Foxboro™ DCS

V91 Virtualization Server for Windows Operating Systems

PSS 41H-4V91

Product Specification

May 2024

https://www.se.com

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Overview

Virtualization is a technology that allows consolidation of multiple servers into a single physical server. This consolidation into a 2U rack-mounted package consumes fewer plant resources. The package is easier to install and maintain. It delivers the technological foundation for high available topologies enabling live migration from running VMs from one physical server instance to a redundant partner and centralized management (CVM) of two or more virtualization servers. The V91 Foxboro DCS Virtualization Server can host up to fourteen Virtual Machines (VM).

The Model V91 Foxboro DCS virtualization server host is a 2U rack-mount server running the Microsoft Windows Server® 2016 or Microsoft Windows Server® 2022 operating system. In addition, a virtual machine running one of these operating systems can be used as a Domain Controller for the V91 Model host servers. Through the use of Microsoft Hyper-V virtualization technology, the V91 is capable of hosting virtual machines running these operating systems.

The virtual machines that are supported include:

- Foxboro DCS virtual machines running the Microsoft Windows Server® 2016 with Control Core Services v9.4–9.7 and Control Software v7.1–7.5 on the Foxboro DCS Control Network
- Foxboro DCS virtual machines running the Microsoft Windows Server® 2022 with Control Core Services v9.8 or later and Control Software v8.0 or later on the Foxboro DCS Control Network
- Virtual machines using the Schneider Electric-provided virtual machine operating system image on networks other than the Control Network

The V91 Server is available with a user-configurable model code.

NOTE: The cover image represents a fully configured server and might show configuration options (for example, hard disks or PCI cards) that are not part of an actual product order.

Features

The Model V91 Host Server running Windows Server 2016 or Windows Server 2022 allows for these features:

- Replication - Replica VMs are automatically created and synchronized to a replica V91 host (requires 2 or more V91s configured as a replication solution)
- Live Migration - Ability to move an active VM from one host to another with no disruption to the operator
- Centralized Management - Ability to monitor and maintain one or more V91 Virtualization Servers from a remote location
- NIC Teaming - Provides redundancy at the Virtualization host for off control networks
- VM Export without shutdown

  NOTE: In order to take advantage of Replication, Live Migration, and Centralized Management, a user-supplied network, referred to as the Virtual Host Network, and a Windows Server 2016/Server 2022 Active Directory domain are required. A user-friendly application is provided to simplify the installation and configuration of this domain.

Other Model V91 Server features include:

- A single or dual processor (each with eight cores), up to 384 GB of memory, up to eight internal hard drives, redundant hot-swappable power supplies, and optional Redundant Array of Independent Disks (RAID) configurations
- The ability to host up to 14 virtual machines running Microsoft Windows Server 2016 or Microsoft Windows Server 2022. One of the virtual machines can be configured to run as a Domain Controller for V91 host servers.
- Trellix® Endpoint Security helps provide security on the V91 server
- Security by Local Group Policies to provide additional layer of protection
- Virtual machines on a V91 can:
  - Be a control processor host and/or provide historization and Foxboro DCS monitoring functions as a Schneider Electric station
  - Serve as a Foxboro DCS workstation or Control Core Services application platform and a human interface station (can open the VM directly)
  - Function as Remote Desktop Services servers to support up to 30 Foxboro™ DCS FoxView per VM or up to 10 Foxboro™ DCS Control HMI remote clients per VM with a limit of 60 RDP sessions across all VMs on a V91 server
  - Support enterprise security Foxboro DCS software with optional Trellix software package. Trellix Endpoint Security provides additional security enhancement features to help complement the security features already built into our products. For stations operating in Local Edition mode, Trellix Endpoint Security (ENS) provides advanced Threat Prevention. For stations operating in Enterprise Edition mode, Trellix ePolicy Orchestrator (ePO) provides all the security of ENS plus Rogue System Detection, Application Allowlisting, Integrity Control and Device Control for Data Loss Prevention (DLP). The license entitlement for the first five years after purchase for all of the listed options is included for the V91 server. After the five years, a renewal is required with the purchase of the Trellix five year license (J0202AS) for each V91 server using any Trellix products.

  NOTE: Trellix Endpoint Security is included with Model V91, However, it is not pre-installed/configured on the system. For additional Trellix security protection options, see *EcoStruxure™ Foxboro™ DCS Trellix Security Products* (PSS 41S-4Trellix).

V91 Physical Operating System Environment (POSE)

The Physical Operating System Environment (POSE) on the V91 server is the Windows Server 2016 or Windows Server 2022 operating system. This pre-installed Windows operating system image on the V91 provides the foundation necessary to support hosting of virtual machines. The image includes:

- Microsoft Hyper-V virtualization technology, which is required for creating, hosting, and managing virtual machines
- Veritas System Recovery Virtual Edition for backing up of an entire V91 server (including all of the hosted virtual machines). A backup can be done live, without rebooting the V91 or any of the individual virtual machines
- Operating system hardening:
  - Unnecessary services, software, and programs are removed
  - Unneeded software ports are disabled
  - Secure BIOS changes

Since the V91's POSE Windows operating system's entire purpose is to support Schneider Electric virtual machines, the only software to be installed on it is Schneider Electric-supplied software directly related to the health and support of virtual machines.

In addition, Foxboro DCS, Foxboro DCS Control Software, or third-party applications cannot be installed on the operating system image shipped with the V91 server virtualization host.

The V91 server supports these peripherals: a mouse, QWERTY keyboard, 23–inch or 24-inch flat panel LCD monitor (purchased separately), optional USB touchscreen (purchased separately with the monitor), and 1Gb copper/fiber network interface. The V91 server does not support the use of serial GCIO annunciator keyboards, Foxboro DCS USB annunciator keyboards, remote graphics units, GPS time sync cards, or local printers.

V91 Virtual Operating System Environment (VOSE)

The V91 server is shipped with a Schneider Electric-created virtual machine operating system image. By using this supplied virtual machine operating system image with the Microsoft Hyper-V technology, the V91's virtual operating system environments (VOSE) can be created. Each virtual machine created with the Schneider Electric-supplied image has its own self-contained virtual operating system environment (VOSE) which includes:

- 64-bit Windows Server 2016 or Windows Server 2022 operating system which is required for loading software applications onto the virtual machine
- Veritas System Recovery 2018 Virtual Edition (K0204BE) or Veritas System Recovery 2023 Virtual Edition (K0204BU) software; which is required for backing up individual virtual machines. The procedure to back-up a virtual machine using Veritas System Recovery is very similar to performing the procedure on a physical machine.
- Operating system hardening:
  - Unnecessary services, software, and programs are removed
  - Software ports not required are disabled

A virtual machine can:

- Be used on the Foxboro DCS Control Network
  - Windows Server 2016: Control Core Services v9.4 through 9.7 and Control Software v7.1 through 7.5
  - Windows Server 2022: Control Core Services v9.8 or later and Control Software v8.0 or later
- Provide a platform for Schneider Electric, third-party, and user-written applications
- Host Foxboro DCS control stations
- Serve as an application platform
- Run Remote Desktop Services (formally known as Terminal Services)
- Connect to a thin client over the DCS Auxiliary Communications Network to provide human-machine interface (HMI) station functionality
- Use security enhancements provided by these Trellix software packages:
  - For stations operating in Local Edition mode, Trellix Endpoint Security (ENS) provides advanced Threat Prevention
  - For stations operating in Enterprise Edition mode, Trellix ePolicy Orchestrator (ePO) provides all the security of ENS plus Rogue System Detection, Application Allowlisting, Integrity Control and Device Control for Data Loss Prevention (DLP)

  NOTE: Virtual machines (VMs) can be ordered with or without EndPoint Protection (EPP). Ordering without EPP is only applicable for markets where local teams add an EPP solution to the VMs before delivering to client. When ordered with EPP selected, Trellix Endpoint Security licensing is included with each VM. However, it is not pre-installed/configured on the system.

NOTICE
POTENTIAL SYSTEM VULNERABILITIES Install and configure EPP on all virtual machines (VMs) to help protect against system vulnerabilities. **Failure to follow these instructions can result in system vulnerabilities.**

The virtual machines hosted by the V91 server connect to the network through internal virtual switches that map virtual machines to the V91's physical 1Gb copper / fiber Ethernet ports. The virtual switch network can be configured to map network connectivity to:

- The Control Network
- The DCS Auxiliary Communications Network (ACN), a 1Gb network comprised of managed Ethernet switches
- Other auxiliary networks

A combination of these different network types can be used.

The virtual machine's network connectivity is configured independently from other virtual machines hosted by the same V91 server. Each network utilizes a dedicated physical 1Gb copper / fiber Ethernet port. The Control Network has two dedicated 1Gb Ethernet ports while the DCS Auxiliary Communications Network (ACN) has one or more dedicated 1Gb Ethernet ports optionally configured to use NIC teaming.

With the exception of the Ethernet network ports, virtual machines cannot access the V91 physical ports (serial, USB, etc.) Therefore, virtual machines only support peripherals that are connected through the network, such as thin clients and network printers. Remote graphics units, GPS time sync cards, and local printers are not supported on virtual machines. A virtual machine can access the USB annunciator keyboard through a thin client.

Virtual Machine Configurations

A V91 server can host virtual machines with these configurations:

- Single processor virtual machines
- Multi-processor virtual machines

  NOTE: Only supported for virtual machines:

  - with Control Core Services connected to the Control Network
  - using the Schneider Electric-provided virtual machine operating system image on networks other than the Control Network
- A mix of single processor virtual machines and multi-processor virtual machines

Sizing

- A V91 server can support up to fourteen virtual machines.
- The maximum number of RDP sessions depends on the number and types of applications being run in the remote sessions. This includes the number of process control points being updated, number of alarms being delivered, number of displays open, etc. If your application needs are high, you might find the actual number of client sessions to be lower. Experimental results indicate that for planning purposes, the number of RDP sessions per virtual machine cannot exceed 30 RDP sessions for FoxView VMs and 10 RDP sessions for Control HMI VMs.
- The total number of RDP sessions across all VMs on a V91 server cannot exceed 60.

Licensing

There are no Foxboro DCS licenses associated with the V91 host itself. However, each virtual machine must have the proper Foxboro DCS license. Virtual machine Foxboro DCS licenses are identical to physical machine licenses.

Optional High Availability For Vital Applications

The Foxboro DCS has the option of running vital run-time applications such as the Control HMI, current Alarm Displays, and Historian (collectors and servers) in parallel on two separate machines. When this functionality is combined with virtualization to run on two physical V91 servers - separated geographically to keep a single condition from affecting both hosts – time, effort, and cost to restore system can be reduced.

V91 Server enhances the virtualization product offering by providing the ability to automate the creation of VM replicas from one V91 host to another using Microsoft Replication. It also reduces disruption of planned maintenance with the ability to move live VMs from one V91 host to another with no operator interruption using Live Migration.

V91 Minimum (Base) Configuration

The V91 default configuration is the minimum recommended hardware for supporting two virtual machines. Options are available to increase the capacity of the V91 to support additional virtual machines or reduce RAID and security peripherals if they are not required.

The Model V91 server base configuration includes:

- Microsoft Hyper-V virtualization technology through the pre-configured and installed Windows Server 2016 or Windows Server 2022 physical operating system environment (POSE)
- Three Trellix ENS licenses are provided to license the V91 host and first two VMs
- Virtualization hosting support for two virtual machines with Microsoft Windows Server 2016 Edition or Microsoft Windows Server 2022 Edition operating system, 64-bit package (virtual operating system environment (VOSE))
- Intel Xeon Silver 4110 Processor
  - HPE DL380 Gen10 Intel Xeon-Silver 4110 (2.1GHz/8-core/85W) Processor Kit (P/N RH103DQ) is available for a field upgrade/expansion to a second processor.
  - Additional HPE 16GB (1x16GB) Dual Rank x8 DDR4-2666 Registered Memory (P/N RH103FW) is needed in the second CPU memory slot with the second processor.

NOTICE
LOSS OF FUNCTIONALITY Do not combine different memory speeds or types (Single Rank/Dual Rank) for the V91. This causes an error code to appear which prevents you from completing the operating system installation process. **Failure to follow these instructions can result in loss of functionality.**

- Quad head graphics card with four mini-DP ports, four adapters from mini-DP to standard display port are provided
- 16 GB DDR-4 Registered Memory
- Two 600 GB SAS hard drives in RAID 1 for operating system “C” drive and two 600 GB SAS hard drives for D drive
- Four integrated 10/100/1000Base-TX Ethernet ports
- Internal SATA CD-RW/DVD drive
- Two rear USB 3.0 ports
- Two front USB 2.0 ports / One front USB 3.0 port
- Redundant hot-swap power supplies
- Redundant hot-swap fans
- USB keyboard
- USB mouse

V91 Options

The Model V91 server offers these options:

- Expandable virtualization hosting support for up to fourteen Virtual Machines running Microsoft Windows Server 2016 or Microsoft Windows Server 2022 operating system, 64 bit package
- Trellix ENS licenses for the host and up to fourteen Virtual Machines
- Dual Intel Xeon CPU processor
- Up to 384 GB registered memory
- No disk unavailability protection - One 600 GB SAS hard drive for operating system “C” drive and one 600 GB SAS hard drives in RAID 0 for “D” drive
- Disk unavailability protection - Two 600 GB SAS hard drives in RAID 1 for operating system “C” drive and three 600 GB SAS hard drives in RAID 5 “D” drive or three, four, five or six 1.2 TB SAS hard drives in RAID 5 with a hot spare for “D” drive
- Options provide up to 4.8 TB total available disk space for virtual machines
- Single or dual port fiber NICs
- Single or dual port copper NICs

Mounting Options

NOTICE
POTENTIAL EQUIPMENT DAMAGE Do not mount the V91 in a standard single depth rack enclosure. Enclosures must accommodate a depth of at least 39.4 in (1000 mm) to allow space for air flow at the front and back of the unit, plus cables at the back of the unit. **Failure to follow these instructions can result in equipment damage.**

The V91 is a 2U high, rack mount server which offers:

- Rail mounting kit as standard equipment
- Optional 2U cable management arm for rail mounting kit

The V91 can be placed in commercially available enclosures that have provisions for adequate ventilation and cooling to maintain the ambient temperature inside the enclosure does not exceed 95°F (35°C). If the enclosure ambient temperature is higher than 95°F (35°C), additional fans are needed. See the Cooling section under Functional Specifications, page 10.

With dual monitor PCIe video cards, the V91s can be located up to 4.5 m (15 ft) from the monitor using direct connect and other human interface cables available from Schneider Electric.

As indicated by the CE logo, the V91 conforms to the applicable European Union Directives.

Functional Specifications

<table>
<tr><td>Processor Type</td><td>Intel Xeon</td></tr>
<tr><td>Memory</td><td>16 GB DDR4 Registered Memory</td></tr>
<tr><td>Devices Served</td><td>SAS Peripherals
One 600 GB internal system disk drive (with option for a second one in a RAID1 configuration) for boot operating system, with one 600 GB disk drive with an option for up to six 1.2 TB drives as an option in a RAID 5 configuration for use with the virtual machines.
Controller Peripherals
One SATA CD-RW/DVD drive
Video Displays (Up to 2)
23-inch LCD USB Touchscreen Monitor
23-inch LCD Monitor
Interfaces to External Devices (USB)
Mouse or Optional Trackball
Alphanumeric Keyboard
Up to four optional touchscreen monitors
Audio Speakers</td></tr>
<tr><td>Internal Diagnostics</td><td>Self-checking performed at power-up</td></tr>
<tr><td>Video</td><td>Output Type
Quad mini-DP 1.4 port PCIe graphics card with adapters to standard display port, up to 4 x1920x1080 (Full HD) pixel resolution
Screen Presentation
Refresh Rate
Up to 85 Hz
Colors
32 bit
Resolution
Widescreen (16:9) (Supported by 23-Inch LCD Monitor)
Up to 1920x1080 pixels</td></tr>
<tr><td>Ethernet Interface Communications</td><td>PCIe Ethernet network interface cards providing connection to Ethernet data bus (10/100Base-TX or 100Base-FX)

Four Integrated Ethernet ports (10/100/1000Base-T)</td></tr>
<tr><td>Power Supplies</td><td>Two redundant, hot swappable, 800 W auto-switching input power supplies, each with a separate power cord</td></tr>
<tr><td>Power Requirements</td><td>Power Parameters<table>
<tr><th colspan="9">HPE 800W Power Supply Kit (865414–B21)</th></tr>
<tr><td>Normal Input Voltage (V rms)</td><td>100</td><td>120</td><td>127</td><td>200</td><td>208</td><td>220</td><td>230</td><td>240</td></tr>
<tr><td>Normal Input Current (A rms)</td><td>9.1</td><td>7.5</td><td>7.0</td><td>4.4</td><td>4.2</td><td>4.0</td><td>3.8</td><td>3.6</td></tr>
</table></td></tr>
</table>

	Input Power • 100-240 VAC, 50 to 60 Hz, auto ranging Inrush Current • 30 A power supply for 20 ms Heat Dissipation • 3067 BTU/hr (at 100 VAC) • 2958 BTU/hr (at 200 VAC)
Power Consumption (Typical)	When equipped with two CPUs with 16 cores (100% utilized) and eight hard drives the measured typical power consumption is 250 watts
Cooling	Hot swappable, redundant I/O and processor fans. Each redundant power supply contains a fan. Temperature Specification can be extended up to 40°C (104°F) with the Optional High Temperature DL380 Gen10 High Performance Fan Kit, Schneider Electric Part Number RH103ES. This fan kit does increase the fan noise of the machine.
Regulatory Compliance, Electromagnetic Compatibility (EMC)	*USA and Canada* • Complies with FCC CFR 47 Part 15 *European Union* • Complies with the EU EMC Directive 2014/30/EU and the following Harmonized Standards: ◦ EN 55035:2017/A11:2020 ◦ EN 55032:2015/A11:2020 Class A ◦ EN 61000-3-2:2014 ◦ EN 61000-3-3:2013
Regulatory Compliance, Product Safety	*USA and Canada* • UL® and cUL Listed *European Union* • Complies with the Low Voltage Directive 2014/35/EU and the following Harmonized Standards: ◦ EN 60950-1:2006 + A11:2009 +A1:2010 +A12:2011+A2:2013 ◦ EN 62368-1:2014 ◦ EN 62479:2010
RoHS Compliance	Complies with EU RoHS Directive 2011/65/EU under the following Harmonized Standard: EN IEC 63000:2018

Environmental Specifications

	Operating	Storage
Temperature	10° to 35°C (50° to 95°F) at sea level with an altitude derating of 1.0°C per every 305 m (1.8°F per every 1000 ft) above sea level to a maximum of 3050 m (10,000 ft); no direct sustained sunlight. Maximum rate of change is 10°C/hr (18°F/hr). The upper limit might be limited by the type and number of options installed. 10 to 40°C (50 to 104°F) with the Optional RH103ES HP DL380 Gen10 High Performance Fan System performance might be reduced if operating with a fan fault or above 30°C (86°F).	-30° to 60°C (-22° to 140°F) Maximum rate of change is 20°C/hr (36°F/hr)
Relative Humidity	10% to 90% relative humidity (Rh), 28°C (82.4° F) maximum wet bulb temperature, noncondensing	5% to 95% relative humidity (Rh), 38.7°C (101.7°F) maximum wet bulb temperature, noncondensing
Maximum Vibration	0.26 G at 5 to 350 Hz in operational orientations	1.54 G rms at 10 Hz to 250 Hz in all orientations
Shock	Half sine shock in all operational orientations of 31 G +/-5% with a pulse duration of 2.6 ms +/-10%	Half sine shock on all six sides of 71 G +/-5% with a pulse duration of 2 ms +/-10% Square wave shock on all six sides of 27 G with velocity change at 235 in/sec or greater
Altitude	3050 m (10,000 ft). This value might be limited by the type and number of options installed. Maximum allowable altitude change rate is 457 m/min (1500 ft/min)	-16 to 9144 m (-50 ft to 30,000 ft)
Contamination	Class G1 (Mild) as defined in ISA Standard S71.04	
Location	UL/UL-C listed as suitable for use in ordinary locations and meets ordinary safety standards for fire and shock hazards.	

Physical Specifications

	Keyboard	Chassis
Dimensions	Height • 35 mm (1.4 in) Width • 445 mm (17.5 in) Depth • 150 mm (5.9 in)	Maximum outside dimensions with bezel and feet Height • 87.3 mm (3.44 in) with bezel Width • 445 mm (17.5 in) Depth • 680 mm (26.75 in)
Weight	1.8 kg (4.0 lbs)	Rack • 23.6 kg (51.5 lbs) maximum configuration

Ordering Information

Part Number	Description
V91	Virtualization Server for Foxboro DCS Virtual Machines
K0204AT	Media kit required to use Centralized Virtualization Management (CVM) with MS Server 2016. One kit required per V91.
K0204BY	Media kit required to use Centralized Virtualization Management (CVM) with MS Server 2022. One kit required per V91.
RH103FL	HP T740 Quad Video Thin Client Single NIC
RH103FN	HP T740 Quad Video Thin Client Dual NIC
P0928MN	HP 2U SFF Easy Install Rail Kit
P0928MR	HP 2U Cable Mgmt Arm For Easy Install Rail Kit
RH103ES	High Performance Temp Fan Kit HP DL380 G10 Rack Server

Related Documents

Topic	Document
Model V91 (HP DL380) Gen10	*EcoStruxure™ Foxboro™ DCS Model V91 Virtualization Host Server (HP DL380 Gen10) for Windows Server 2016 User's Guide* (B0700HQ)
	EcoStruxure™ Foxboro™ DCS Model V91 Virtualization Host Server (HP DL380 Gen10) for Windows Server 2022 User's Guide (B0700WT)
Hypervisor	*EcoStruxure™ Foxboro™ DCS Hypervisor Technology – Microsoft® Hyper-V™ Hypervisor* (PSS 41S-8HYPRVOV)
Virtualization	*EcoStruxure™ Foxboro™ DCS Centralized Virtualization Management for Windows Server 2016 User's Guide* (B0700HC)
	EcoStruxure™ Foxboro™ DCS Virtualization for Windows Server 2016 User's Guide (B0700HD)
	EcoStruxure™ Foxboro™ DCS Centralized Virtualization Management for Windows Server 2022 User's Guide (B0700JH)
	EcoStruxure™ Foxboro™ DCS Virtualization for Windows Server 2022 User's Guide (B0700WW)
Control Network	*EcoStruxure™ Foxboro™ DCS Switch Configurator Application Software (SCAS) for the Control Network User's Guide* (B0700CA)
Thin Client	*EcoStruxure™ Foxboro™ DCS Thin Client with Windows® 10 User's Guide* (B0700WC)
	EcoStruxure™ Foxboro™ DCS Thin Client (PSS 41H-4THNCLNT)
Security Products	*EcoStruxure™ Foxboro™ DCS Trellix Security Products* (PSS 41S-4Trellix)
	EcoStruxure™ Foxboro™ DCS Trellix ENS 10.7 and ePO 5.10 for Windows Server 2016 Installation and User's Guide (B0700WR)
	EcoStruxure™ Foxboro™ DCS Trellix ENS 10.7 and ePO 5.10 SP1 for Windows Server 2022 Installation and User's Guide (B0700XD)
System Recovery	*EcoStruxure™ Foxboro™ DCS Veritas System Recovery 18 User's Guide* (B0700HS)
	EcoStruxure™ Foxboro™ DCS Veritas System Recovery 23 User's Guide (B0700WY)

⚠ **WARNING**: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.p65warnings.ca.gov/.

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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