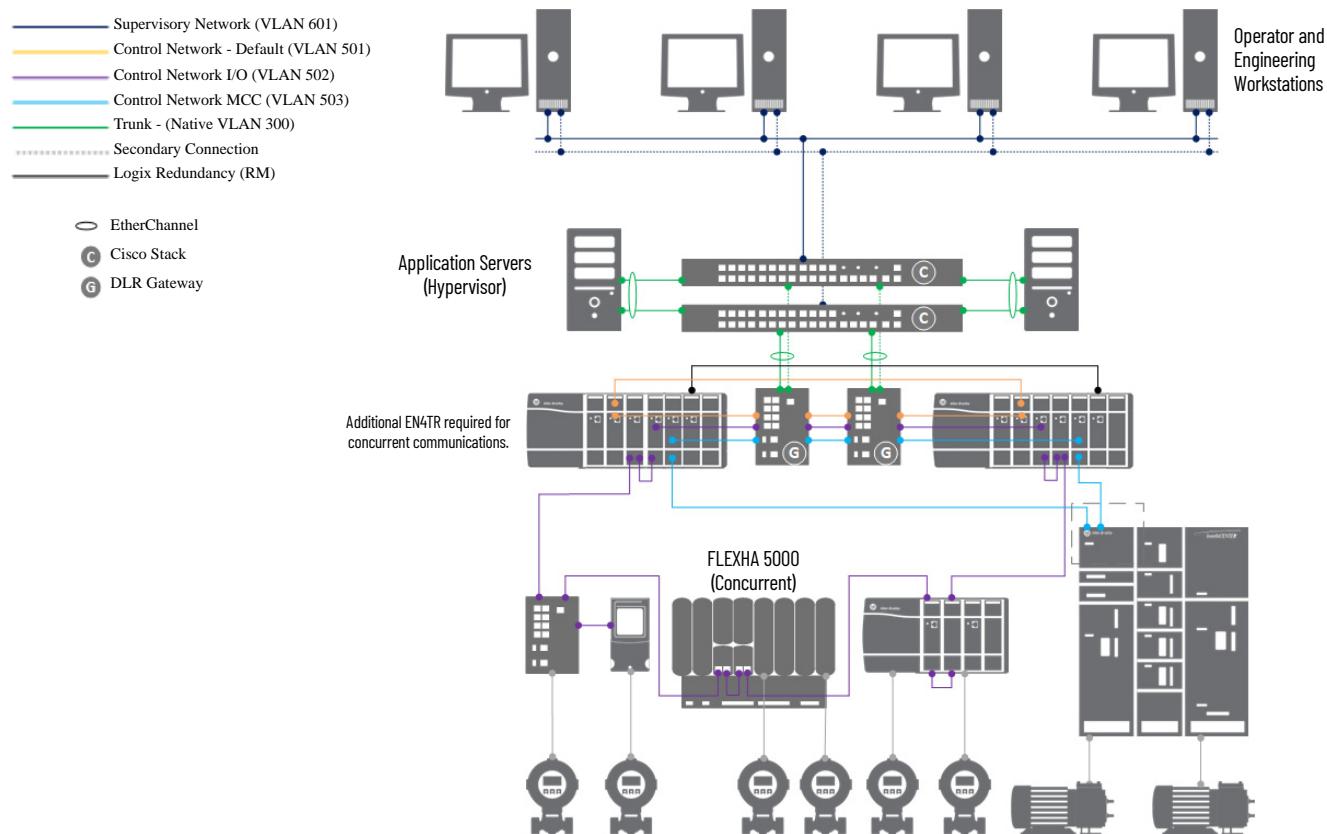
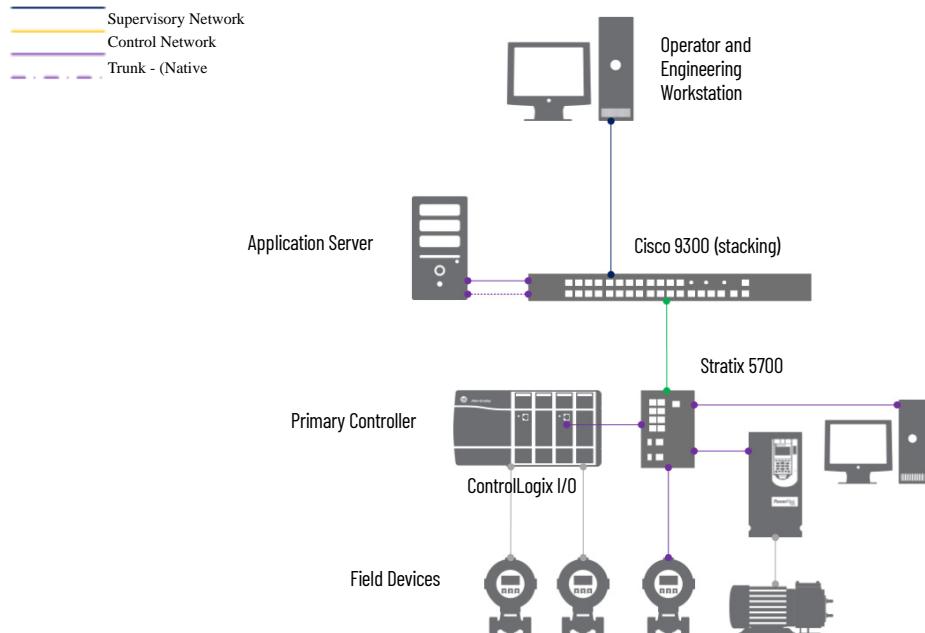


Table 6 - Properties of Example 2 Architecture

Resilient DLR Topology	
Why would I select this architecture?	This architecture provides a means to detect, monitor, manage, and recover from one fault ring-based network. You can use redundant gateways to provide DLR network resiliency to the rest of the network.
What protocols does it use?	<ul style="list-style-type: none"> <li>• Implementation of EtherChannel for hardware redundancy between servers and workstations</li> <li>• EIGRP (Enhanced Interior Gateway Routing Protocol) provides Layer 3 routing capabilities; this protocol is used within the Cisco® Catalyst® switches</li> <li>• DLR is a ring topology that recovers after one point of failure (3 msec or less)</li> </ul>
What components do I need?	<ul style="list-style-type: none"> <li>• Cisco Catalyst 3850, 9300 stack switches</li> <li>• Redundant application servers via physical or virtualized environments</li> <li>• DLR gateway capable switches (if you need multiple rings, use a Stratix 5400 or 5410 switch)</li> <li>• DLR capable Stratix switches</li> <li>• DLR capable Ethernet modules</li> </ul> <p>Check I/O device specifications to verify DLR support.</p>

## Example 3: Simplex - Star Topology

Simplex - Star topology features single network connections throughout the topology. There's no redundancy so connected nodes can't communicate on the network if there's a network failure.

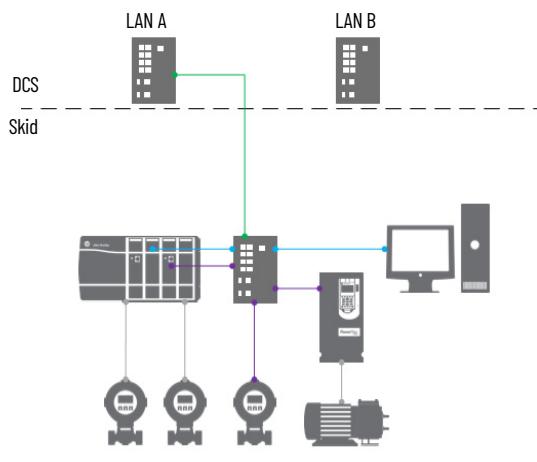


**Table 7 - Properties of Example 3 Architecture**

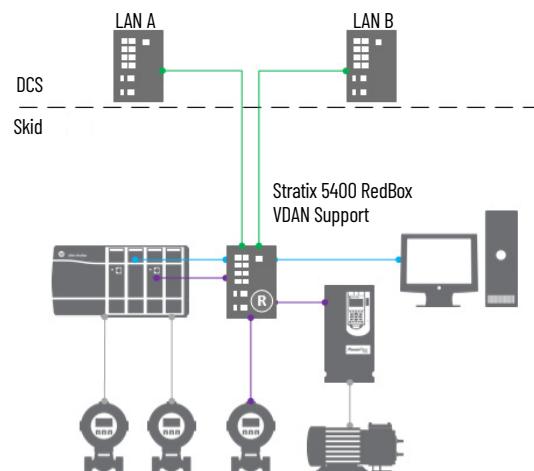
Simplex - Star Topology	
Why would I select this architecture?	This architecture provides a basic network configuration. You can monitor and control non-critical equipment. However, there's no ability to recover from an architectural fault.
What protocols does it use?	<ul style="list-style-type: none"><li>• EtherNet/IP™ backbone between devices in a star topology</li><li>• EtherChannel is optional</li><li>• NIC teaming is optional.</li></ul>
What components do I need?	<ul style="list-style-type: none"><li>• Layer 2 Stratix switches</li><li>• Ethernet capable devices</li></ul>

## Example 4 A: PRP Skid and MCC Lineup

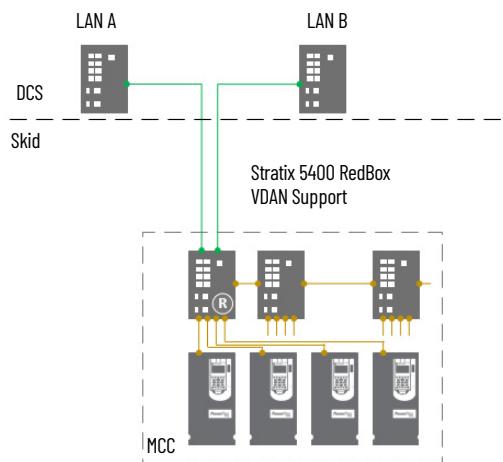
PRP Simplex Connection to Either LAN A/B



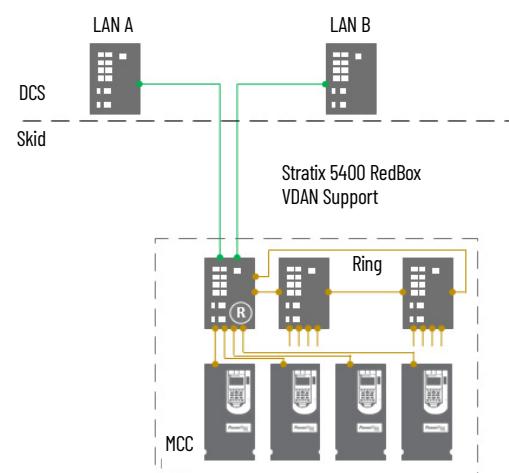
PRP DCS LAN A/B Infrastructure



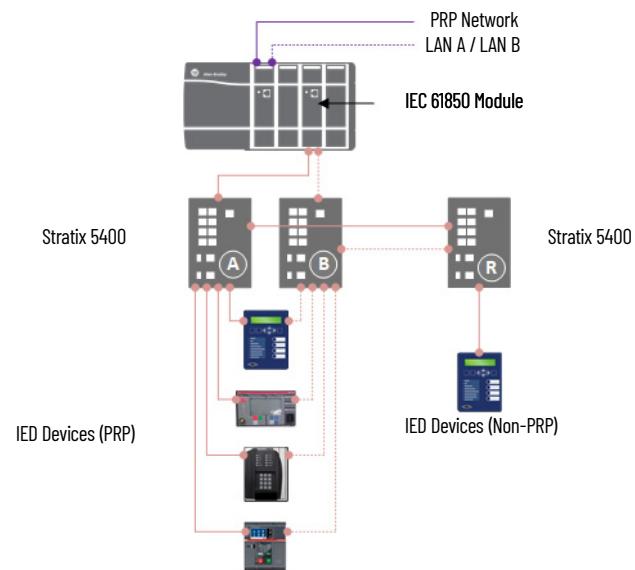
PRP MCC RedBox Connected to LAN A and LAN B



PRP MCC Connected to LAN A/B with DLR Ring

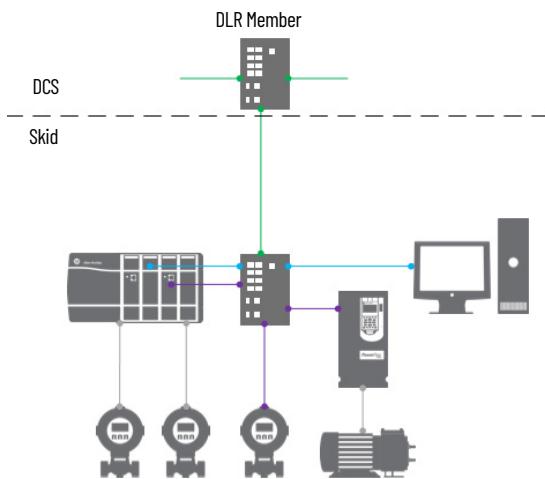


Redundant-PRP IEC 61850

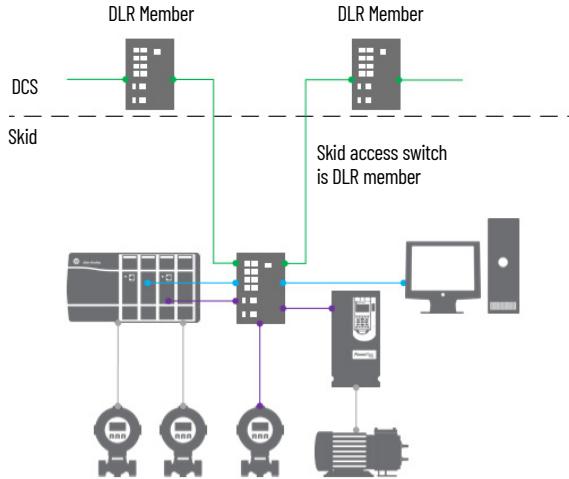


## Example 4 B: DLR Skid and MCC Lineup

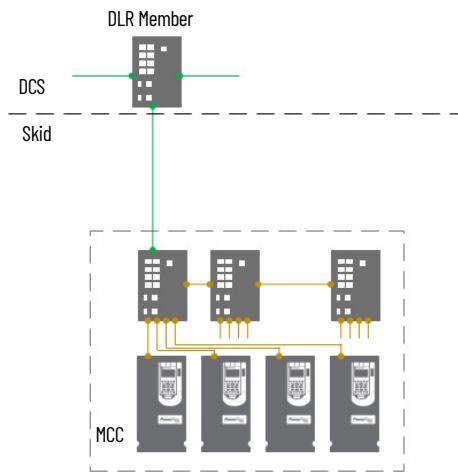
DLR Simplex Connection to Either LAN A/B



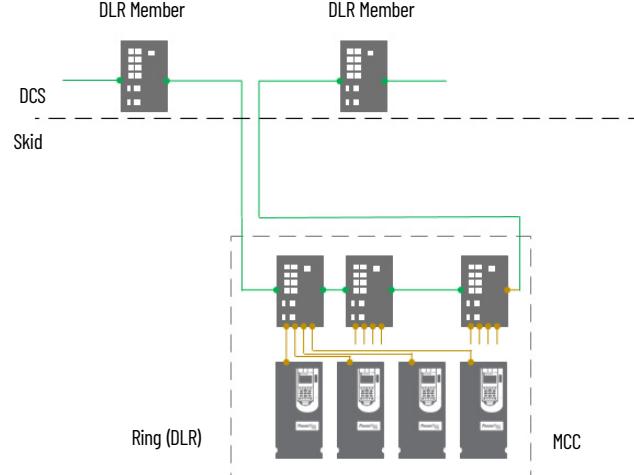
DLR DCS Integration



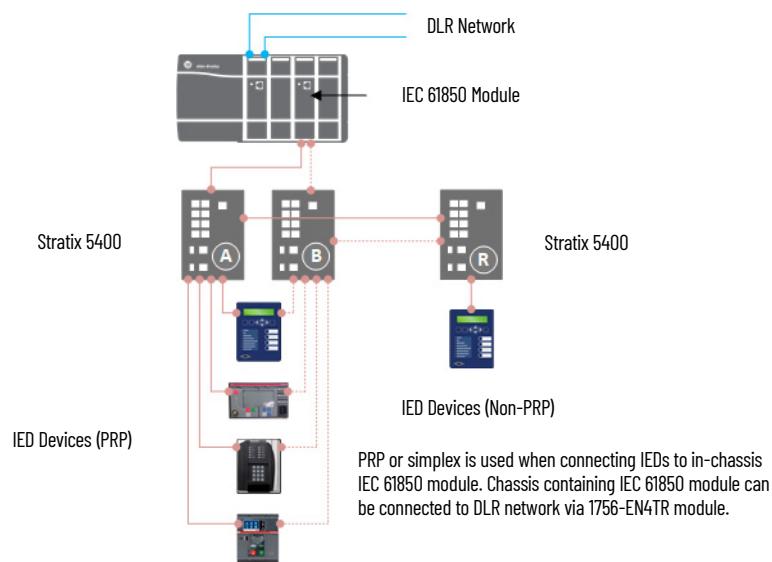
DLR Simplex/MCC Connection to DLR Ring Switch



DLR MCC Lineup as part of the DCS DLR Ring

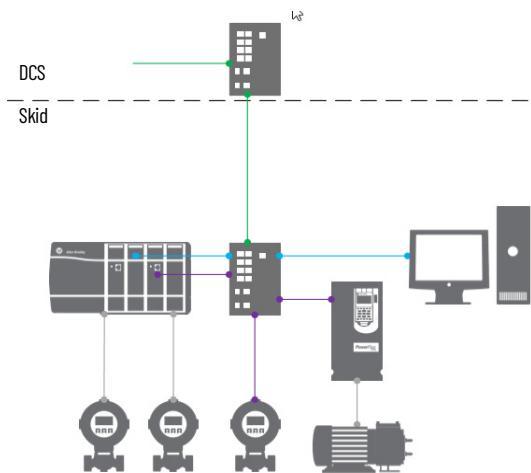


Resilient-DLR IEC 61850

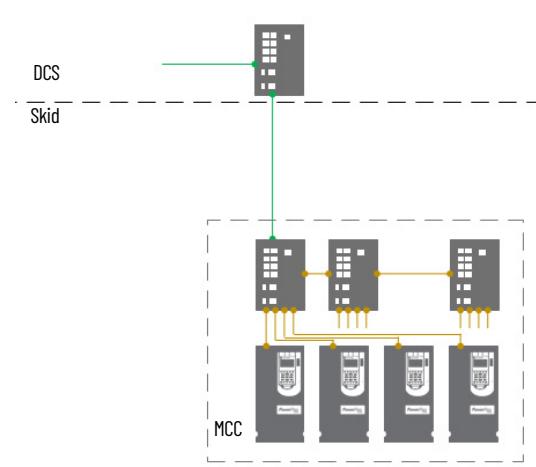


## Example 4C: Simplex Skid and MCC Lineup

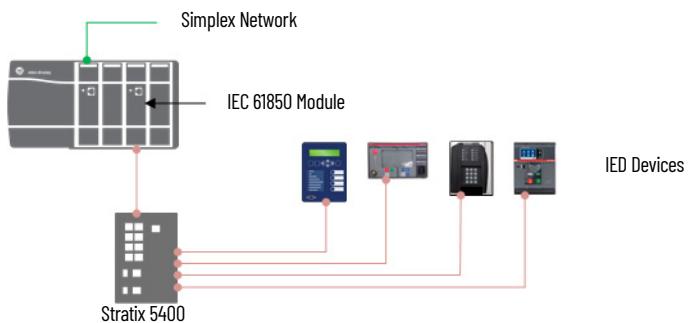
Simplex Connection to Simplex DCS



Simplex MCC Connection to Simplex DCS



Simplex IEC 61850



The supervisory layer of the PlantPAx system can include several servers and workstations. This section explains the server and workstation system elements to help you define a bill of materials.

### PASS Servers

The Process Automation System Server (PASS) is a required system element that hosts essential software components to run the system. The essential software components include the data server, HMI server, and alarm server.

You must determine how many PASS servers are needed for your architecture. If your system requires multiple servers, acquaint yourself with the following descriptions of the data, HMI, and alarm servers.

**Table 8 - PASS Server Software Components**

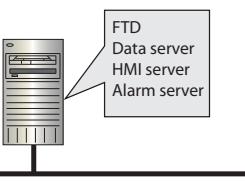
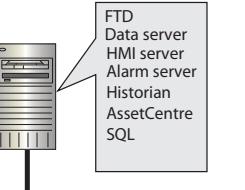
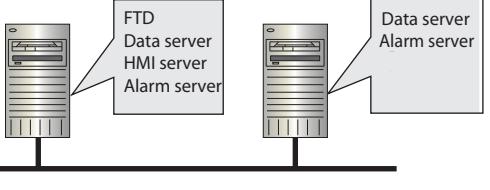
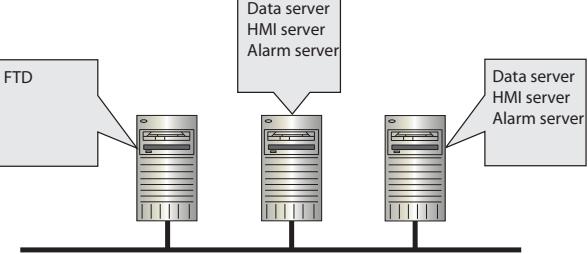
Software Components	Description
FactoryTalk® Directory (FTD) server <sup>(1)</sup>	Secures information from multiple Rockwell Automation software components across multiple computers and allows central administration throughout the PlantPAx system. Application components, such as display and security settings, can be stored in their original environments and made available to the entire PlantPAx system without the need for duplication.
FactoryTalk Activation server <sup>(1)</sup>	The FactoryTalk Activation server is part of the FactoryTalk® Services Platform. The server is used for FactoryTalk-enabled software products to be activated via files generated by Rockwell Automation over the Internet. This server essentially manages the files that are required to license Rockwell Automation products on the PlantPAx system.
FactoryTalk View HMI server	The human machine interface (HMI) server is configured within your FactoryTalk View SE application. The HMI server stores HMI project components, such as graphic displays, and serves these components to OWSs upon request. The HMI server can also manage tag databases and log historical data. Multiple HMI servers can exist on the PlantPAx system. Each HMI server must be on a separate PASS.
FactoryTalk View Data server (FactoryTalk Linx)	The Data server component provides access to information from the process controllers to servers and workstations on the PlantPAx system. The Data server that is mentioned in PlantPAx documentation generally refers to the Rockwell Automation Device servers. Data servers are configured within your FactoryTalk View SE application. A single PASS can host up to 2 instances of FactoryTalk Linx.
FactoryTalk View Data server (OPC UA connector)	The OPC UA connector provides access to data and alarms from OPC UA servers and devices. The OPC UA connector is configured within your FactoryTalk View SE application. No additional licensing is required to use the OPC UA data connector. PlantPAx recommends hosting the OPC UA connector on a dedicated PASS with no more than 50,000 OPC UA tags and 5,000 OPC UA alarms and conditions.
FactoryTalk View Alarm and Event server	The Alarm and Event server publishes information from controllers and servers available to all subscribing OWSs. Alarm and Event servers are configured within your FactoryTalk View SE application. You can install only one Alarm and Event server on a PASS. <ul style="list-style-type: none"><li>• PlantPAx System Release 5. supports Logix tag-based alarms. These device level, tag-based alarms monitor a tag value to determine the alarm condition. Tag-based alarms aren't part of the logic program and do not increase the scan time for a project. The controller caches information, such as time stamps, alarm states, and associated tag values in a 1000 KB buffer. The controller transmits the information to subscribing FactoryTalk Alarm &amp; Event servers.</li><li>• For server tag-based alarms a FactoryTalk® Alarms and Events server monitors controllers for alarm conditions through data servers and publishes event information that can be displayed and logged.</li></ul>
Optional	
FactoryTalk Batch client software	If a Batch Application server is being used on the system, FactoryTalk Batch client components are required to support replication of batch-related objects on the displays to the OWS.

(1) In redundant PASS configurations, this component is included on the primary PASS only.

## Determine the Number of PASS Servers

The following graphics illustrate how many servers are needed when you aren't considering redundancy options.

**Table 9 - Non-redundant Server Options**

Server Options	Description
<b>Option 1 - One PASS System Server</b>  	<p>This option has all essential software components that are housed in one PASS server. The components are FTD, Data server, HMI server, and alarm and event server. There are additional system elements, such as batch management, asset management, and FactoryTalk Historian. You can deploy these elements on separate servers or you can deploy elements on the same server as detailed in Option 2.</p> <p>One HMI server license is required.</p>
<b>Option 2 - One PASS Consolidated Server (small systems)</b>  	<p>The PASS - C option is for valid small systems with fewer than 2000 I/O points. With this option, you can locate multiple system elements on the same virtual image template. A USB device contains the system elements that are shown in the illustration for Option 2.</p> <p>One HMI server license is required.</p>
<b>Option 3 - Multiple PASS Servers (additional data capacity)</b>  	<p>This option contains all software components in one server as shown in Option 1. Option 3 also adds another server for extra data and alarm capacity without adding another HMI server. If the PASS server is being used as a data server, and additional capacity is needed, you can add more PASS servers. Use the PSE to determine if more PASS servers are needed. We recommend that you have an HMI server on the PASS if you're segregating the application into individual operational areas. See Option 4.</p> <p>One HMI server license is required.</p>
<b>Option 4 - Multiple PASS Servers (logically segregated plant)</b>  	<p>Place the FTD on its own server to manage applications that exist on multiple client servers. If an area must be shut down, the other separate areas aren't affected because the FTD is on its own server. For example, you can perform maintenance on one area without affecting another operational area of the plant. FTD can be a workstation class machine.</p> <p>An HMI server license is required for each PASS that contains an HMI server.</p> <p>The benefits of placing the FactoryTalk Directory on a dedicated server include:</p> <ul style="list-style-type: none"> <li>• <b>System Startup:</b> It's best if the FTD is the first component to start and the last to stop. Because most FactoryTalk software products rely on the various services that are provided by the FTD, the lowest risk scenario is to have it available as these products are initializing.</li> <li>• <b>Compatibility:</b> While all versions are generally compatible, the FTD is occasionally required to be at the highest version of FTSP installed in the system. This requirement can interfere with another FactoryTalk component if the FTD is co-located with another product.</li> <li>• <b>Patching/Upgrading:</b> Patching an FTD hosted on a dedicated computer translates to minimum system downtime, as it isn't affecting the operation of other FactoryTalk components while rebooting.</li> <li>• <b>Redundancy:</b> In redundant systems (for example, FactoryTalk View SE, FactoryTalk® Linx, FactoryTalk Alarms and Events), it's best if the FTD remains available during any failover scenarios. While the redundant server pair can function without the presence of the FTD, the lowest risk scenario is keeping it available.</li> </ul>

Redundancy can be added to be sure of the availability of critical operations. For PASS servers, you can choose the level of redundancy that you need. When a PASS is made redundant, typically all above elements that are hosted on the PASS are made redundant.

The PASS-C can be made redundant by duplicating the hardware as well. Redundant data servers impact controller memory and communication bandwidth.

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**Table 10 - PASS Requirements**

Category	Requirement <sup>(1)</sup>
Hardware - virtual infrastructure	<p>Required:</p> <ul style="list-style-type: none"><li>• 4 vCPU</li><li>• 16 GB vRAM min</li><li>• 60 GB vHardDisk</li></ul> <p>Recommended CPU and memory allocation:</p> <ul style="list-style-type: none"><li>• High priority Resource pool</li></ul>
Hardware - traditional infrastructure	The PASS must be installed on server-class hardware. The following are sample specifications that are based on PlantPAx system characterization: <ul style="list-style-type: none"><li>• Intel® Xeon Multicore processor (4 cores or greater)</li><li>• 2.40 GHz CPU min</li><li>• 16 GB RAM min</li><li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure it supports redundant media)</li></ul>
Operating system	Windows® Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

**Table 11 - PASS-C Requirements**

Category	Requirement
Hardware - virtual infrastructure	The PASS-C was tested in a virtual environment using the Stratus zTC Edge 110i with{ <ul style="list-style-type: none"><li>• Intel i7-8700T (or greater)</li><li>• 2.4GHz GHz CPU min</li><li>• 32 GB RAM min</li><li>• Redundant Ethernet media</li></ul>
Hardware - traditional infrastructure	For systems with fewer than 2000 I/O points, the PASS - Consolidated contains HMI, data collection, decision-making, and asset management servers. These combined tools form a basic PlantPAx system in one server, referred to as consolidated. The PASS must be installed on a server-class computer. The following are sample specifications that are based on PlantPAx system characterization: <ul style="list-style-type: none"><li>• Intel® Xeon E3-1270 v5 (or greater)</li><li>• 3.60 GHz CPU min</li><li>• 32 GB RAM min</li><li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure it supports redundant media)</li></ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

The PASS requires that you purchase an HMI server license. If the PASS server isn't being used as an HMI server, then no license purchase is required. Make sure to account for process displays, faceplates, and navigation devices in your display count. All displays of the Rockwell Automation Library of Process Objects count against your display count license.

Whether you deploy a PASS system element in a traditional or virtual architecture, you must purchase the proper activations.

**Table 12 - PASS Software and Licenses**

Category	Cat. No.
Virtual Image Template	<ul style="list-style-type: none"> <li>• 9528-PASSVTENM USB device contains a virtual image template that has pre-installed applications that are required on the PASS.</li> <li>• 9528-PASSCVTENM USB device contains a virtual image template that contains a consolidated PASS. The template has pre-installed applications that can be used on a PASS within the documented constraints for a PASS-C.</li> </ul>
Rockwell Automation software licenses	<p>Select the following for the first/main PASS in your system when the PASS is used as an HMI server:<sup>(1)(2)</sup></p> <ul style="list-style-type: none"> <li>• 9528x-PASS05T3y (PlantPAX PASS Small 5-Client)</li> <li>• 9528x-PASS10T2y (PlantPAX PASS Medium 10-Client)</li> <li>• 9528x-PASS25T1y (PlantPAX PASS Large 25-Client)</li> </ul> <p>Select the following for a PASS that will be a redundant/secondary HMI Server:</p> <ul style="list-style-type: none"> <li>• 9701x-VWRVRT3y (Redundant Server Unlimited Display)</li> </ul>
Rockwell Automation software licenses (for PASS-C) <sup>(3)</sup>	<p>Select one copy per project of the following:<sup>(1)(2)</sup></p> <ul style="list-style-type: none"> <li>• 9528x-PASS05T3y (PlantPAX PASS Small 5-Client)</li> <li>• 9528x-PASS10T2y (PlantPAX PASS Medium 10-Client)</li> </ul> <p>Select any quantity of the following up to 60,000 tags total:<sup>(3)</sup></p> <ul style="list-style-type: none"> <li>• 9518x-HSTT1y (FactoryTalk Historian SE 1,000 Tags)</li> <li>• 9518x-HST5KT4y (FactoryTalk Historian SE 5,000 Tags)</li> <li>• 9518x-HST10KT5y (FactoryTalk Historian SE 10,000 Tags)</li> <li>• 9518x-HST20KT6y (FactoryTalk Historian SE 20,000 Tags)</li> <li>• 9518x-HST50KT7y (FactoryTalk Historian SE 50,000 Tags)</li> </ul> <p>FactoryTalk Batch when required:</p> <ul style="list-style-type: none"> <li>• 9358x-FTBT1y (FactoryTalk Batch Server - 1 Unit)</li> <li>• 9358x-FTBT5y (FactoryTalk Batch Server - 3 Units)</li> <li>• 9358x-FTBT2y (FactoryTalk Batch Server - 10 Units)</li> <li>• 9358x-FTBT6y (FactoryTalk Batch Server - 30 Units)</li> <li>• 9358x-FTBT3y (FactoryTalk Batch Server - 60 Units)</li> </ul>

(1) When your system has two or more PASS servers that are HMI servers, purchase the FactoryTalk View SE software licenses.

(2) Where: x = M (perpetual use license) or C (subscription license) and y = 1 (8x5 support) or 2 (24x7 support)

(3) If necessary, the end user is responsible for acquiring the Microsoft SQL Server license.

## Engineering Workstation (EWS)

The engineering workstation (EWS) supports system configuration, application development, and maintenance functions. The EWS is the central location for monitoring and maintaining the systems operation. The recommended limit is five EWS per system.

**Table 13 - EWS Virtual Requirements**

Category	Requirement <sup>(1)</sup>
Hardware	<p>Required:</p> <ul style="list-style-type: none"> <li>• 2 vCPU</li> <li>• 8 GB vRAM min</li> <li>• 100 GB vHardDisk</li> </ul> <p>Recommended CPU and memory allocation:</p> <ul style="list-style-type: none"> <li>• Normal priority Resource pool</li> </ul>
Operating system	Windows 10 operating system, 64 bit
Additional third-party software	Antivirus software

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

**Table 14 - EWS Traditional Requirements**

Category	Requirement
Hardware	The EWS must be installed on workstation-class hardware. The following are sample specifications that are based on PlantPAX system characterization: <ul style="list-style-type: none"> <li>• Intel Core 2 Duo (or greater)</li> <li>• 2.40 GHz CPU min</li> <li>• 8 GB RAM min</li> <li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</li> </ul>
Operating system	Windows 10 operating system, 64 bit
Additional third-party software	Antivirus software

Whether you deploy an EWS system element in a traditional or virtual architecture, you must purchase the proper activations.

**Table 15 - EWS Automation System Software and License**

Category	Cat. No.
Virtual Image Template	<ul style="list-style-type: none"> <li>• 9528-EWSVTENM</li> </ul> <p>USB device contains a virtual image template that has pre-installed all applications that are required on the EWS.</p>
Rockwell Automation software license	<p>The following licenses enable the software tools that are deployed on the EWS:<sup>(1) (2)</sup></p> <ul style="list-style-type: none"> <li>• 9324x-RLDT3y</li> <li>• 9701x-VWSSPT3y</li> <li>• 9701x-VWSDRT1y</li> </ul>

(1) Where: x = M (perpetual use license) or C (subscription license)

(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)

## Engineering Workstation Application Server (AppServ-EWS)

The AppServ-EWS uses ThinManager® or Microsoft Remote Desktop Services (RDS) technology to serve multiple instances of the EWS as thin clients from one server. Thin clients can run applications and process data on a remote computer. The recommended limit is five active and connected RDS client connections per AppServ-EWS. The application server can host up to 10 clients, but only five are to be active at one time.

**Table 16 - AppServ-EWS Virtual Requirements**

Category	Requirement <sup>(1)</sup>
Hardware	<p>Required:</p> <ul style="list-style-type: none"> <li>• 4 vCPU</li> <li>• 16 GB vRAM min</li> <li>• 100 GB vHardDisk</li> </ul> <p>Recommended CPU and memory allocation: Normal priority Resource pool</p>
Thin client	We recommend a maximum of five active and connected FactoryTalk View SE clients per application server.
Operating system	Windows Server 2019 operating system, 64 bit

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

Whether you deploy an AppServ-EWS system element in a traditional or virtual architecture, you must purchase the proper activations.

**Table 17 - AppServ-EWS Automation System Software and License**

Category	Cat. No.
Virtual Image Template	<ul style="list-style-type: none"> <li>• 9528-APPXWSENM</li> </ul> <p>USB device contains a virtual image template that has pre-installed all applications that are required on the EWS.</p>
Rockwell Automation software license <b>IMPORTANT:</b> The identified set of Rockwell Automation licenses must be purchased for each client that is connected to the AppServ-EWS.	<p>The following licenses enable the software tools that are deployed on an EWS client:<sup>(1) (2)</sup></p> <ul style="list-style-type: none"> <li>• 9324x-RLDT3y</li> <li>• 9701x-VWSSPT3y</li> <li>• 9701x-VWSDRT1y</li> </ul>

(1) Where: x = M (perpetual use license) or C (subscription license)

(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)

## Operator Workstations (OWS)

The operator workstation (OWS) provides the graphical view and interface into the process. The OWS supports operator interaction and isn't meant to support development or maintenance activities, although these activities are possible if desired.

**Table 18 - OWS Virtual Requirements**

Category	Requirement <sup>(1)</sup>
Hardware	Required: <ul style="list-style-type: none"><li>• 2 vCPU</li><li>• 4 GB vRAM min</li><li>• 40 GB vHardDisk</li></ul> Recommended CPU and memory allocation: <ul style="list-style-type: none"><li>• High priority Resource pool</li></ul>
Operating system	Windows 10 operating system, 64 bit
Additional third-party software	Antivirus software

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

**Table 19 - OWS Traditional Requirements**

Category	Requirement
Hardware	The OWS must be installed on workstation-class hardware. The following are sample specifications that are based on PlantPAx system characterization: <ul style="list-style-type: none"><li>• Intel Core 2 Duo (or greater)</li><li>• 2.40 GHz CPU min</li><li>• 4 GB RAM min</li><li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</li></ul>
Operating system	Windows 10 operating system, 64 bit
Additional third-party software	Antivirus software

Whether you deploy an OWS system element in a traditional or virtual architecture, you must purchase proper activations.

**Table 20 - OWS Automation System Software and License**

Category	Cat. No.
Virtual image template	• 9528-OWSVTENM USB device contains a virtual image template that has pre-installed all applications that are required on the OWS.
Rockwell Automation software license	For each OWS: <sup>(1)</sup> <sup>(2)</sup> <ul style="list-style-type: none"><li>• 9701x-VWSDRT1y</li></ul>

(1) Where: x = M (perpetual use license) or C (subscription license)

(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)

## Operator Workstation Application Servers (AppServ-OWS)

The AppServ-OWS uses Microsoft Remote Desktop Services (RDS) technology to serve multiple instances of the OWS as thin clients from one server. Thin clients can run applications and process data on a remote computer to minimize the amount of information on a network. The AppServ-OWS is only configured to run FactoryTalk View SE clients and the recommended limit is 10 clients per application server.

**Table 21 - AppServ-OWS Virtual Requirements**

Category	Requirement <sup>(1)</sup>
Hardware	Required: <ul style="list-style-type: none"><li>• 8 vCPU</li><li>• 16 GB vRAM min</li><li>• 60 GB vHardDisk</li></ul> Recommended CPU and memory allocation: <ul style="list-style-type: none"><li>• High priority Resource pool</li></ul>
Operating system	Windows Server 2019 operating system, 64 bit
Thin client	We recommend a maximum of 10 FactoryTalk View SE clients per application server.
Additional third-party software	Antivirus software

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

Whether you deploy an AppServ-OWS system element in a traditional or virtual architecture, you must purchase the proper activations.

**Table 22 - AppServ-OWS Automation System Software and License**

Category	Cat. No.
Virtual image template	<ul style="list-style-type: none"><li>• 9528-APPXWSENM</li></ul> USB device contains a virtual template for the AppServ-OWS.
Rockwell Automation software license <b>IMPORTANT:</b> The identified set of Rockwell Automation licenses must be purchased for each client that is connected to the AppServ-OWS.	Purchase a license for each client that the AppServ-OWS servers: <sup>(1) (2)</sup> <ul style="list-style-type: none"><li>• 9701x-VWSDRT1y</li></ul>

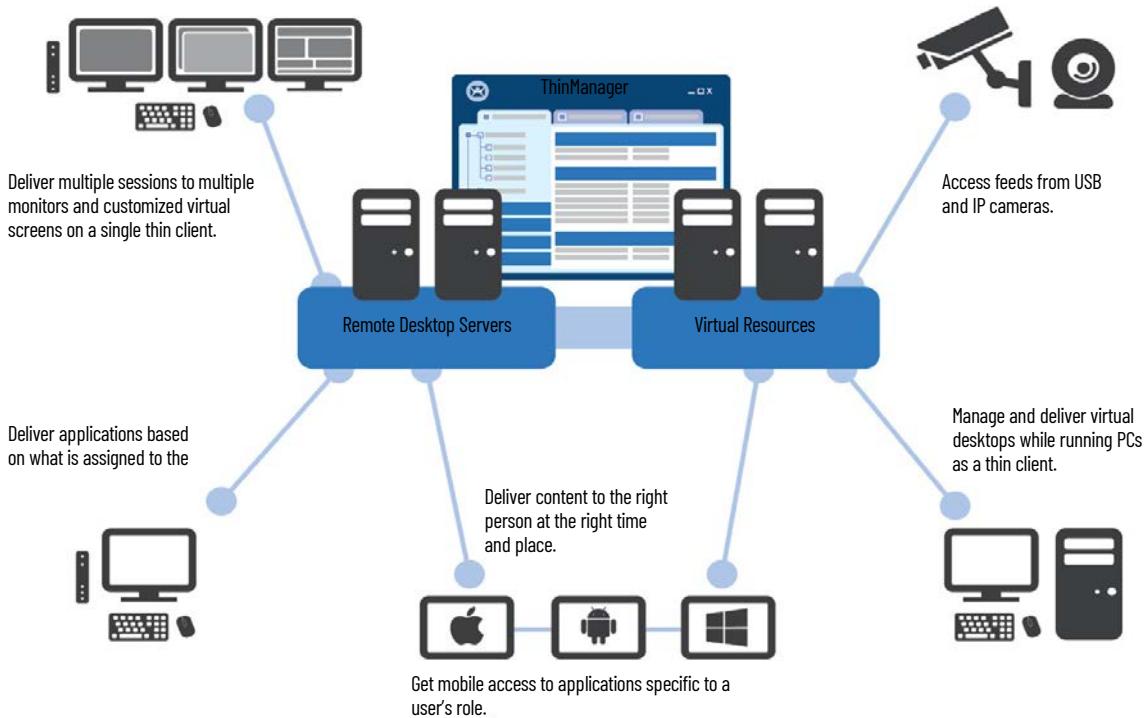
(1) Where: x = M (perpetual use license) or C (subscription license)

(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)

## ThinManager Server Options

The AppServ-OWS system element virtual-image template is pre-configured with Remote Desktop Services (RDS). The AppServ-OWS includes the ThinManager Server installation file. You can configure the AppServ-OWS as your ThinManager Server and deploy up to 10 OWS sessions to simplify the management of all devices and users.

ThinManager increases your productivity, visualization, mobility, and security from a centralized, and scalable management platform.



Safely and securely deliver your content to any combination of device, user, and location with the following features:

- Boost productivity by reducing the time that is spent in managing computers
- Enhance visualization by delivering your content to where you need it and the way you want it to be shown
- Extend security through encrypted communications, Active Directory, and secure thin clients
- Smart mobility where QR Codes, Bluetooth, Wi-Fi, and GPS make sure that devices receive content in authorized areas

For more information, see [Thin Client Management Software](#).

## Independent Workstations (IndWS)

The independent workstation (IndWS) combines the roles of the PASS, EWS, and OWS in one computer. This workstation can be used as a 'shadow system' for emergency purposes.

**Table 23 - IndWS Traditional Requirements**

Category	Requirement
Hardware	<p>The IndWS must be installed on workstation-class hardware. The following are sample specifications that are based on PlantPax system characterization:</p> <ul style="list-style-type: none"> <li>• Intel Multicore processor (4 cores or greater)</li> <li>• 2.40 GHz CPU min</li> <li>• 16 GB RAM min</li> <li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</li> </ul> <p>There's no virtual template for the IndWS.</p>
Operating system	Windows 10 operating system, 64 bit
Additional third-party software	Antivirus software

If you deploy an IndWS system element, you must purchase the proper activations.

**Table 24 - IndWS Automation System Software and Licenses**

Category	Cat. No. <sup>(1)</sup> (2)
Rockwell Automation software licenses	<p>One per IndWS if being used as EWS:</p> <ul style="list-style-type: none"><li>• 9324x-RLDT3y (Studio 5000 Professional Edition Design Environment Software)</li></ul> <p>Select one of the following:</p> <ul style="list-style-type: none"><li>• - 9701x-VWSTNBOLT4y (FactoryTalk View SE Station Bundle: Unlimited Displays)</li></ul>

(1) Where: x = M (perpetual use license) or C (subscription license)

(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)

## Information Management Application Servers (AppServ-Info)

Information management application servers (AppServ-Info) represent a broad category of servers and software that provides value to the PlantPAx system by offering data management and decision support functionalities. Except where specifically noted, all options that are listed must be installed on their own servers to maximize performance.

**Table 25 - Data Management Options**

Category	Requirement	Option
Time series	<ul style="list-style-type: none"><li>• High-speed, on-machine data collection</li><li>• &lt; 2500 tags</li></ul>	Information Management server is optional because you can use an embedded historian module for the ControllLogix chassis (FactoryTalk Historian ME). If the Factory Talk Historian ME module is collecting 2500 points per second, the duration of history that is stored is approximately 14 hours. <ul style="list-style-type: none"><li>• 1756-HIST2G (2 GB)</li></ul>
	<ul style="list-style-type: none"><li>• Longer term data storage</li><li>• &gt; 2500 tags</li></ul>	An Information Management server is required with FactoryTalk Historian SE software.
Event based	Relational database	An additional AppServ-Info server can be considered for the storage of transactional data. You can select a Microsoft SQL server database to act as the central collection point for event-based data: <ul style="list-style-type: none"><li>• FactoryTalk Alarm and Event data</li><li>• FactoryTalk Batch data</li></ul> This database can be installed on an Information Management server or another server on your system.

Additional tools to support your information management strategies include:

**Table 26 - Decision Support Options**

Category	Description
FactoryTalk Historian ProcessBook software	An Information Management server is required to enable ProcessBook content (standard ProcessBook displays, SQC view, batch view, alarm view). The content is to be hosted and displayed from within FactoryTalk View SE by using the ProcessBook Runtime.

## AppServ-Info (Historian)

One of the ways to configure the AppServ-Info is as a historian to collect data. Follow these guidelines if you're adding a Historian server to your PlantPAx system.

**Table 27 - AppServ-Info (Historian) Virtual Requirements**

Category	Requirement <sup>(1)</sup>
Hardware	Required: <ul style="list-style-type: none"><li>• 2 vCPU</li><li>• 4 GB vRAM min</li><li>• 120 GB vHardDisk</li></ul> Recommended CPU and memory allocation: <ul style="list-style-type: none"><li>• Normal priority Resource pool</li></ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

**Table 28 - AppServ-Info (Historian) Traditional Requirements**

Category	Requirement
Hardware	The Information Management server must be installed on server-class hardware: <ul style="list-style-type: none"><li>• Intel Xeon Multicore processor (4 cores or greater)</li><li>• 2.40 GHz CPU min</li><li>• 4 GB RAM min</li><li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</li></ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

Whether you deploy a Historian system element in a traditional or virtual architecture, you must purchase the proper activations.

**Table 29 - FactoryTalk Historian Software and Licenses**

Category	Cat. No. <sup>(1)(2) (3)</sup>
Virtual image template	• 9528-APPHISENM USB device contains a virtual template for the AppServ-Info (Historian).
Rockwell Automation software license	Select one of the licenses: <ul style="list-style-type: none"><li>• 9518x-HSTT1y (FactoryTalk Historian SE - 1,000 tags)</li><li>• 9518x-HTS5KT4y (FactoryTalk Historian SE - 5,000 tags)</li><li>• 9518x-HST10KT51y (FactoryTalk Historian SE - 10,000 tags)</li><li>• 9518x-HST20KT6y (FactoryTalk Historian SE - 20,000 tags)</li><li>• 9518x-HST50KT7y (FactoryTalk Historian SE - 50,000 tags)</li></ul> <b>Note:</b> order these in quantities to meet your need not to exceed a total of 60,000 tags.
FactoryTalk Historian Vision Client	Select for each client that is using FactoryTalk Historian Vision Client: <ul style="list-style-type: none"><li>• 9518x-HSTRT4y (FactoryTalk Historian Vision Client - Single User)</li></ul>
Excel® Add-in	• 9518x-HSTRT3y (Historian SE, DataLink Client, 5 Users)

(1) If you plan to use redundant Historian for high availability, you must license an equivalent number of tags for the redundant Historian.

(2) Where: x = M (perpetual use license) or C (subscription license)

(3) Where: y = 1 (8x5 support), y = 2 (24x7 support)

## **AppServ-Info (SQL)**

Another way to configure AppServ-Info is as a Microsoft SQL Server relational database. Software such as FactoryTalk AssetCentre, and FactoryTalk Batch use a SQL Server database to store and access process data. The FactoryTalk Alarm and Event server uses a SQL Server database to store information.

The process library includes standard reports that support basic and advanced alarm and event reports along with per process object reporting.

**Table 30 - AppServ-Info (SQL) Virtual Requirements**

Category	Requirement <sup>(1)</sup>
Hardware	Required: <ul style="list-style-type: none"><li>• 2 vCPU</li><li>• 4 GB vRAM min</li><li>• 120 GB vHardDisk</li></ul> Recommended CPU and memory allocation: <ul style="list-style-type: none"><li>• Normal priority Resource pool</li></ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

**Table 31 - AppServ-Info (SQL) Traditional Requirements**

Category	Requirement
Hardware	The Information Management server must be installed on server-class hardware: <ul style="list-style-type: none"><li>• Intel Xeon Multicore processor (4 cores or greater)</li><li>• 2.40 GHz CPU min</li><li>• 4 GB RAM min</li><li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</li></ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Microsoft SQL Server Antivirus software

Microsoft SQL Server is licensed in one of two ways: Server + CAL or Per Core. 'CAL' is an abbreviation for client access license. Server+CAL licensing is recommended for fewer clients. Every additional client requires a CAL license. Per Core licensing provides unlimited number of CALs.

Whether you deploy a Microsoft SQL Server system element in a traditional or virtual architecture, you must purchase the proper licensing. The End User is responsible for acquiring the appropriate Microsoft SQL Server licensing.

Category	Requirement
Virtual image template	<ul style="list-style-type: none"><li>• 9528-APPSQLENM</li></ul> USB device contains a virtual template for the AppServ-Info (SQL).

## **Asset Management Servers (AppServ-Asset)**

An asset management server (AppServ-Asset) is an extension to the PlantPAx system that adds maintenance and plant operations to the system with FactoryTalk AssetCentre software. This server provides controller data backup for disaster recovery, diagnostics, and real-time monitoring. The server also audits assets and monitors network health to improve overall resource availability.

The asset management server provides centralized system management for Rockwell Automation and third-party field assets.

**Table 32 - AppServ-Asset Virtual Requirements**

Category	Requirement <sup>(1)</sup>
Hardware	<p>Required:</p> <ul style="list-style-type: none"> <li>• 2 vCPU</li> <li>• 4 GB vRAM min</li> <li>• 60 GB vHardDisk</li> </ul> <p>Recommended CPU and memory allocation:</p> <ul style="list-style-type: none"> <li>• Normal priority Resource pool</li> </ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

**Table 33 - AppServ-Asset Traditional Requirements**

Category	Requirement
Hardware	<p>The Asset Management server must be installed on server-class hardware:</p> <ul style="list-style-type: none"> <li>• Intel Xeon Multicore processor (4 cores or greater)</li> <li>• 2.40 GHz CPU min</li> <li>• 4 GB RAM min</li> <li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</li> </ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

**Table 34 - AppServ-Asset Software and Licenses**

Category	Cat. No. <sup>(1)</sup> (2)
Virtual image template	<ul style="list-style-type: none"> <li>• 9528-APPASMEMN USB device contains a virtual template for the AppServ-Asset.</li> </ul>
Rockwell Automation software license	<ul style="list-style-type: none"> <li>• 9515x-FTACT2y (FactoryTalk AssetCentre Base) A license for AssetCentre Base isn't required when the system included a PASS licensed using a SystemID bundle as it is already included.</li> </ul>
Asset licenses	<p>Select one or more of the following so that the sum of licenses is equal to or greater than the number of assets that is to be managed by the Asset Management server:<sup>(3)</sup></p> <ul style="list-style-type: none"> <li>• 9515x-FTACRT9y (FactoryTalk AssetCentre 25 Assets)</li> <li>• 9515x-FTACRT1y (FactoryTalk AssetCentre 100 Assets)</li> </ul>
Virtual server disaster recovery licenses	<p>If disaster recovery is to be used, select from the following:</p> <ul style="list-style-type: none"> <li>• 9515x-FTACRT10y (Disaster recovery for Rockwell Automation)</li> <li>• 9515x-FTACRT2y (Disaster recovery for remote computers)</li> </ul>

(1) Where: x = M (perpetual use license) or C (subscription license)

(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)

(3) The server license, included with the System ID bundle, includes 10 assets.

Whether you deploy an AppServ-Asset system element in a traditional or virtual architecture, you must purchase the proper activations.

## Batch Management Servers (AppServ-Batch)

PlantPAx systems support scalable options for batch management that are based on ISA88 standards:

Feature	Logix Batch & Sequence Manager	SequenceManager™	FactoryTalk® Batch
Deployment	Logix controller code	Firmware-based controller feature	Server-based application (AppServ-Batch)
Supported controllers	ControlLogix 5580 CompactLogix 5380 ControlLogix 5570 CompactLogix 5370	ControlLogix 5570 CompactLogix 5370	ControlLogix 5580 CompactLogix 5380 ControlLogix 5570 CompactLogix 5370
Units	Single unit recipes	Single unit recipes	Multiple unit recipes
Phase construction	PhaseManager™ programs	PhaseManager programs	PhaseManager programs
Phase interface	Phase and bit logic	Pull-down menu	Pull-down menu
Max recipes/steps/phases	32	Limited by memory or resources	Limited by memory or resources
Max input/report parameters	4	No max	No max
Parameter expressions	No	Yes	Yes
Parameter data types	BOOL REAL	BOOL INT, INT, DINT REAL	BOOL SINT, INT, DINT REAL
Procedural structure	Sequential Concurrent	Sequential Concurrent Divergent Recurrent	Sequential Concurrent Divergent Recurrent
Recipe design	Tabular HMI configured	SFC like	SFC like
Recipe editing	Runtime via HMI	Import only at runtime	Runtime editing via Recipe Editor
HMI integration	Faceplates	3 Active X	4 Active X API
Batch reporting	Queue controller services	Event client and archive services	Event client and archive services
FactoryTalk Batch integration	No	Yes	Na
Dynamic unit binding	No	No	Yes
Unit arbitration	No	No	Yes

The batch management server (AppServ-Batch) offers equipment-independent recipe management, batch-independent equipment control, and regulatory compliance.

**Table 35 - AppServ-Batch Virtual Requirements**

Category	Requirement <sup>(1)</sup>
Hardware	<p>Required:</p> <ul style="list-style-type: none"> <li>• 2 vCPU</li> <li>• 4 GB vRAM min</li> <li>• 60 GB vHardDisk</li> </ul> <p>Recommended CPU and memory allocation:</p> <ul style="list-style-type: none"> <li>• Normal priority Resource pool</li> </ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

**Table 36 - AppServ-Batch Traditional Requirements**

<b>Category</b>	<b>Requirement</b>
Hardware	The Batch Management server must be installed on server-class hardware: <ul style="list-style-type: none"> <li>• Intel Xeon Multicore processor (4 cores or greater)</li> <li>• 2.40 GHz CPU min</li> <li>• 4 GB RAM min</li> <li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</li> </ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

**Table 37 - AppServ-Batch Software and Licenses**

<b>Category</b>	<b>Cat. No. (1) (2)</b>
Virtual image template	<ul style="list-style-type: none"> <li>• 9528-APPBATENM</li> </ul> <p>USB device contains a virtual template for the AppServ-Batch.</p>
Batch unit software licenses	<p>Purchase multiple licenses to obtain the desired number of batch units.</p> <ul style="list-style-type: none"> <li>• 9358x-FTBT1y (FactoryTalk Batch Server – 1 Unit)</li> <li>• 9358x-FTBT5y (FactoryTalk Batch Server – 3 Units)</li> <li>• 9358x-FTBT2y (FactoryTalk Batch Server – 10 Units)</li> <li>• 9358x-FTBT6y (FactoryTalk Batch Server – 30 Units)</li> <li>• 9358x-FTBT3y (FactoryTalk Batch Server – 60 Units)</li> </ul>
Batch backup software licenses	<p>If a back-up server is required, obtain the equivalent number of units of back-up keys.</p> <ul style="list-style-type: none"> <li>• 9358x-FTBRT1y (FactoryTalk Batch Back-up Key – 1 Unit)</li> <li>• 9358x-FTBRT4y (FactoryTalk Batch Back-up Key – 3 Units)</li> <li>• 9358x-FTBRT2y (FactoryTalk Batch Back-up Key – 10 Units)</li> <li>• 9358x-FTBRT5y (FactoryTalk Batch Back-up Key – 30 Units)</li> <li>• 9358x-FTBRT3y (FactoryTalk Batch Back-up Key – 60 Units)</li> </ul>
eProcedure® software licenses	<p>eProcedure is included with Batch licenses that are listed. These catalog numbers are to order software separately.</p> <ul style="list-style-type: none"> <li>• 9358x-FTBEPT1y (FactoryTalk Batch eProcedure– 3 Units)</li> <li>• 9358x-FTBEPT2y (FactoryTalk Batch eProcedure– 10 Units)</li> <li>• 9358x-FTBEPT3y (FactoryTalk Batch eProcedure– 30 Units)</li> <li>• 9358x-FTBEPT4y (FactoryTalk Batch eProcedure– 60 Units)</li> </ul>
eProcedure backup software licenses	<p>eProcedure is included with Batch licenses that are listed. These catalog numbers are to order software separately.</p> <ul style="list-style-type: none"> <li>• 9358x-FTBEPT1y (FactoryTalk Batch eProcedure Back-up Key – 3 Units)</li> <li>• 9358x-FTBEPT2y (FactoryTalk Batch eProcedure Back-up Key – 10 Units)</li> <li>• 9358x-FTBEPT3y (FactoryTalk Batch eProcedure Back-up Key – 30 Units)</li> <li>• 9358x-FTBEPT4y (FactoryTalk Batch eProcedure Back-up Key – 60 Units)</li> </ul>
Batch View Clients	<p>Each license enables one concurrent user to access FactoryTalk Batch from a remote browser.</p> <ul style="list-style-type: none"> <li>• 9358x-FTBT4y (FactoryTalk Batch View Standard)</li> </ul>

(1) Where: x = M (perpetual use license) or C (subscription license)

(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)

Whether you deploy an AppServ-Batch in a traditional or virtual architecture, you must purchase the proper activations.

Batch high availability options depend on the hardware and software options in the system:

- For the application server in a system where a bump in the process cannot be tolerated, FactoryTalk Batch software helps support a real-time, uninterrupted high availability option. This option leverages Stratus servers or VMware virtualization.
- Standard FactoryTalk Batch software supports a warm back-up option that allows a Batch server to start up and rebuild the active batches from the Event Journals and Logs and places them on the batch list in a held state.
- A redundant ControlLogix system with PhaseManager software provides protection so that the control platform continues to execute during a hardware failure.

## Domain Controllers

PlantPAx uses a domain controller to store user account information, authenticate users, and enforce security policies. Follow these guidelines for the domain controller:

- A domain controller is required if there are 10 or more workstations or servers.
- A domain controller is a separate computer. Do not load any application software on a domain controller. Load all system application software on the other computers, such as the PASS, application server, OWS, and EWS.
- The domain controller must be local to the system workstations and servers (within the local firewall) and not remote to the system.

**Table 38 - Domain Virtual Requirements**

Category	Requirement <sup>(1)</sup>
Hardware	Required: <ul style="list-style-type: none"><li>• 1 vCPU</li><li>• 4 GB vRAM min</li><li>• 40 GB vHardDisk</li></ul> Recommended CPU and memory allocation: <ul style="list-style-type: none"><li>• Low-priority Resource pool</li></ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

**Table 39 - Domain Traditional Requirements**

Category	Requirement
Hardware	The Information Management server must be installed on server-class hardware: <ul style="list-style-type: none"><li>• Intel Xeon Multicore processor (4 cores or greater)</li><li>• 2.40 GHz CPU min</li><li>• 4 GB RAM min</li><li>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure it supports redundant media)</li></ul>
Operating system	Windows Server 2019 operating system, 64 bit
Additional third-party software	Antivirus software

**Table 40 - Domain Software**

Category	Requirement
Virtual image template	<ul style="list-style-type: none"><li>• 9528-PADCVTENM</li></ul> USB device contains a virtual template for the AppServ-Asset.

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**Notes:**

The optimal number of controllers for the PlantPAx system depends on the size of your application, physical layout of your plant, and the design of your process. Consider segregating non-related process equipment into separate controllers so that maintenance activities in one area do not impact the operation of another area.

PlantPAx system release 5.0 adds process controllers to the Logix 5000® family of controllers. The process controller is an extension of the Logix 5000 controller family that focuses on plant-wide process control. The process controller is preconfigured with a default process tasking model and dedicated PlantPAx process instructions that are optimized for process applications to improve design and deployment efforts.

Regardless of which type of controller that you use, controllers are capacity limited. This capacity can be roughly estimated based on I/O count, but is also greatly impacted by the design of your application. These limitations can include the amount of automation code that is required, the amount of information being read by supervisory applications, and the number of alarms configured in your system.

**Table 41 - Process and Standard Controller Hardware**

Category	Cat. No.
Process controllers	<ul style="list-style-type: none"> <li>• ControlLogix 1756-L81EP, 1756-L83EP, 1756-L85EP</li> <li>• CompactLogix 5069-L320ERP, 5069-L340ERP</li> </ul>
Standard controllers	<ul style="list-style-type: none"> <li>• ControlLogix 1756-L71, 1756-L72, 1756-L73, 1756-L74, 1756-L75, 1756-L81E, 1756-L82E, 1756-L83E, 1756-L84E, 1756-L85E</li> <li>• CompactLogix 1769-L24ER-0, 1769-L33ER, 1769-L36ERM, 1769-L37ERM, 1769-L38ERM</li> </ul>
Standard Ethernet interfaces (ControlLogix)	<ul style="list-style-type: none"> <li>• For direct PRP connection: 1756-EN4TR, 1756-EN2TP</li> <li>• For direct DLR connection: 1756-EN4TR, 1756-EN2TR</li> <li>• For secure connections: 1756-EN2TSC</li> </ul>

## Simplex Controllers

Non-redundant controllers are referred to as simplex controllers.

**Table 42 - Simplex - Process Controllers**

Category <sup>(1)</sup>	1756-L81EP	1756-L83EP	1756-L85EP
User memory	3 MB	10 MB	40 MB
PID loop control strategies @ 100 ms max		570	
PID loop control strategies @ 250 ms max	185	625	1425
PID loop control strategies @ 500 ms max			2000
PID loop control strategies @ 1000 ms max			
Tags/sec delivered to data server max	50,000		
Logix tag based alarms max	7500		

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system.  
For more detailed sizing, please use the PlantPAx System Estimator included in the Integrated Architecture Builder software.

**Table 43 - Simplex - Standard Controllers**

<b>Category<sup>(1)</sup></b>	<b>1756-L71</b>	<b>1756-L72</b>	<b>1756-L73</b>	<b>1756-L74</b>	<b>1756-L75</b>	<b>1756-L81E</b>	<b>1756-L82E</b>	<b>1756-L83E</b>	<b>1756-L84E</b>	<b>1756-L85E</b>		
User memory	2 MB	4 MB	8 MB	16 MB	32 MB	3 MB	5 MB	10 MB	20 MB	40 MB		
PID loop control strategies @ 100 ms max	75	85					235	425	500			
PID loop control strategies @ 250 ms max			215						1250			
PID loop control strategies @ 500 ms max			175	430		380			910	2000		
PID loop control strategies @ 1000 ms max			800						1875			
Tags/sec delivered to data server max	10,000	20,000					50,000					

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system. For more detailed sizing, please use the PlantPAx System Estimator included in the Integrated Architecture Builder software.

## Redundant Controllers

ControlLogix controllers support redundancy on EtherNet/IP networks. For a PlantPAx system, you need these components:

**Table 44 - Redundant Process and Standard Controller Hardware**

<b>Category</b>	<b>Cat. No.</b>
Process redundant controllers	ControlLogix 1756-L81EP, 1756-L83EP, 1756-L85EP
Standard redundant controllers	<ul style="list-style-type: none"> <li>• ControlLogix 1756-L73, 1756-L74, 1756-L75<sup>(1)</sup></li> <li>• ControlLogix 1756-L81E, 1756-L82E, 1756-L83E, 1756-L84E, 1756-L85E</li> </ul>
Redundancy module	1756-RM2 <sup>(2)</sup>
Standard Ethernet interfaces	<ul style="list-style-type: none"> <li>• For direct PRP connection: 1756-EN4TR, 1756-EN2TR</li> <li>• For direct DLR connection: 1756-EN4TR, 1756-EN2TR</li> </ul> <p>PlantPAx recommends a dedicated Ethernet module for Supervisory communications (Non-Swapping IP addresses) and one or more Ethernet modules for I/O / MCC communications (Swapping IP addresses). For more information, see the ControlLogix 5580 Redundant Controller user manual, publication <a href="#">1756-UM015</a>.</p>

(1) ControlLogix 1756-L71 and 1756-L72 controllers are not recommended for PlantPAx systems due to memory constraints.

(2) The PlantPAx system recommendation is to use only one redundant controller in a chassis with a 1756-RM2 redundancy module.

**Table 45 - Redundant - Process Controllers**

<b>Category<sup>(1)</sup></b>	<b>1756-L81EP</b>	<b>1756-L83EP</b>	<b>1756-L85EP</b>
User memory	3 MB	10 MB	40 MB
PID loop control strategies @ 100 ms max	125		
PID loop control strategies @ 250 ms max	190	325	325
PID loop control strategies @ 500 ms max		625	650
PID loop control strategies @ 1000 ms max			1300
Tags/sec delivered to data server max	50,000		
Logix alarms max	7500		

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system. For more detailed sizing, please use the PlantPAx System Estimator included in the Integrated Architecture Builder software.

**Table 46 - Redundant - Standard Controllers**

<b>Category<sup>(1)</sup></b>	<b>1756-L73</b>	<b>1756-L74</b>	<b>1756-L75</b>	<b>1756-L81E</b>	<b>1756-L82E</b>	<b>1756-L83E</b>	<b>1756-L84E</b>	<b>1756-L85E</b>
User memory	8 MB	16 MB	32 MB	3 MB	5 MB	10 MB	20 MB	40 MB
PID loop control strategies @ 100 ms max	40			65				
PID loop control strategies @ 250 ms max	100			155				
PID loop control strategies @ 500 ms max	150	195		240	315			
PID loop control strategies @ 1000 ms max		315	400		430	625		
Tags/sec delivered to data server max	10,000	20,000		50,000				

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system. For more detailed sizing, please use the PlantPAX System Estimator included in the Integrated Architecture Builder software.

## Controllers for Skid-based Equipment

The CompactLogix controller platform offers a solution for skid-based equipment to be part of the overall PlantPAX system if the application requires the following:

- Control of multiple loops for temperature, pressure, flow, or level
- Operating as a subsystem with sequencing and automation
- Controlled as part of the overall process, accepting reference inputs and delivering process variables to a supervisory controller

**Table 47 - Skid-based Controllers**

<b>Category<sup>(1)</sup></b>	<b>CompactLogix 1769-L24ER-Q</b>	<b>CompactLogix 1769-L33ER</b>	<b>CompactLogix 1769-L36ERM</b>	<b>CompactLogix 1769-L37ERM</b>	<b>CompactLogix 1769-L38ERM</b>	<b>CompactLogix 5069-L320ERP (Process Controller)</b>	<b>CompactLogix 5069-L340ERP (Process Controller)</b>
User memory	0.75 MB	2 MB	3 MB	4 MB	5 MB	2 MB	4 MB
PID Loop Control Strategies @ 100 ms max					65		
PID Loop Control Strategies @ 250 ms max					80		
PID Loop Control Strategies @ 500 ms max	12	35	50	65		125	250
PID Loop Control Strategies @ 1000 ms max							
Tags/sec delivered to data server max			3000			50,000	
Logix alarms max			—			7500	

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system. For more detailed sizing, please use the PlantPAX System Estimator included in the Integrated Architecture Builder software.

## Process Controller Emulation

FactoryTalk Logix Echo (FTLE) is a controller emulation software platform that emulates ControlLogix 5580 controllers. The platform also provides workflows designed to make emulation and program testing more accessible and flexible.

FactoryTalk Logix Echo is available as a subscription, available on the Rockwell Automation Software Portal. The license is a single node license.

## I/O Products

Field networks and I/O components connect process instrumentation and field devices to the PlantPAx system for real-time data acquisition and control. The PlantPAx system supports several families of I/O.

**Table 48 - I/O Communication Interfaces**

Chassis-based I/O modules	1756 ControlLogix I/O	<ul style="list-style-type: none"> <li>• 1756-EN2T, 1756-EN2TP, 1756-EN2TR, 1756-EN3TR, 1756-EN2F, 1756-EN2TXT, 1756-EN2TSC</li> </ul> <p>For more information, see the ControlLogix System Selection Guide, publication <a href="#">1756-SG001</a>.</p>
	5069 Compact 5000™ I/O	<ul style="list-style-type: none"> <li>• 5069-AENTR dual-port EtherNet/IP adapter</li> <li>• 5069-AENTRK dual-port EtherNet/IP adapter, conformal coated</li> <li>• 5069-AEN2TR dual-port EtherNet/IP adapter with display diagnostics, integrated USB port, and SD card</li> </ul> <p>For more information, see Compact 5000 I/O Modules and EtherNet/IP Adapters Specifications Technical Data, publication <a href="#">5069-TD001</a></p>
	1769 Compact I/O™	<ul style="list-style-type: none"> <li>• 1769-AENTR</li> </ul> <p>For more information, see the CompactLogix Communication Modules Specifications Technical Data, publication <a href="#">1769-TD007</a>.</p>
Distributed I/O, low-channel density	1734 POINT I/O™	<ul style="list-style-type: none"> <li>• 1734-AENT, 1734-AENTR EtherNet/IP adapters</li> <li>• 1734-ADN, 1734-ADNX, 1734-PDN DeviceNet® adapters</li> </ul> <p>For more information, see the POINT I/O Modules Selection Guide, publication <a href="#">1734-SG001</a>.</p>
Distributed I/O, high-channel density	5094 FLEX 5000™ I/O	<ul style="list-style-type: none"> <li>• 5094-AENTR, 5094-AENTRXT</li> <li>• 5094-AEN2TR, 5094-AEN2TRXT</li> <li>• 5094-AENSFPR, 5094-AENSFPRXT</li> <li>• 5094-AEN2SFP, 5094-AEN2SFPRT</li> </ul> <p>For more information, FLEX 5000 Modules Specifications Technical Data, see publication <a href="#">5094-TD001</a></p>
	1794 FLEX™ I/O	<ul style="list-style-type: none"> <li>• 1794-AENT, 1794-AENTR, 1794-AENTRXT EtherNet/IP adapters</li> <li>• 1794-ADN, 1794-ADNX DeviceNet adapters</li> <li>• For more information, see the FLEX I/O, FLEX I/O-XT, and FLEX Ex Selection Guide, publication <a href="#">1794-SG002</a>.</li> </ul>
Distributed I/O, no cabinet enclosure	1738 ArmorPOINT® I/O	<ul style="list-style-type: none"> <li>• 1738-AENT, 1738-AENTR EtherNet/IP adapters</li> <li>• 1738-ADN12, 1738-ADN18, 1738-ADN18P, 1738-ADNX DeviceNet adapters</li> </ul> <p>For more information, see the ArmorPoint I/O Selection Guide, publication <a href="#">1738-SG001</a>.</p>
Condition monitoring module	1444 Dynamix™ I/O	<p>Built-in Ethernet connectivity with 1444-DYN04-01RA module</p> <p>For more information, see the Dynamix -1444 Series Monitoring System User Manual, publication <a href="#">1444-UM001</a>.</p>
Redundant I/O	5015 FLEXHA 5000™ I/O <sup>(1)</sup>	<p>5015-AENFTXT Redundant EtherNet/IP adapter.</p> <p>For more information, see the FLEXHA 5000 I/O System Specifications Technical Data, publication <a href="#">5015-TD001</a>.</p>
	1715 Redundant I/O	<p>1715-AENTR Redundant EtherNet/IP adapter</p> <p>For more information, see the 1715 Redundant I/O System Specifications Technical Data, publication <a href="#">1715-TD001</a>.</p>
Intrinsically Safe I/O	1719 Class 1, Div 2 I/O	<p>1719-AENTR Intrinsically safe EtherNet/IP adapter</p> <p>For more information, see the 1719 Ex I/O Technical Data, publication <a href="#">1719-TD001</a>.</p>

(1) Review the FLEXHA 5000 product documentation for limitations on the early release of this product.

**Table 49 - Online Addition of Module and Connection Types**

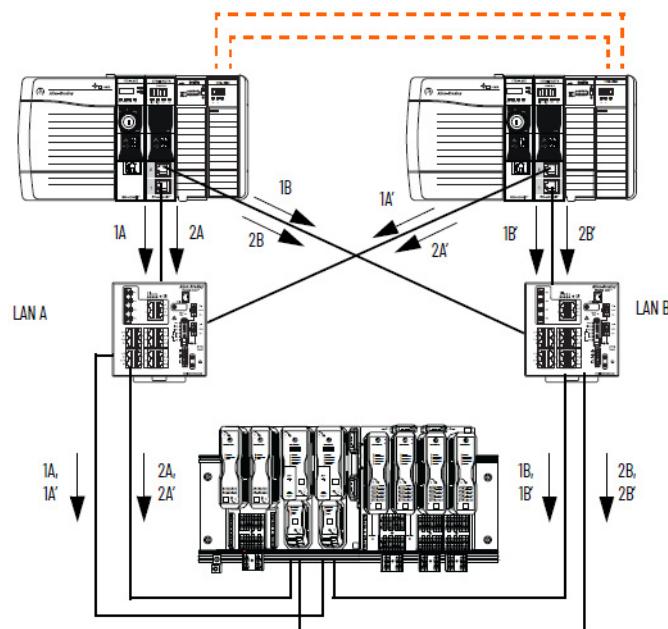
Module Type and Connection Method	In Local Chassis		Remote via an EtherNet/IP Network		Remote via a ControlNet® Network				Configure Hold Last Output State
	Offline	Runtime	Offline	Runtime	Offline		Runtime		Offline only
					Scheduled	Unscheduled	Scheduled	Unscheduled	
Digital - direct	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	Yes - 1756 I/O digital output modules
Digital - rack-optimized	—	—	Yes	Yes	Yes	—	Yes	—	Yes - 1756 I/O digital output modules
Analog - direct	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	Yes
Generic third-party - direct	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—
1715 Redundant I/O	—	—	Yes	Yes	—	—	—	—	—
1718/1719 I/O	—	—	Yes	Yes	—	—	—	—	Yes - Both analog and digital modules
1756-ENx - no connection	Yes	Yes	Yes	Yes	—	—	—	—	—
1756-ENx - rack-optimized	—	—	Yes	Yes	—	—	—	—	—
Generic EtherNet/IP third-party - direct	—	—	Yes	Yes	—	—	—	—	—
1788-EN2FFR or 1788-EN2PAR	—	—	Yes	Yes	—	—	—	—	—
1788-CN2FFR or 1788-CN2PAR	—	—	—	—	No	Yes	—	—	—
1794 FLEX I/O	—	—	Yes	—	Yes	Yes	—	—	Yes - Analog output modules only
1734 POINT I/O	—	—	Yes	—	Yes	Yes	—	—	Yes
1734 POINT Guard I/O™	Yes	—	Yes	—	—	—	—	—	—
5069 Compact 5000 I/O	Yes	—	Yes	Yes <sup>(1)</sup>	—	—	—	—	Yes
5069 Compact 5000 I/O Safety Modules	Yes	—	Yes	—	—	—	—	—	—
5094 FLEX 5000	—	—	Yes	Yes	—	—	—	—	Yes
5094 FLEX 5000 I/O Safety Modules	—	—	Yes	—	—	—	—	—	Yes
5015 FLEXHA 5000 I/O	—	—	Yes	Yes	—	—	—	—	—

(1) Only supported if adding an entire rack of Compact 5000 I/O modules.

## Concurrent Communication

Concurrent communication provides for seamless failover for any redundant pair of hardware components.

With concurrent communication, data transmission between the ControlLogix 5580 controllers and the FLEXHA 5000 I/O modules can be completely redundant at the logical and physical levels.



Remember the following:

- Each 1756-EN4TR EtherNet communication module in the redundant chassis pair sends duplicated data on each LAN at the same time.
- Data with the similar designations, for example, 1A and 1A', are the same but from different controllers with the only difference being a small identifier. In this case, it is the prime (') designation.
- All data transmission starts at the same time. The duplicated data that reaches the adapters first is what's used in the FLEXHA 5000 I/O system. The other data is disregarded.

## Logical Level

Concurrent communication uses one logical CIP connection to transmit duplicate copies of I/O data to redundant devices. There is one I/O packet for each redundant device.

Via a 1756-EN4TR EtherNet/IP communication module, ControlLogix 5580 controllers operate in parallel and open the concurrent communication path to the FLEXHA 5000 I/O modules.

Each duplicate is targeted for one of the FLEXHA 5000 I/O modules in the redundant pair. The paired I/O modules receive duplicate data, compare the data, and establish one signal value that is set on the terminal screws.

A similar pattern is followed for input data that is transmitted from the paired FLEXHA 5000 I/O modules to the redundant ControlLogix 5580 controllers.

## Physical Level

During transmission, the duplicated data passes along physical connections from the 1756-EN4TR EtherNet/IP communication modules and the FLEXHA 5000 EtherNet/IP adapter. Physical network redundancy is provided whether the system is operating in a PRP or DLR topology. Thus, the system has increased resiliency.

The physical network redundancy is achieved via redundant path between the 1756-EN4TR EtherNet/IP communication module and the FLEXHA 5000 EtherNet/IP adapter as follows:

- PRP network - Duplicated data at the physical level for each path.
- DLR network - Providing redundant paths.

## Process Network Devices

PlantPAx leverages smart instrumentation to provide the right information to the right personnel at the right time. In a PlantPAx system, controllers are connected to field devices via field device components and communicate seamlessly through EtherNet/IP, DeviceNet, FOUNDATION Fieldbus, and PROFIBUS PA networks or by using HART protocol.

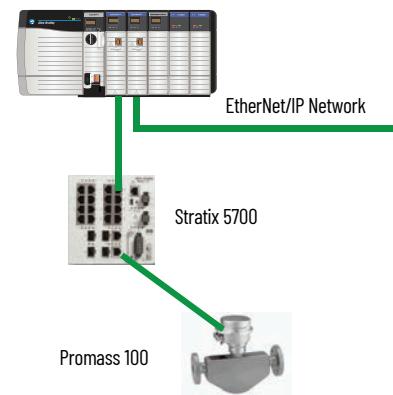
### EtherNet/IP Devices

In a PlantPAx system, the EtherNet/IP™ network provides the communication backbone for the supervisory network for the workstations, servers, and the controllers. The EtherNet/IP network also supports controller downlinks and connections to remote I/O and field device interfaces.

The EtherNet/IP network technology is owned and managed by ODVA, a global association of member companies that advance open, interoperable information, and communication technologies in industrial automation.

Field instruments that support a direct connection to EtherNet/IP networks include the following:

- Endress+Hauser, Promass 83 and compact Promass 100 Coriolis flowmeters for liquid and gas flows
- Endress+Hauser, Promag 53 electromagnetic flowmeter for conductive liquids
- Endress+Hauser, Liquiline CM444 Multiparameter transmitter for monitoring and controlling processes
- Endress+Hauser, Proline Promag 100 Electromagnetic flowmeter for conductive liquids
- Endress+Hauser, Proline Promag L 400 Electromagnetic flowmeter for conductive liquids



**Table 50 – EtherNet/IP Interface**

Category	Cat. No.	Description
ControlLogix EtherNet/IP interface	1756-EN2T, 1756-EN2TP, 1756-EN2TR, 1756-EN3TR, 1756-EN4TR, 1756-EN2F	ControlLogix EtherNet/IP bridge
Time Synchronization Ethernet Device	Aparian A-TSM/B	The Time Sync module provides Precision Time Protocol (PTP – Grand Master) and NTP Time services. This enables precision time synchronization for Logix Controllers and HMI systems. It can also provide GPS position data.

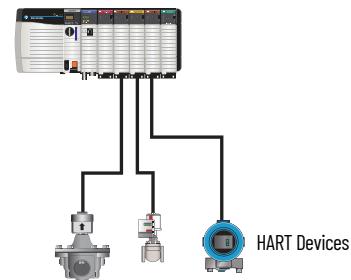
## HART Devices

HART is an open communication protocol that is designed to connect analog devices to the controller and system.

The PlantPAx system interfaces with HART devices both directly and via remote I/O modules. The HART protocol creates one termination point to gather analog process variables and the additional HART digital data.

Highly-integrated HART provides a PlantPAx data type in the process controller for use with FLEX 5000 and FLEXHA 5000 modules:

- Configuration of devices within the I/O Configuration tree (no Add-On Instruction needed)
- Device diagnostics automatically propagate to the controller project



**Table 51 - HART Interface**

Category	Cat. No.	Description
Chassis-based I/O modules	1756-IF8H, 1756-IF16H, 1756-OF8H	Allen-Bradley® analog I/O with the following: <ul style="list-style-type: none"> <li>• 8-channel HART analog input module</li> <li>• 16-channel HART analog input module</li> <li>• 8-channel HART analog output module</li> </ul>
	1756-IF8IH, 1756-IF16IH, 1756-OF8IH	Allen-Bradley isolated analog I/O with the following: <ul style="list-style-type: none"> <li>• 8-channel isolated HART analog input module</li> <li>• 16-channel isolated HART analog input module</li> <li>• 8-channel isolated HART analog output module</li> </ul>
Distributed I/O, high-channel density	1794-IF8IH, 1794-OF8IH	Allen-Bradley FLEX isolated analog I/O modules with the following: <ul style="list-style-type: none"> <li>• 8-channel isolated HART analog input module</li> <li>• 8-channel isolated HART analog output module</li> </ul>
	1794-IF8IHNFXT	Allen-Bradley FLEX I/O module with the following: <ul style="list-style-type: none"> <li>• Extended temperature, noise filtering 8-channel isolated HART analog input module</li> </ul>
	5094-IF8IH, 5094-IF8IHXT 5094-OF8IH, 5094-OF8IHXT	Allen-Bradley HART I/O with the following: <ul style="list-style-type: none"> <li>• 8-channel isolated HART</li> <li>• 8-channel isolated HART extreme temperature</li> </ul>
Distributed I/O, low-channel density	1734sc-IE2CH, 1734sc-IE4CH	Spectrum Controls, analog input module for the POINT I/O system <ul style="list-style-type: none"> <li>• 2-channel HART analog input module</li> <li>• 4-channel HART analog output module</li> </ul>
	1734sc-0E2CIH	Spectrum Controls, isolated analog input module for the POINT I/O system <ul style="list-style-type: none"> <li>• 2-channel isolated HART analog output module</li> </ul>
	1769sc-IF4IH, 1769sc-OF4IH	Spectrum Controls, isolated analog Compact I/O modules with HART: <ul style="list-style-type: none"> <li>• 4-channel isolated HART analog input module</li> <li>• 4-channel isolated HART analog output module</li> </ul> See the Encompass website for Spectrum Controls for product offerings.
Distributed I/O, intrinsically safe	1718-CF4H, 1718-IF4HB 1719-CF4H, 1719-IF4HB	Allen-Bradley EX I/O chassis-based design for Zone 2 or Class I, Div 2., via EtherNet/IP: <ul style="list-style-type: none"> <li>• 4-channel configurable HART analog module</li> <li>• 4-channel HART analog input module</li> <li>• 4-channel HART analog input-wide module</li> </ul>

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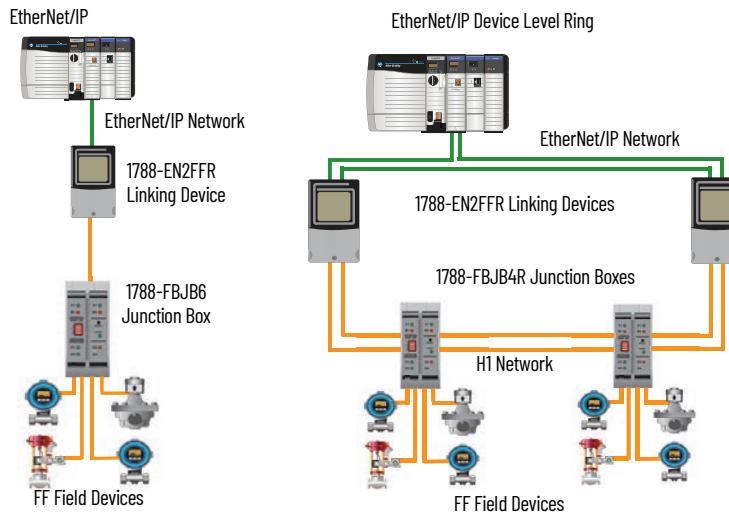
**Table 51 - HART Interface**

<b>Category</b>	<b>Cat. No.</b>	<b>Description</b>
Redundant I/O Modules	5015-UHIHFTXT	Allen-Bradley redundant I/O with the following: <ul style="list-style-type: none"><li>• 8-channel Universal I/O module</li></ul>
	1715-IF16 1715-OF8I	Allen-Bradley redundant I/O with the following: <ul style="list-style-type: none"><li>• 16-channel HART analog input module</li><li>• 8-channel isolated HART analog output module</li></ul>
Wireless HART	<ul style="list-style-type: none"><li>• SWA70</li><li>• SWG70</li><li>• RSG4</li></ul> <ul style="list-style-type: none"><li>• WHA-ADP</li><li>• WHA-BLT</li><li>• WHA-GW</li></ul>	<p>Endress+Hauser wireless HART:<ul style="list-style-type: none"><li>• WirelessHART adapter</li><li>• WirelessHART fieldgate</li><li>• Data manager</li></ul></p> <p>Pepperl+Fuchs wireless HART:<ul style="list-style-type: none"><li>• WirelessHART adapter</li><li>• WirelessHART bullet adapter</li><li>• Wireless HART gateway</li></ul></p>

## FOUNDATION Fieldbus Devices

The FOUNDATION Fieldbus network is a protocol that is designed for robust, distributed process application control. Devices that are connected by a FOUNDATION Fieldbus network can be used for sophisticated process control with seamless data distribution from the H1 device-level network.

PlantPAx systems communicate with FOUNDATION Fieldbus devices through EtherNet/IP linking devices as shown in the examples. Other configurations are available for simplex and redundant topologies.



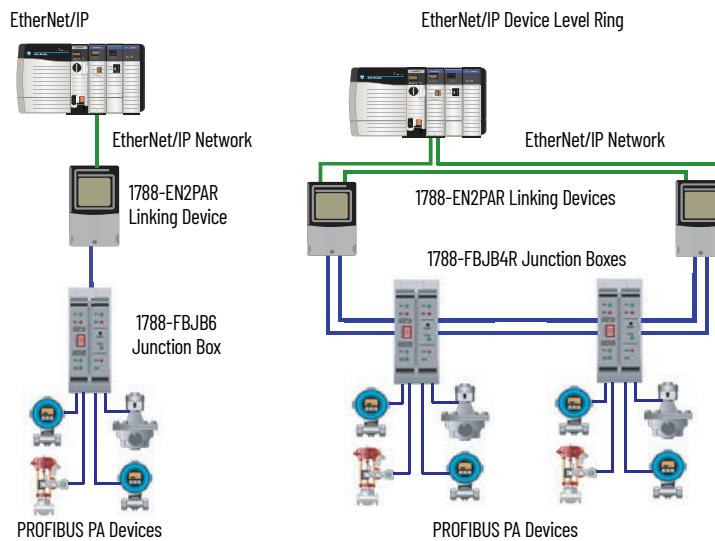
**Table 52 - FOUNDATION Fieldbus Interface**

Category	Cat. No.	Description
EtherNet/IP interface	1788-EN2FFR	Bridge from an Ethernet network to an H1 network. Supports redundant media and DLR-capable Ethernet network. Linking devices have built-in termination.
FOUNDATION Fieldbus network components	Power conditioning	Included in the 1788-EN2FFR and 1788-CN2FFR linking devices.
	1788-FBJB4R	Intelligent junction box supports redundancy, includes four drop ports and four trunk ports.
	1788-FBJB6	Intelligent junction box with six drop ports and two trunk ports.
	Additional components	Pepperl+Fuchs, FOUNDATION Fieldbus components, such as valve couplers, surge protectors, and distributors. See the Encompass website for Pepperl+Fuchs product offerings.
	Segment protection	Helps protect against device or line faults with short- and open-circuit protection. Pepperl+Fuchs, intrinsic safety components, such as isolated barrier systems, hazardous area enclosures, and equipment. See the Encompass™ website for Pepperl+Fuchs product offerings.

## PROFIBUS PA Devices

The PROFIBUS PA network connects automation systems and process control systems with field devices such as flow, level, pressure, and temperature transmitters.

PlantPAx systems communicate with PROFIBUS PA fieldbus devices through EtherNet/IP linking devices. Other configurations are available for simplex and redundant topologies.



**Table 53 - PROFIBUS PA Interface**

Category	Cat. No.	Description
PROFIBUS interface	1788-EN2PAR	EtherNet/IP to PROFIBUS PA linking device. Supports redundant PROFIBUS PA media and DLT-capable Ethernet network. Linking devices have built-in terminators.
PROFIBUS network components	Power conditioning	Included in the 1788-EN2PAR and 1788-CN2PAR linking devices.
	1788-FBJB4R	Intelligent junction box supports redundancy, includes four drop ports and four trunk ports.
	1788-FBJB6	Intelligent junction box with six drop ports and two trunk ports.
	Additional components	Pepperl+Fuchs <sup>(1)</sup> , PROFIBUS components, such as valve couplers, surge protectors, and distributors. See the Encompass website for Pepperl+Fuchs product offerings.
	Segment protection	Helps protect against device or line faults with short- and open-circuit protection. Pepperl+Fuchs, intrinsic safety components, such as isolated barrier systems, hazardous area enclosures, and equipment. See the Encompass website for Pepperl+Fuchs product offerings.

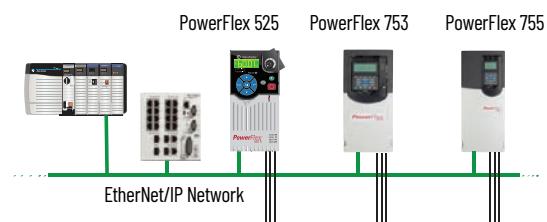
(1) For more information on Encompass third-party products, see <http://www.rockwellautomation.com/encompass>.

## Motor Control Devices

Rockwell Automation offers a broad range of motor control solutions to complement various application requirements. The portfolio of motor control devices includes simplified programming and configuration along with safety features to help protect personnel and assets that help to reduce downtime.

### Low Voltage Drives

PowerFlex® Low Voltage AC drives provide scalable motor control solutions and are designed to deliver more powerful performance and flexibility for process applications. As part of a PlantPAx system, PowerFlex drives offer seamless integration into your process control system for simplified development, use, and maintenance.



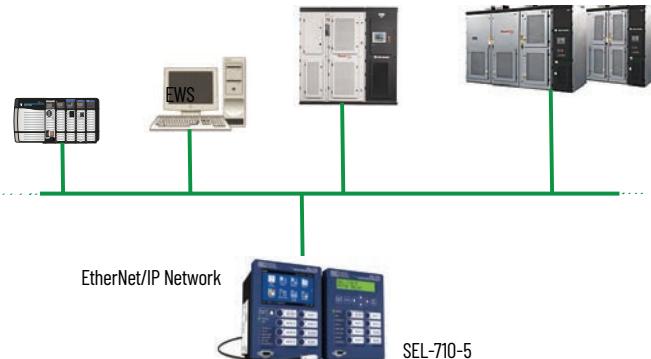
**Table 54 - PowerFlex Drives and Communication Modules**

Drive Cat. No. <sup>(1)</sup>	Description	Available Communication Modules <sup>(1)</sup>	
		Cat. No.	Description
25B-	PowerFlex 525 AC drive with an embedded EtherNet/IP port and an embedded Safe Torque Off (STO).	<ul style="list-style-type: none"> <li>• 25-COMM-E2P</li> <li>• 25-COMM-D</li> </ul>	<ul style="list-style-type: none"> <li>• Dual-port EtherNet/IP, supports DLR functionality</li> <li>• DeviceNet</li> </ul>
20F-	PowerFlex 753 AC drive	<ul style="list-style-type: none"> <li>• 20-750-BNETIP</li> <li>• 20-750-DNET</li> <li>• 20-750-ENETR</li> <li>• 20-750-PBUS</li> <li>• 20-COMM-D</li> <li>• 20-COMM-E</li> <li>• 20-COMM-P</li> </ul>	<ul style="list-style-type: none"> <li>• BACnet/IP option modules</li> <li>• DeviceNet option module</li> <li>• Dual-port EtherNet/IP option module</li> <li>• PROFIBUS DPV1 option module</li> <li>• DeviceNet communication adapter</li> <li>• EtherNet/IP communication adapter</li> <li>• PROFIBUS DP communication adapter</li> </ul>
20G-	PowerFlex 755 drive		
20G-	PowerFlex 755TL/755TR	<ul style="list-style-type: none"> <li>• 20-750-DNET</li> <li>• 20-750-ENETR</li> <li>• 20-750-PBUS</li> </ul>	<ul style="list-style-type: none"> <li>• DeviceNet option module</li> <li>• Dual-port EtherNet/IP option module</li> <li>• PROFIBUS DPV1 option module</li> </ul>

(1) For a complete list of catalog numbers, see the PowerFlex Low Voltage AC Drives Selection Guide, publication [PFLEX-SG002](#).

### Medium Voltage Drives and Relays

PowerFlex medium voltage AC drives and relays provide scalable motor control solutions and electrical protection. Standalone drives control speed, torque, direction, starting, and stopping of standard asynchronous or synchronous AC motors. As part of a PlantPAx system, PowerFlex drives incorporate leading-edge technology, embedded communications, and significant commonality across multiple platforms, networks, operator interface programming and hardware. The benefits of this exceptional level of integration between the drives and Logix controllers provides distinctive time-saving features for the PowerFlex 6000 and 7000 drives.



**Table 55 - Medium Voltage Drives and Relays**

Drive Cat. No. <sup>(1)</sup>	Description	Available Communication Modules <sup>(1)</sup>	
		Cat. No.	Description
PF-6000G	PowerFlex 6000	<ul style="list-style-type: none"> <li>• 13MLXE</li> <li>• 13MLXP</li> <li>• 13TMLXH, 13TMLXM, 13TMLXMP</li> </ul>	<ul style="list-style-type: none"> <li>• EtherNet/IP</li> <li>• PROFIBUS RS-485</li> <li>• Modbus Communication Adapters</li> </ul>

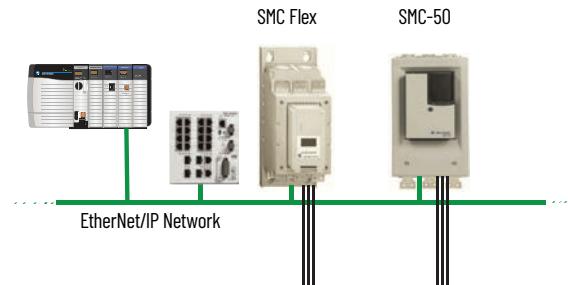
**Table 55 - Medium Voltage Drives and Relays**

Drive Cat. No. <sup>(1)</sup>	Description	Available Communication Modules <sup>(1)</sup>
PF-6000T	PowerFlex 6000	<ul style="list-style-type: none"> <li>13TCOMME</li> <li>13TCOMMP</li> <li>13TCOMMPN1, 13TCOMMPN2</li> <li>13TMLXH, 13TMLXM, 13TMLXMP</li> </ul> <ul style="list-style-type: none"> <li>EtherNet/IP</li> <li>PROFIBUS DPV1</li> <li>PROFINET Communication Adapters</li> <li>Modbus Communication Adapters</li> </ul>
PF-7000 / PF-7000A / PF-7000L	PowerFlex 7000	<ul style="list-style-type: none"> <li>13COMMER</li> <li>13COMME</li> <li>13COMM</li> <li>13COMM, 13COMM</li> </ul> <ul style="list-style-type: none"> <li>Dual EtherNet/IP</li> <li>EtherNet/IP</li> <li>PROFIBUS</li> <li>Modbus Communication Adapters</li> </ul>
SEL-710-5	Motor Protection Relay	See the <a href="#">SEL website</a> or your Rockwell Automation representative or more information.

(1) For a complete list of catalog numbers, see the PowerFlex Medium Voltage AC Drives Selection Guide, publication [PFLEX-SG003](#).

### Soft Starters

SMC™ Soft Starters are designed to help minimize cost by reducing overall system power requirements and wear and tear on equipment. Our soft starters can be easily integrated into your process control system to offer higher productivity and shorter downtimes.



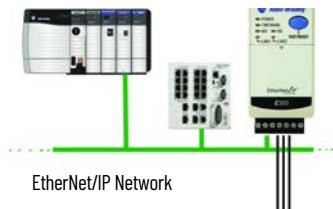
**Table 56 - SMC Soft Starters and Communication Modules**

Cat. No. <sup>(1)</sup>	Description	Available Communication Modules <sup>(1)</sup>	
		Cat. No.	Description
150-F	SMC™ Flex Smart Motor Controllers	<ul style="list-style-type: none"> <li>20-COMM-D</li> <li>20-COMM-E</li> <li>20-COMM-ER</li> </ul>	<ul style="list-style-type: none"> <li>DeviceNet communication adapter</li> <li>EtherNet/IP communication adapter</li> <li>Dual-port EtherNet/IP communication adapter</li> </ul>
150-S	SMC™-50 Solid-state Smart Motor Controllers	<ul style="list-style-type: none"> <li>20-COMM-D</li> <li>20-COMM-E</li> <li>20-COMM-ER</li> </ul>	<ul style="list-style-type: none"> <li>DeviceNet communication adapter</li> <li>EtherNet/IP communication adapter</li> <li>Dual-port EtherNet/IP communication adapter</li> </ul>

(1) For additional product information, see the Smart Motor Controllers – SMC™-3, SMC™ Flex, and SMC-50 Soft Starters Family Brochure, publication [150-BR144](#).

### Across-the-line Starters

Our light industrial IEC starters are environmentally friendly, versatile, and flexible. Our heavy-duty NEMA starters are renowned for a more-rugged construction, more dependable performance, and longer electrical life. In addition, this portfolio offers Electronic Overload Relays that provide integration between the starters and Logix controllers. The diagnostic capabilities of the overload relays help maximize uptime for motor control in an automation system.



**Table 57 - Electronic Overload Relays and Communication Modules**

Cat. No. <sup>(1)</sup>	Description	Available Communication Modules <sup>(1)</sup>	
		Cat. No.	Description
193/592-E300	E300™ Electronic Overload Relays	193-ECM-ETR	EtherNet/IP communication module

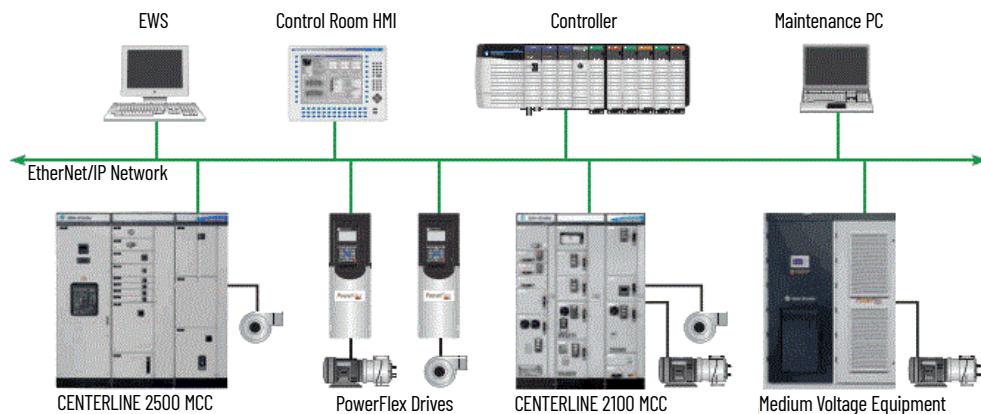
(1) For additional product information, see the Motor Protection Solutions Brochure, publication [193-BR029](#).

## Motor Control Centers

As an alternative to wiring each device individually, Rockwell Automation offers low-voltage motor control centers (MCC). The MCCs feature a rugged, high-performance packaging solution for all your motor control needs that integrate control and power in one centralized location.

CENTERLINE® MCCs are available with safety options that help reduce exposure to electrical hazards and arc flash mitigation and containment.

**Table 58 - Low Voltage Motor Control Centers**



Category <sup>(1)</sup>	Cat. No.	Description
CENTERLINE 2100 MCC	2100	<ul style="list-style-type: none"> <li>Designed to meet UL and NEMA standards</li> <li>Allen-Bradley motor control devices: starters, soft-starters, and drives</li> <li>Available with SecureConnect™ units</li> <li>ArcShield™ arc-resistant enclosures available</li> <li>EtherNet/IP and DeviceNet networking</li> <li>IntelliCENTER® software</li> </ul>
CENTERLINE 2500 MCC	2500	<ul style="list-style-type: none"> <li>Designed to meet IEC standards</li> <li>Allen-Bradley motor control devices: starters, soft-starters, and drives</li> <li>ArcShield™ arc-resistant enclosures available</li> <li>EtherNet/IP and DeviceNet networking</li> <li>IntelliCENTER software</li> </ul>

(1) For more information, see [Low Voltage Motor Control Centers](#).

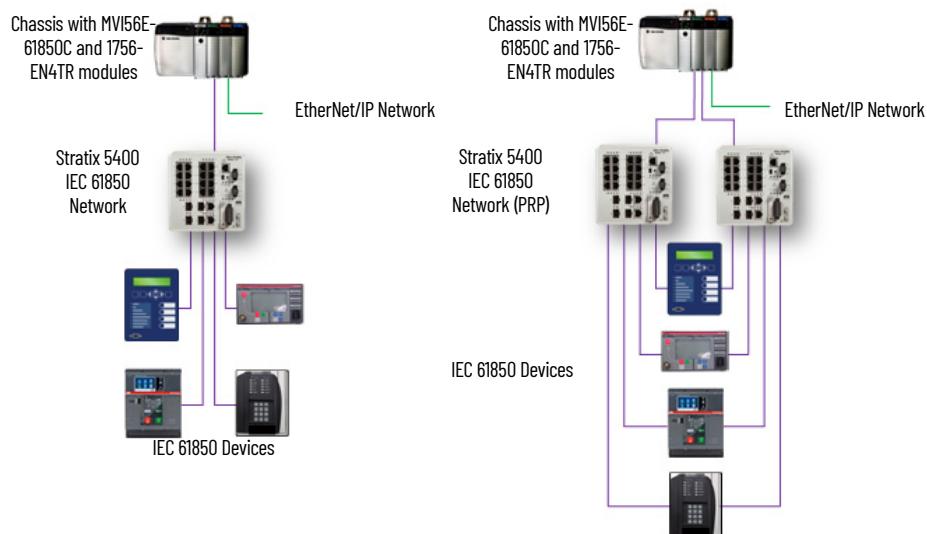
## Electrical Protection Devices

The ProSoft MVI56E-61850C is an in-chassis communication module that connects Intelligent Electrical Devices (IEDs) communicating on IEC 61850 to the process automation equipment communicating on EtherNet/IP. The IEC 61850 communication module allows users to have complete control, visualization and reporting across their entire PlantPAx system.

Refer to the [ProSoft website](#) for more information.

Additionally, PlantPAx fully supports the Library of Electrical Protection Devices. The Library of Electrical Protection Devices includes vendors such as Schweitzer Engineering Lab, ABB, GE and Allen-Bradley Intelligent Electrical Devices. The library contains Add-on Instructions, Global Objects and graphics that allows the user to easily integrate the control and visualization of IEDs into a power single line diagram.

Refer to Rockwell Automation Library of Electrical Protection Devices, publication [PROCES-RM011](#) for more information.



### IEC 61850 Module

Category	Cat. No.	Description
IEC 61850 module	ProSoft MVI56E-61850C	Prosoft In-Chassis IEC 61850 Communication Module
IEC 61850 additional components	1756-EN4TR	In-Chassis Ethernet/IP Communication Module
	Stratix 5400	Network switch for IEC 61850 protocol
	ControlLogix 5580	Controller required for IEC 61850 module (v32 or greater)

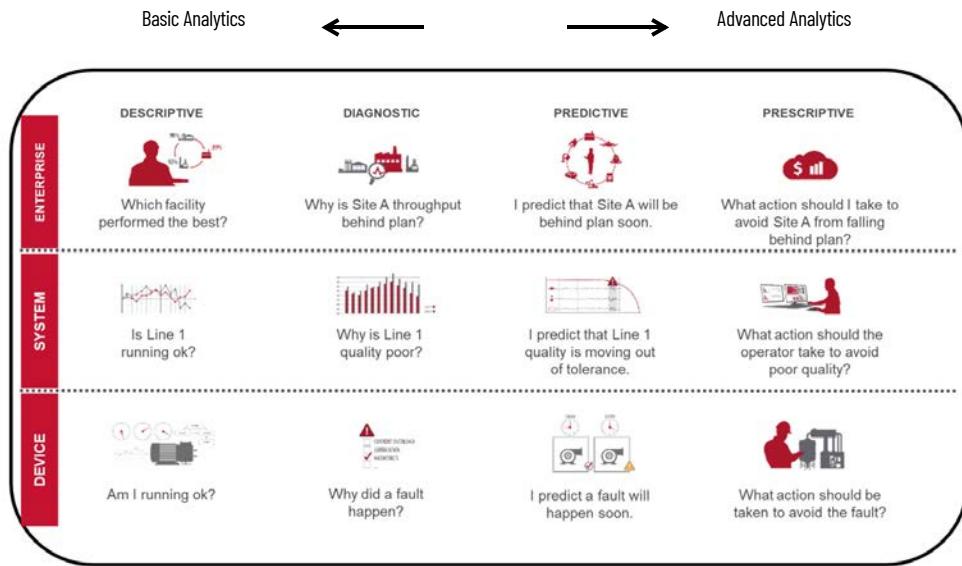
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**Notes:**

Analytics is the discovery, interpretation, and communication of meaningful patterns in data. Analytics relies on the application of statistics, computer programming, and operations research to quantify performance.

Analytics provides methods to measure our performance and then provide feedback for continuous improvement. Analytics drive business value, regardless of the industry, by helping to:

- bring a product to market faster
- lower the total cost of ownership because of more effective maintenance
- improve asset utilization by maximizing the throughput



## IIoT Data Enablement Options

To enable IIoT applications with the critical data from the PlantPAx DCS, users need to utilize gateways that can pull data from the various data sources. PlantPAx offers multiple options to enable this data flow.

Option	Description	
FactoryTalk Edge Gateway	<p>FactoryTalk Edge Gateway software unifies data from industrial sources and control or automation systems. It integrates with a variety of cloud, IIoT, and big data applications including ThingWorx, Microsoft Azure IoT Hub, Microsoft SQL and more. It also uses OPC-DA, the automation industry standard for interoperability, to access KEPServer Enterprise data for third-party connectivity.</p> <p><b>PlantPAX specific support:</b></p> <ul style="list-style-type: none"> <li>EventQ Add on enables the capture of controller-based events to be used in Standard PlantPAX report</li> </ul>	<p><b>Type:</b> IIoT Data Enablement Software</p> <p><b>Environment:</b> Software on Premise</p> <p>Requirements:</p> <ul style="list-style-type: none"> <li>Software Licenses available via the subscription portal</li> </ul>
FactoryTalk Linx Gateway	<p>FactoryTalk Linx Gateway software provides data from the PlantPAX FactoryTalk Linx servers as a OPC UA Server. It integrates with IIoT applications that are configured as a OPC UA Client for live PlantPAX DCS data.</p> <p><b>PlantPAX specific support:</b></p> <ul style="list-style-type: none"> <li>Enables the connection from FactoryTalk Linx to ThingWorx OPC Aggregator for live DCS data.</li> </ul>	<p><b>Type:</b> IIoT Data Enablement Software</p> <p><b>Environment:</b> Software on Premise</p> <p>Requirements:</p> <ul style="list-style-type: none"> <li>Software Licenses available via the subscription portal</li> </ul>

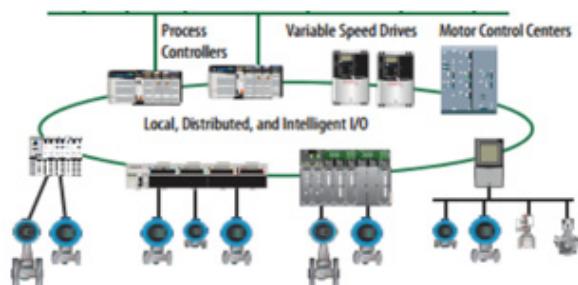
## Device Level Options

Allen-Bradley products have device-level diagnostics built in, such as fault and alarm codes for use in fault routines. Other products provide predictive and prescriptive analytics at the device-level of the architecture.

Device-level analytics provide:

- Streaming analysis
- Runtime deployment
- Device data generation

Products that provide device-level analytics include:



Option	Description	
FactoryTalk® Analytics™ LogixAI®	<p>An embedded analytics software that enables controls engineers to apply models to make predictions in ControlLogix applications. Automated modeling capabilities that enable predictive capabilities in the controller.</p>	<p><b>Type:</b> Diagnostic, Predictive</p> <p><b>Environment:</b> ControlLogix chassis Available via the subscription portal</p> <p>Requirements:</p> <ul style="list-style-type: none"> <li>1756M-FTALGXAIT1M FactoryTalk Analytics LogixAI appliance</li> </ul>
PlantPAX MPC	<p>Model Predictive Control embedded in ControlLogix systems</p> <ul style="list-style-type: none"> <li>Multi-variable in and multi-variable out</li> <li>Predictive control</li> <li>Reduction in variability</li> </ul>	<p><b>Type:</b> Predictive, Prescriptive</p> <p><b>Environment:</b> ControlLogix chassis</p> <p>Requirements:</p> <ul style="list-style-type: none"> <li>1756-PPMPC or 9529-PPMPCENM module</li> </ul>
APC Function Blocks	<p>You can use APC function blocks in place of PID instructions for loops with long dead-times and interacting loops. The APC function blocks are licensed, run on the EWS, and require the Studio 5000 Logix Designer application.</p> <ul style="list-style-type: none"> <li>Internal model control (IMC) to control one process variable</li> <li>Coordinated control (CC) to control one process variable with up to three control variables</li> <li>Modular multivariable control (MMC) to control two process variables with up to three control variables</li> </ul>	<p><b>Type:</b> Predictive, Prescriptive</p> <p><b>Environment:</b> Logix 5000 function blocks</p> <p>Requirements:</p> <ul style="list-style-type: none"> <li>9324-RLDAPCENE for first controller</li> <li>9324-RLDAPCCENE for subsequent controllers</li> </ul>

## System Level Options

System-level analytics provide:

- Data management, and transformation
- Model training and deployment
- Pattern extractions



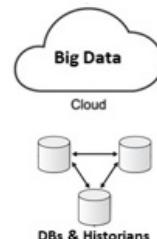
FactoryTalk products that add system-level analytics include:

Option	Description	Type: Environment: Requirements:
Pavilion®	Provides closed-loop, prescriptive analytics to maximize process performance in quality, throughput and efficiency. <ul style="list-style-type: none"><li>• Model-based advanced, dynamic control drives stable performance</li><li>• Integrated MPC, calculation, and soft sensor visualization and performance reporting</li></ul>	<b>Type:</b> Predictive, Prescriptive <b>Environment:</b> Server based Requirements: <ul style="list-style-type: none"><li>• Pavilion8 software</li></ul>
FactoryTalk® Analytics Edge ML (also applicable at enterprise level)	A machine learning application that provides expert-driven data analytics within the plant, where low latency is a requirement. <ul style="list-style-type: none"><li>• Helps make decisions as close as possible to the data</li><li>• Reduce loads on controllers by off-loading data preprocessing</li><li>• Reduces deployment time costs</li><li>• Out-of-box connectivity reduces design time</li></ul>	<b>Type:</b> Predictive <b>Environment:</b> Server based Part of the FactoryTalk Analytics; available via the subscription portal Requirements: <ul style="list-style-type: none"><li>• FactoryTalk Analytics Edge ML base bundle or<ul style="list-style-type: none"><li>• FactoryTalk Analytics Platform base bundle</li></ul></li></ul>
FactoryTalk® Analytics™ DataView (also applicable at enterprise level)	A visualization tool that lets you access and transform data through storyboards. Gain a business understanding of data to pinpoint opportunities for improvement. <ul style="list-style-type: none"><li>• Reduces time to value by reducing the dependence on data architects and data scientists</li><li>• Enables self-service analytics</li><li>• Minimizes the need for expensive infrastructure that is associated with traditional warehousing</li></ul>	<b>Type:</b> Descriptive, Diagnostic <b>Environment:</b> Server based Part of FactoryTalk Analytics; available via the subscription portal Requirements: <ul style="list-style-type: none"><li>• FactoryTalk Analytics DataView base bundle or<ul style="list-style-type: none"><li>• FactoryTalk Analytics Platform base bundle</li></ul></li></ul>

## Enterprise-Level Options

Enterprise-level analytics provide:

- Data visualization
- Data mining
- Enterprise resource planning
- Model training
- Model operationalization
- Pattern extraction



FactoryTalk products that add enterprise-level analytics include:

Option	Description	
FactoryTalk Analytics Edge ML (also applicable at system level)	<p>A machine learning application that provides expert-driven data analytics within the plant, where low latency is a requirement.</p> <ul style="list-style-type: none"> <li>• Helps make decisions as close as possible to the data</li> <li>• Reduce loads on controllers by off-loading data preprocessing</li> <li>• Reduces deployment time costs</li> <li>• Out-of-box connectivity reduces design time</li> </ul>	<p><b>Type:</b> Predictive</p> <p><b>Environment:</b> Server based Part of the FactoryTalk Analytics; available via the subscription portal</p> <p>Requirements:</p> <ul style="list-style-type: none"> <li>• FactoryTalk Analytics Edge ML base bundle or</li> <li>• FactoryTalk Analytics Platform base bundle</li> </ul>
FactoryTalk Analytics DataView (also applicable at system level)	<p>A visualization tool that lets you access and transform data through storyboards. Gain a business understanding of data to pinpoint opportunities for improvement.</p> <ul style="list-style-type: none"> <li>• Reduces time to value by reducing the dependence on data architects and data scientists</li> <li>• Enables self service analytics</li> <li>• Minimizes the need for expensive infrastructure that is associated with traditional warehousing</li> </ul>	<p><b>Type:</b> Descriptive, Diagnostic</p> <p><b>Environment:</b> Server based Part of FactoryTalk Analytics; available via the subscription portal</p> <p>Requirements:</p> <ul style="list-style-type: none"> <li>• FactoryTalk Analytics DataView base bundle or</li> <li>• FactoryTalk Analytics Platform base bundle</li> </ul>
Vuforia® Augmented Reality	<p>An industrial augmented reality platform that can improve workforce efficiency and customer satisfaction with real-time, step-by-step work instructions and data.</p> <ul style="list-style-type: none"> <li>• Work instructions become handsfree and are delivered in real time where assembly or field service take place.</li> <li>• Tribal knowledge of experienced workers is captured and shared with new workers and service technicians.</li> <li>• Remote expertise can be delivered to workers no matter where they are in the world.</li> </ul> <p><b>PlantPAX specific support:</b></p> <ul style="list-style-type: none"> <li>• Process strategy experience templates provide users with faceplate-like features within an AR experience. The templates enable users to build additional functionality around the PlantPAX information.</li> </ul>	<p><b>Type:</b> Descriptive, Diagnostic</p> <p><b>Environment:</b> Cloud-based Part of the FactoryTalk® InnovationSuite Bulletin 95057C; available via the subscription portal</p> <p>Requirements:</p> <ul style="list-style-type: none"> <li>• Vuforia Engine software</li> <li>• Vuforia Studio software</li> <li>• Vuforia Chalk software</li> <li>• Vuforia Expert Capture software</li> </ul>
ThingWorx® Industrial IoT platform	<p>An integrated, secure solution to minimize risk, reduce IT burden, and maximize value from the software investment. ThingWorx industrial connectivity provides data access for client applications such as MES and SCADA and IoT and Big Data analytics software. It leverages OPC and IT-centric communication protocols to provide one source of industrial data. Supported protocols include proprietary protocols (including GE NIO, SuiteLink/FastDDE, and Splunk), IT protocols (including MQTT, REST, ODBC, and SNMP), and flow measurement export to common oil and gas industry formats. ThingWorx industrial connectivity provides one solution to collect, aggregate, and securely access industrial operations data. Connect, manage, monitor, and control diverse automation devices and software applications through one intuitive user interface.</p> <p><b>PlantPAX specific support:</b></p> <ul style="list-style-type: none"> <li>• Process strategy Thing templates replicate structure and functionality within ThingWorx, which enable users to create an analysis of the objects with Live and Historical Data</li> <li>• ThingWorx mashup templates provide the ability to investigate alarms by area, priority, and other critical alarming criteria. Advanced alarm analysis includes fleeting, chattering, and stale alarm insights. Similar dashboard functionality is also provided for SQL server reporting services.</li> </ul>	<p><b>Type:</b> Descriptive, Diagnostic, Predictive, Prescriptive</p> <p><b>Environment:</b> Cloud-based Part of the FactoryTalk Innovation Suite Bulletin 95057C; available via the subscription portal</p> <p>Requirements:</p> <ul style="list-style-type: none"> <li>• ThingWorx platform software <ul style="list-style-type: none"> <li>- Asset Advisor</li> <li>- Operator Advisor</li> <li>- Production Advisor</li> <li>- ControlAdvisor</li> </ul> </li> <li>• ThingWorx Industrial Connectivity software</li> </ul>

A process automation solution often includes the requirement for an integrated safety system as part of the overall Safety Instrumented System (SIS) requirements for a process facility. The SIS logic solver is a separate but integrated technology that can use common or diverse technology to meet the safety integrity needs for any process application.

The SIS logic solver requirements can include fault tolerance, fail-safe, or a mix of architecture and Safety Integrity Level (SIL) requirements. Fault tolerance means that plant operation is maintained if a fault occurs, while fail-safe means that the SIS initiates a shutdown upon detecting a fault.

**Table 59 - Typical SIL and Architecture System Requirements**

Process Safety Platform	Safety Application	Architecture	Typical SIL Range	Demand
Trusted	Emergency shutdown/SIS	Fault Tolerant	Up to SIL 3	Low/High
	Fire and gas		SIL 2	Low
	High integrity pressure system		SIL 3	Low
	Chemical processing			High
	Refining		Up to SIL 3	Low/High
Process Safety Platform	Safety Application	Architecture	Typical SIL Range	Demand
AADvance	Burner management (continuous process)	Fault Tolerant	Up to SIL 3	High
	Subsea <sup>(1)</sup>		SIL 2	Low
	Power generators			
Process Safety Platform	Safety Application	Architecture	Typical SIL Range	Demand
ControlLogix	Burner management (power and utilities)	Fail-safe	Up to SIL 3	High <sup>(2)</sup>
	Turbomachinery			
	Life sciences		SIL 2	Low
	Mining			
	Power equipment	Fault Tolerant	Up to SIL 3	Low/High <sup>(2)</sup>
	Specialty chemical			
	High Availability control systems			

(1) The AADvance solution is available in a Eurocard format, qualified for Subsea production applications under ISO13628-6.

(2) ControlLogix controllers are limited to a demand rate not to exceed 10 demands per year. While this is a high demand rate, this solution possibly could not be suitable for high-demand applications.

Safe, reliable systems safeguard people, property, the environment, and company or corporate reputations. Third-party certification for applying technologies in applications up to a specific SIL level significantly reduces complexity when complying with national and international process safety standards worldwide.

Process safety technology selection is based on functional and target SIL requirements, which are defined in the projects Safety Requirements Specification (SRS). For example, if the SRS requirement is for the Safety Instrumented Function to fail safely upon a fault, you can select a fail-safe only technology. If however, some level of fault tolerance is defined for your process safety system, you can select a fault tolerant technology.

There are different levels of fault tolerance available. For example:

- 1oo2d refers to a voting and degradation architecture where diagnostics are used to determine the validity of two values or states. When both values are 'healthy', then either one out of the two (1oo2) available is used in the outcome of the safety instrumented function (SIF). When one of the two values or states is determined to be 'invalid', then that value or state is no longer considered when determining the outcome of the SIF. (The voting degrades to 1oo1, one out of the remaining good one). This dramatically reduces the spurious trip rate of a basic 1oo2 architecture, while maintaining safety performance.
- 2oo3 refers to a voting and degradation architecture where comparison diagnostics are used to determine the outcome of the SIF. Two 'out of the three (2oo3) available values or states are required to determine the outcome of a SIF. This architecture, often referred to as Triple Modular Redundancy (TMR), lets a failed value or state be ignored when resolving the SIF.

 In addition to the comparison diagnostics, active diagnostics are also used to validate states and values that are used in the outcome of the SIF.

## ControlLogix SIL 2 Systems

ControlLogix supports process safety applications up to SIL 2 that require fault tolerance and redundancy. ControlLogix supports 1oo2d fault tolerance with the 1715 I/O system. However, ControlLogix redundancy does not use a voting mechanism, rather it acts as a hot standby. The components of the 1715 I/O system comprise a pair of partnered Ethernet adapters that communicate to ControlLogix controllers via an EtherNet/IP network, and digital and analog I/O modules that are configurable in simplex and duplex modes.

The ControlLogix controller complies with the requirements of the relevant standards (SIL 2 according to IEC 61508) and can be used in low demand applications up to SIL 2 according to IEC 61508). The instructions of the associated Safety Reference Manual and User Manuals are to be considered.

ControlLogix SIL 2 systems use the same programming software and data interfaces as used for process control on the PlantPAx system. The hardware that is used for process safety must be dedicated for process safety applications. Specific hardware, firmware revisions, and software versions are required to meet SIL certifications.

## AADvance and Trusted SIL 2, SIL 3, and TMR Systems

Diverse SIS logic solvers use different hardware and software platforms for process safety applications than that used for process control on the PlantPAx system. This approach is used to minimize common cause faults from influencing the overall safety integrity. Triple redundancy minimizes the possibility of any single component failure to cause a spurious or spurious trip. Diverse process safety integrates with the basic process control on the PlantPAx system by using CIP™ connectivity including profile support in the Studio 5000 Logix Designer application (AADvance) or via OPC connectivity (AADvance or Trusted®).

Both the Trusted and AADvance systems share a common EtherNet/IP network within a PlantPAx system. In addition, AADvance and Trusted support redundant Ethernet networks, while the AADvance system supports the CIP producer and consumer communication protocol.

**Table 60 - Diverse SIL 2 and SIL 3 Products**

Category	Description
AADvance system	<ul style="list-style-type: none"><li>Configurable for SIL 2 and SIL 3</li><li>Scalable redundancy for fault tolerance</li><li>Simplex, duplex, or triplex configuration</li></ul>
Trusted system	Trusted technology uses 3-2-0 (3-2-2-0 optionally) fault-tolerant control to help eliminate spurious trips. Triple modular redundancy (TMR) uses majority voting to identify a source of failure. Available with OPC or CIP integration.

**Table 61 - Additional Resources**

Resource	Description
AADvance Controller Solutions Handbook, publication <a href="#">ICSTT-RM447</a>	Explains the features, performance, and functionality of the AADvance controller and systems. It sets out some guidelines on how to specify a system to meet your application requirements.
AADvance Controller System Build Manual, publication <a href="#">ICSTT-RM448</a>	Provides experienced panel builders with information on how to assemble a system, switch on and validate the operation of a controller.
AADvance Controller Configuration Guide, publication <a href="#">ICSTT-RM405</a>	Defines how to configure an AADvance controller by using the AADvance Workbench to meet your Safety Instrument Function (SIF) application requirements.
AADvance Controller Safety Manual, publication <a href="#">ICSTT-RM446</a>	Provides mandatory guidance on how to apply AADvance to meet various industry standards and makes recommendations to apply AADvance in SIS applications safely.
AADvance Controller Troubleshooting and Repair Manual, publication <a href="#">ICSTT-RM406</a>	Provides plant maintenance personnel with information on how to trace and repair a fault in an AADvance system and perform routine maintenance tasks.

## SIL-rated Instruments

SIL-rated instruments are typically required for process safety loops. Rockwell Automation provides premier integration between ControlLogix systems and Endress+Hauser SIL-rated instruments. For more details, see the Endress+Hauser website at <https://www.endress.com>.

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## PowerFlex SIL 2 and SIL 3 Systems

PowerFlex AC drives offer SIL ratings up to and including SIL 3. Specifically, the PowerFlex 525 AC drive offers Safe Torque Off (STO) as a standard embedded feature with a safety rating of PLd/SIL2 Cat. 3. The PowerFlex 753 and 755 AC drives are available with optional STO functionality with a safety rating of PLe/SIL3 Cat. 3. In addition, the PowerFlex 753 and 755 offer a Safe Speed Monitor option for applications that can benefit from access to a safety zone while there is limited motion. The Safe Speed Monitor option has a rating of PLe/SIL3 Cat. 4.

PowerFlex STO functionality is designed to help safely remove power from the gate firing circuits of the output power devices (IGBTs). This functionality helps prevent the output power devices from switching in the pattern necessary to generate AC power to the motor. PowerFlex AC drives can be used in combination with other safety devices to satisfy the requirements of IEC 61508, IEC 61800-5-2 SIL 3, ISO 13849-1 PLe, and Category 3 for STO.

For more information, see the PowerFlex Low Voltage AC Drives Selection Guide, publication [PFLX-SG002](#).

## OptiSIS Safety Integrated Systems

The OptiSIS® safety system uses an AADvance safety logic solver for a process safety solution that is ready to install and configure with no programming required. OptiSIS lets you configure safety functions by using an intuitive Cause and Effect interface from the HMI display.

OptiSIS includes options for:

- Fail-safe or fault tolerant architectures
- Indoor or outdoor environments
- Floor and wall mount
- 50 or 100 I/O count

OptiSIS is a great solution for small process safety applications. In addition, if you have an existing process safety system (for example, an older relay or legacy system) that can no longer be maintained, OptiSIS can provide a cost-effective and short delivery replacement.

For more information, see the OptiSIS Packaged Solution Profile, publication [1711-PP006](#).

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**Notes:**



# Rockwell Automation Support

Use these resources to access support information.

<b>Technical Support Center</b>	Find help with how-to videos, FAQs, chat, user forums, and product notification updates.	<a href="http://rok.auto/support">rok.auto/support</a>
<b>Knowledgebase</b>	Access Knowledgebase articles.	<a href="http://rok.auto/knowledgebase">rok.auto/knowledgebase</a>
<b>Local Technical Support Phone Numbers</b>	Locate the telephone number for your country.	<a href="http://rok.auto/phonesupport">rok.auto/phonesupport</a>
<b>Literature Library</b>	Find installation instructions, manuals, brochures, and technical data publications.	<a href="http://rok.auto/literature">rok.auto/literature</a>
<b>Product Compatibility and Download Center (PCDC)</b>	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	<a href="http://rok.auto/pcdc">rok.auto/pcdc</a>

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