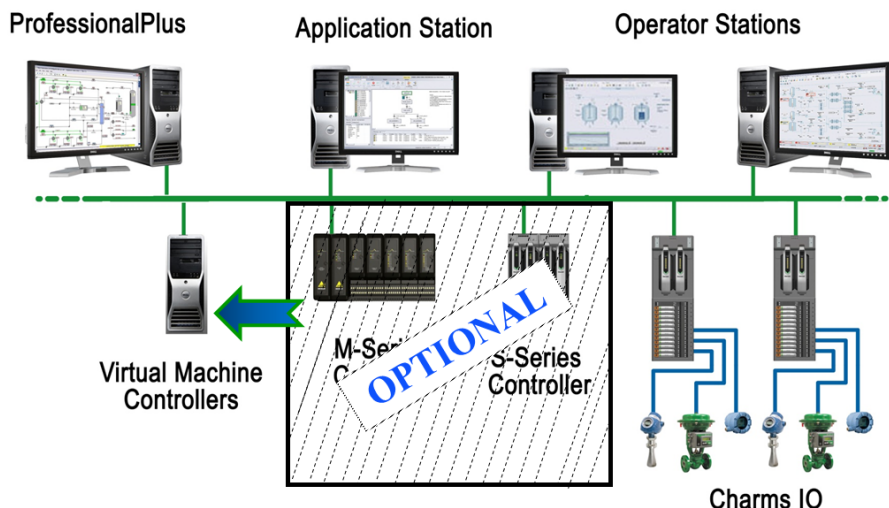


DeltaV™ Virtual S-series and M-series Controller Simulation



Virtual S-series and M-series Controllers run in host workstation for off-line development and testing.

- Minimize controller hardware for development and test
- Avoid control or I/O configuration changes
- Reduce the risk of unexpected problems during commissioning or upgrades
- Improve engineering efficiency and reduce project execution costs

Introduction

DeltaV™ Virtual S-series and M-series controllers provide an easy, cost effective way to simulate controller functionality for system development and testing. With these virtual controllers, configuration and I/O assignments can be thoroughly tested without the need for actual controller hardware. This means less physical equipment to set-up and maintain. And the virtual environment makes it easy to add and remove controllers as needed.

In the past, rigorous control system development and testing required physical controllers connected to virtual

I/O module (VIM) hardware. Now, the same software used in physical controllers can be run in virtual machines (VMs) in a workstation. These virtual machine controllers, called VM Controllers, can be used for development and testing of the same configuration and I/O assignments used by physical controllers, but without the controller hardware. And unlike control simulation in the DeltaV Application or ProfessionalPlus workstations, the VM Controllers can be configured identically to your physical hardware controllers. No configuration changes are required between the off-line test system and on-line production system, including I/O assignments and controller node names.

DeltaV VM Controllers also support simulated process I/O for rigorous testing of control applications prior to commissioning. The DeltaV virtual S-series controllers support simulated I/O for both classic I/O and CHARMS based Ethernet I/O cards. Physical or virtual CHARMS I/O cards may be used with the virtual S-series controllers. Virtual M-series controllers support only simulation for classic I/O.

Virtual S-series and M-series controllers are supported for off-line DeltaV Virtual Studio and VMware based systems, and are available for DeltaV version v11.3.1 and v12.3.



Benefits

Minimize controller hardware for development and test. Now you can develop and thoroughly test your control configurations and I/O assignments without control hardware or Virtual I/O Modules (VIMS). Virtual S-series and M-series controllers run in a workstation and support simulated I/O for testing.

Avoid control or I/O configuration changes.

Virtual machine controllers are configured the same as real controllers, including I/O assignments and node names. That means you don't have to reassign modules or bypass I/O during development or FAT, avoiding configuration changes and minimizing the possibility of introducing errors.

Reduce the risk of unexpected problems during commissioning or upgrades. Rigorous testing with simulated I/O can uncover configurations errors and avoid costly rework during commissioning. Virtual machine controllers make it easy to thoroughly test applications in a user-friendly workstation environment.

Improve engineering efficiency and reduce project execution costs. Virtualization provides significant efficiency improvement in set up and tear down of systems for development and test. Create new controllers and add them to the DeltaV network in minutes, without wiring or setting up physical hardware. Virtual S-series and M-series controllers save both time and money.

Product Description

DeltaV Virtual S-series and M-series Controllers enable you to develop and thoroughly test control configurations without physical controller hardware. They are part of an integrated DeltaV virtualization solution called DeltaV Virtual Studio that makes creating virtual DeltaV systems easy. *For more information, see the DeltaV Virtual Studio product data sheet.* Virtual S-series and M-series Controllers are also available for off-line VMware virtualization environments.

The DeltaV Virtual S-series and M-series Controllers are Virtual Machines (VMs) that run in a host computer. These virtual machine controllers, called VM Controllers, are configured and behave the same as physical controllers. Configuration is the same because they use the same software as the physical controller, but the software runs in a virtual machine. When a virtual controller is created and connected to a DeltaV system, it can be commissioned and used for I/O checkout the same way you would use a physical controller.

The DeltaV VM Controllers are completely separate from the DeltaV workstation-based control software (a.k.a., "virtual controller") which allows you to assign and execute modules on a DeltaV Application or ProfessionalPlus workstation. The DeltaV workstation control software requires a full DeltaV workstation to be installed in order to run. The DeltaV VM Controller is an independent controller, just like a physical controller, but runs instead as a virtual machine on a host computer.

For most off-line engineering activities, a VM Controller can be used as a substitute for a physical controller, except that the following features are NOT supported:

- Controller redundancy
- ACN redundancy (i.e., switch over of networks)
- Cold restart (power up configuration) and warm restart (tuning parameter restore)
- Controller diagnostics
- AMS device support
- Bus or serial I/O simulation

In addition, the VM Controller will not have the same performance metrics because of hardware differences. Specifically, the VM Controller should not be used to test loading, FRETIME, FREMEM, Module Execution Time, and Scan Period may be significantly different between a physical and a virtual controller. Virtual controller loading may also be subject to other operating system scheduling activities.

Virtual I/O Simulation Capability

An important capability of the VM Controller is the ability to use simulated I/O with the same I/O assignments used by physical I/O cards and controllers. The Virtual S-series Controller supports simulated I/O for both Classic I/O and CHARMS I/O cards. The Virtual M-series Controller only supports simulated I/O for Classic I/O.

Simulated CHARMS I/O Cards

Simulated process I/O is supported with either physical or virtual CHARMS I/O Cards. You can read and write to primary parameter and status fields using the DeltaV's CHARMS Simulate application or with Mynah's MiMiC process simulation application. The virtual CHARMS I/O Card is supported for both DeltaV Virtual Studio and VMware environments and is easily interfaced with the Virtual S-series Controller through a standard DeltaV ACN Ethernet connection.

Simulated Classic I/O

For Classic I/O simulation, the Virtual S-series and M-series Controllers use virtual I/O parameters which can be easily accessed without any additional hardware (for example, no VIM Card is required). You can read and write to primary parameter and status fields via DeltaV parameter references, DeltaV function blocks, and OPC clients such as DeltaV Watchit, and DeltaV Operate. You may also read/write to simulated virtual I/O parameters using Mynah's MiMiC via OPC. *Contact Mynah for the MiMiC release which supports Virtual Controllers I/O simulation.*

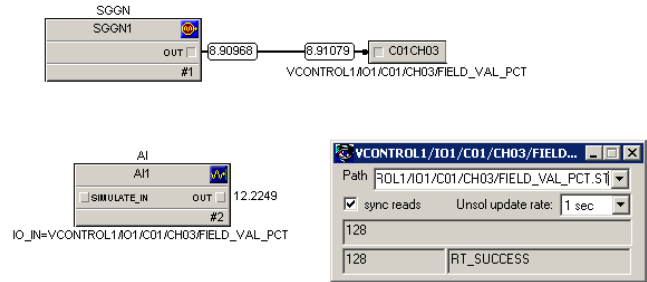


Figure 1 – Referencing Virtual I/O Parameters

Figure 1 shows examples of accessing the virtual I/O parameters through parameter references, function blocks and OPC clients. A typical path for a virtual I/O parameter would be <node name>/IO1/<card number>/<channel number>/<field parameter name>.

Virtual I/O Simulation for Classic I/O

The following table lists the Classic I/O channel types and field parameters supported for the virtual I/O interface.

Supported Virtual I/O Types for Classic I/O Simulation	
Channel Type	Field Parameter
Analog Input	FIELD_VAL_PCT
HART Analog Input	HART_FIELD_VAL
Analog Output	OUT
HART Analog Output	OUT
Discrete Input	FIELD_VAL_D
Pulse Count Input	COUNTER_IN
Pulse Input	COUNTER_IN FREQUENCY
Discrete Output	OUT_D
Continuous Pulse Output	ONTIME
Momentary Output	OUT_D
RTD, Thermocouple, Voltage, and mV types	FIELD_VAL FIELD_VAL_PCT
SOE Discrete Input	FIELD_VAL_D

Virtual I/O Simulation Limitations

The virtual I/O channel simulation provided with the VM Controller does not support the following features:

Remote I/O. The simulation of remote I/O such as Wireless Devices, Zone1 and Zone2 I/O are not supported through the direct virtual I/O parameter references.

Bussed I/O. The simulation of bussed I/O such as Fieldbus, AS-I bus, DeviceNet, Serial I/O and ProfiBus is not supported through virtual I/O simulation.

DeltaV Diagnostics. Virtualized I/O does not involve real devices; therefore, it is impossible to have valid diagnostic data from the virtual I/O channels. Diagnostic utilities such as DeltaV Diagnostics should not be expected to provide accurate information.

Advanced I/O Card Features. Advanced features that may be available on some real I/O cards will not be supported for virtualized I/O. This includes redundant card operation, card maintenance port access, railbus statistics, card status and card integrity. Certain advanced channel features must be taken into account during I/O virtualization. This includes secondary parameters such as the FREQUENCY parameter of a pulse input channel. The FREQUENCY parameter is normally calculated by the I/O card, so the virtualization configuration must provide that information for a DeltaV configuration utilizing FREQUENCY to work properly. Other passive channel configurations must similarly be taken into account with the virtualization configuration including cold junction compensation, linefault detection, pulse period, I/O filters, debouncing options, and any actions taken on a channel value reset. Other advanced channel features not supported include SOE Event Generation, SOE Chatter Control, and digital HART functionality.

DeltaV Virtual Studio

DeltaV Virtual Studio is an integrated DeltaV application environment designed for easy implementation and management of virtual DeltaV control systems for both off-line and on-line production systems. DeltaV Virtual Studio is used to create, modify, stop, and move DeltaV virtual machines. DeltaV VM Controllers are easily created and assigned to host computers using DeltaV Virtual Studio. Figure 2 shows the DeltaV Virtual Studio application.

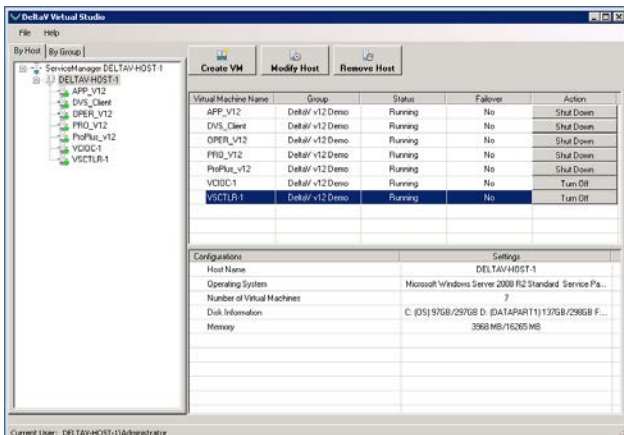


Figure 2 - DeltaV Virtual Studio Application

DeltaV VM Controllers are easy to create and implement using virtual machine templates. These templates allow you to easily add controllers from a single configuration dialog. Simply specify the host computer, enter a controller name, select the DeltaV S-series or M-series controller template, select the network connections from a drop down menu, and press OK. Within a minute or two the new controller will be automatically generated from a prebuilt template. For more information, see the product data sheet for DeltaV Virtual Studio.

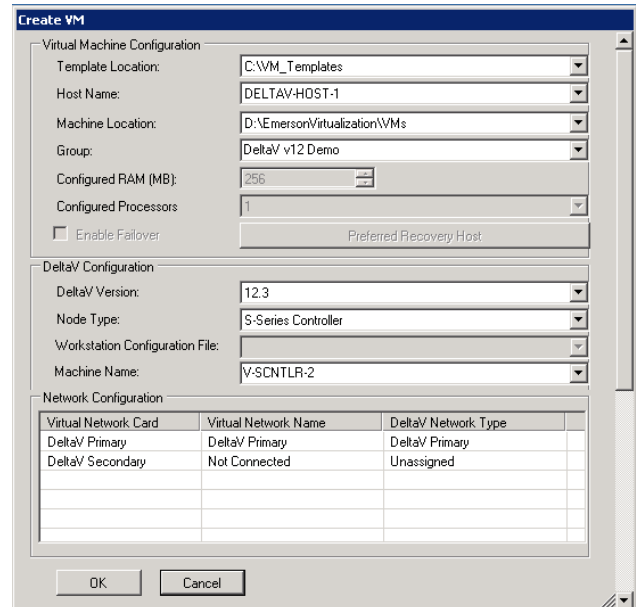


Figure 3 – Creating a Virtual S-series Controller

Licensing

DeltaV Virtual S-series and M-series controllers are licensed per VM Controller for a specific DeltaV system ID and may be used for off-line simulation only. A base license must be purchased and then additional VM Controller licenses can be added. The licenses are sold in quantities of 1, 5, 10, and 20 as described below. The VM Controller license may be used for either the virtual S-series or M-series controller.

Capacities

Sizing for the virtual S-series and M-series controllers are based on the largest available model (i.e., SX and MX controllers) and contain a superset of all functionality for their respective controller series. The recommended maximum number of VM controllers is 20 per host computer, dependent on host computer resources. See DeltaV Virtual Studio product data sheet for System Planning Guidelines.

Ordering Information*

Description	Model Number
DeltaV Simulate Virtual Machine (VM) Controller (Base License)	VX1019S001
DeltaV Simulate VM Controller Scale-up, 1 VM Controller	VX1019UPS01
DeltaV Simulate VM Controller Scale-up, 5 VM Controllers	VX1019UPS05
DeltaV Simulate VM Controller Scale-up, 10 VM Controllers	VX1019UPS10
DeltaV Simulate VM Controller Scale-up, 20 VM Controllers	VX1019UPS20

**Ordering information is for licenses only. Virtual machine controller software is provided with the media kits as described in the DeltaV Virtual Studio product data sheet.*

Prerequisites

- DeltaV v11.3.1 or later is required.

Not Supported Products

- **DeltaV SZ Controller.** The DeltaV Virtual S-series controller does not include support for DeltaV SIS SZ controllers.

Related Products

- **DeltaV Virtual Studio** is an integrated DeltaV application environment designed for easy implementation and management of virtual DeltaV control systems for both off-line and on-line production systems. Virtual machine templates are provided for automatic generation and configuration of DeltaV workstations and controller hardware. *For more information, see product data sheet for DeltaV Virtual Studio.*
- **DeltaV Virtual CHARMS I/O Card Simulation.** Simulation of process I/O using virtual CHARMS I/O cards running in a workstation PC. Virtual CHARMS I/O cards provide the same simulation capability as real CHARMS I/O cards and can be used for rigorous checkout of I/O assignments, operator displays, and control functionality. Available for both DeltaV Virtual Studio and VMware environments. *For more information, see product data sheet for DeltaV Virtual CHARMS I/O Simulation.*

Related Hardware Products

- **DeltaV Virtualization Hardware.** Thoroughly tested and supported computer and peripheral devices for use with DeltaV Virtual Studio. Hardware includes host servers, storage area network (SAN), thin clients, network switches, and related hardware required for DeltaV Virtualization. *For more information, see product data sheet for DeltaV Virtualization Hardware.*

Related 3rd Party Products

- **VMware Workstation and ESXi Hypervisor.** DeltaV Virtual S-series and M-series Controllers are available and supported for VMware environments. Refer to Emerson Alliance Partner webpage for the latest implementation guidelines and limitations.
- **Mynah MiMiC Simulator** supports both simple tie-back simulation and rigorous first principle process simulation. MiMiC has special I/O drivers developed to support DeltaV VM Controllers. *Refer to Mynah MiMiC product data sheets for more information.*

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