

DeltaV™ Network Time Synchronization

This document describes how DeltaV™ system time is managed using Network Time Servers.

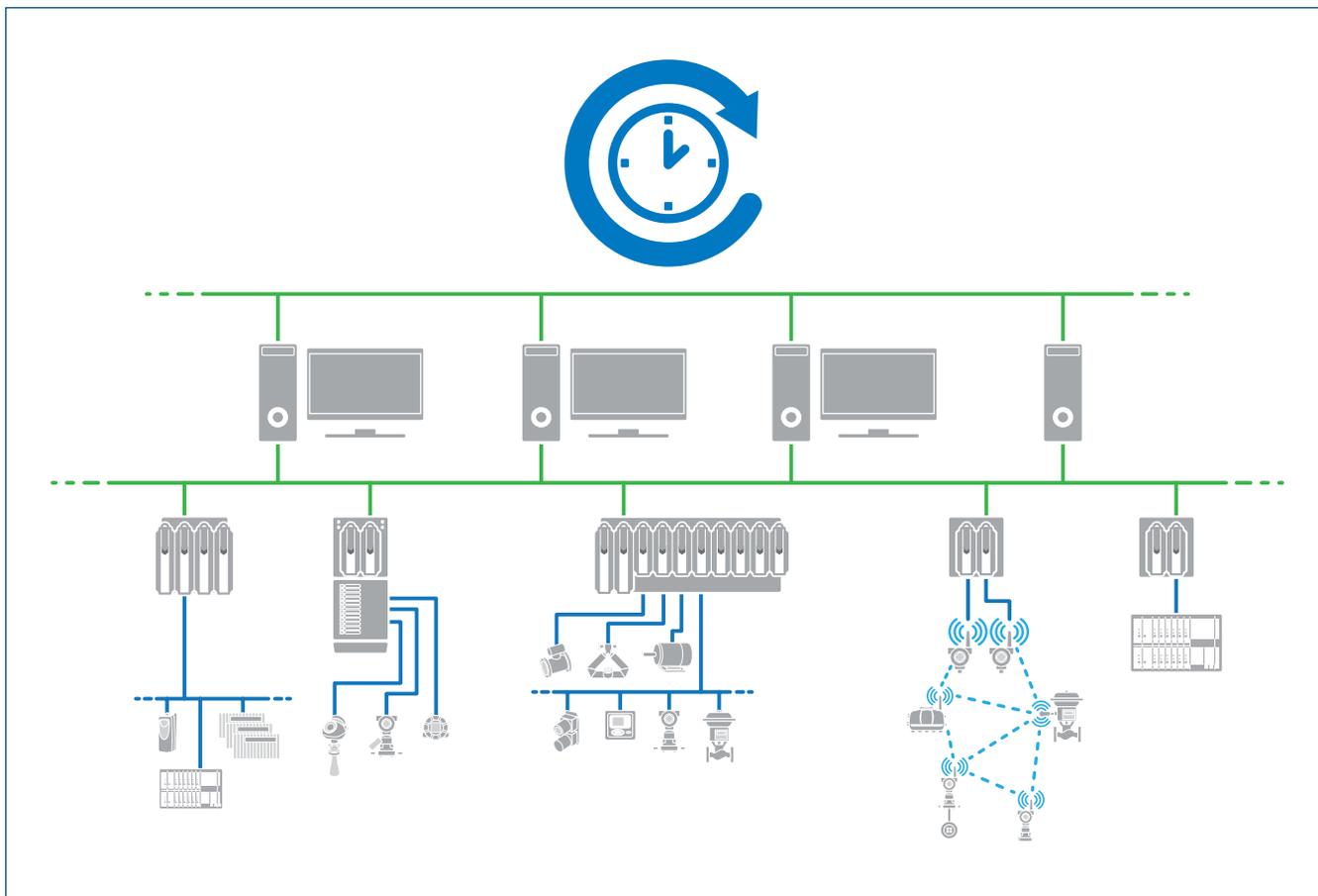


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Introduction

Starting with v5.2, DeltaV systems use the Network Time Protocol (NTP) to maintain system time on workstations, servers, and embedded nodes. The DeltaV system uses NTP to keep all the DeltaV workstations and controllers in synchronization with a master time server.

Time synchronization within DeltaV systems is important for the following use cases/applications, but not limited to:

Support the Sequence of Events (refer to the SOE product data sheet) capability, which requires very accurate time synchronization between Control Network devices, time reference for DeltaV virtualization and security solutions such as the Security Information and Event Management (SIEM) for DeltaV systems, as well as network devices, among others.

Network Time Protocol

NTP is a standard communication protocol that allows computers to synchronize with a time server across a network. NTP time servers are arranged in a hierarchy. At the top (Stratum 1) are the primary servers. Then come secondary servers (Stratum 2 and so on down to Stratum 16).

DeltaV Time Synchronization

DeltaV Workstations as Time Servers for the DeltaV Area Control Network (ACN)

The DeltaV system supports master and backup time servers as a standard feature. These time servers can be any local DeltaV workstation and they are lower down in the NTP hierarchy. The master and backup time servers are defined under the 'Properties' of the 'Physical Network' in DeltaV Explorer.

By default, the master time server is the Professional PLUS Station. The backup time server can be any local workstation other than the master time server. A download of the 'Setup' for the 'Control Network' is required if a time server is changed to a different workstation. Starting with DeltaV v14.LTS the concept of master and backup time server does not apply to DeltaV anymore since NTP peer mode has been implemented to streamline the process and allow the node with the most accurate time in the network to provide the time reference to the system nodes.

For DeltaV workstations on a remote network, the remote workstations configured as Remote Access Server is the master time server.

To set the time on a DeltaV system that is not using Stratum 1 NTP servers, the existing 'Set/Synchronize Network Time' utility is used. The time synchronization accuracy for workstations and controllers can be expected to be ± 50 ms in this configuration.

On this specific setup, the primary and backup time servers can still communicate to a Stratum 1 NTP time server, and this is accomplished by means of a request/response communication model. This is the most common way of deploying DeltaV systems and usually the Stratum 1 NTP time server is connected out of the DeltaV system boundaries as a time reference for other systems and network devices.

Using Stratum 1 NTP Time Servers Directly Connected to the DeltaV ACN

If a Stratum 1 NTP time server is installed on the ACN, then the DeltaV workstations and embedded nodes will automatically get their time from this server instead. Even the workstations that are defined as time servers will request time synchronization messages from this NTP server because it is higher up in the NTP hierarchy. Both primary and backup Stratum 1 NTP servers may be deployed.

If an NTP server becomes unavailable, then the DeltaV nodes will seek the next-highest time server, if available. If there is no other NTP server (or it also becomes unavailable), then the DeltaV workstations that are defined as time servers will take over.

The Stratum 1 NTP time servers shall be configured with certain predefined IP addresses for them to work on the DeltaV ACN (refer to Table 1 below for these addresses). The configuration of these IP addresses is done through the NTP time server configuration software and not through any DeltaV system application.

	Primary Control Network Address	Secondary Control Network Address
Master NTP Server	10.4.128.1	10.8.128.1
Backup NTP Server	10.4.128.2	10.8.128.2

Table 1. Stratum 1 NTP time server reserved addresses for the DeltaV ACN.

The 'Set/Synchronize Network Time' utility normally should not be used when a Stratum 1 NTP server is in use. The utility will not change the time on the NTP server. The only reason to use this utility should be to set the time on a workstation to be very close to the NTP server time. This helps the workstation achieve quicker synchronization with the NTP server.

The time synchronization accuracy for workstations, using 100Mbps ethernet, can be expected to be ±10ms in this configuration. For DeltaV embedded nodes, the accuracy will be ±1ms (older DeltaV controllers running at 10Mbps are able to achieve ±10ms accuracy). These accuracies can be achieved only when the Stratum 1 time server is directly connected to the DeltaV ACN.

The following network topologies are supported for the control network:

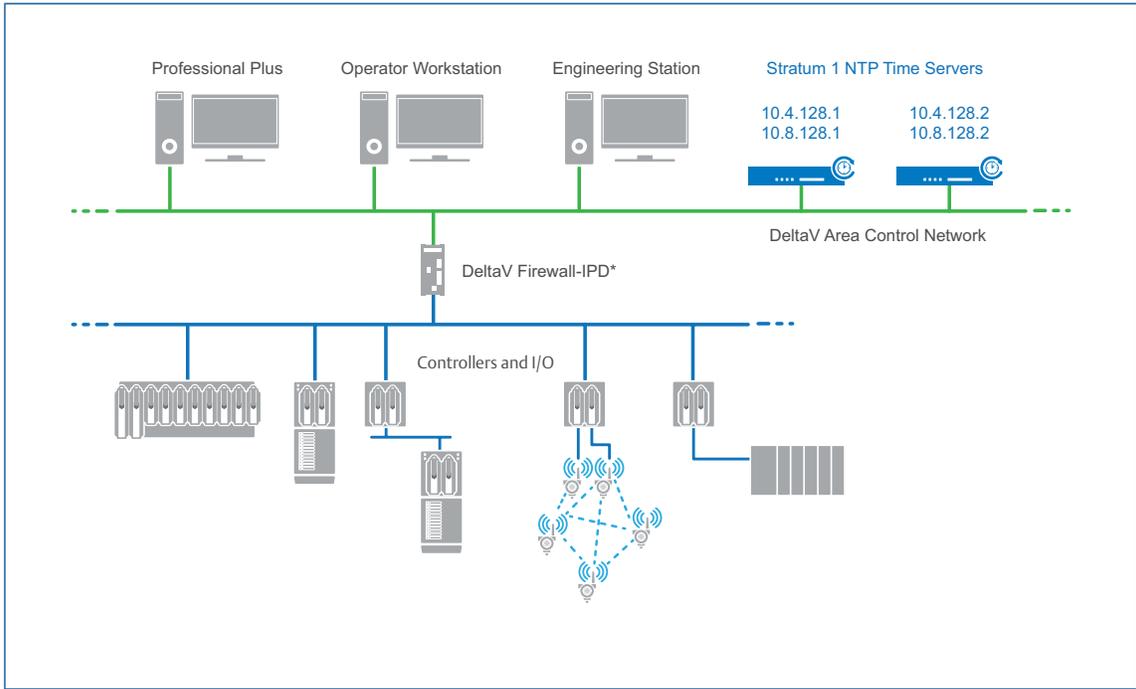


Figure 1. DeltaV ACN with NTP servers.

*Redundancy not included for simplicity on this diagram.

Using Stratum 1 NTP Time Servers on a Remote Network

For remote DeltaV networks, the same basic topology as described above for the DeltaV ACN is supported. However, in this case the NTP Time servers are usually connected out of the DeltaV system boundaries to either a DMZ network or L3 network – either way, beyond the DeltaV system perimeter firewall (e.g. Emerson Smart Firewall).

The IP addresses for NTP time servers on a remote DeltaV network are not controlled by the DeltaV system. However, the DeltaV system needs to be configured with these addresses so that the remote workstations know where to request time from. These IP addresses must be defined under the 'Properties' of the 'Remote Network' in DeltaV Explorer. A download of the 'Setup Data' for the workstation that contains the remote network is required if a time server IP address is changed.

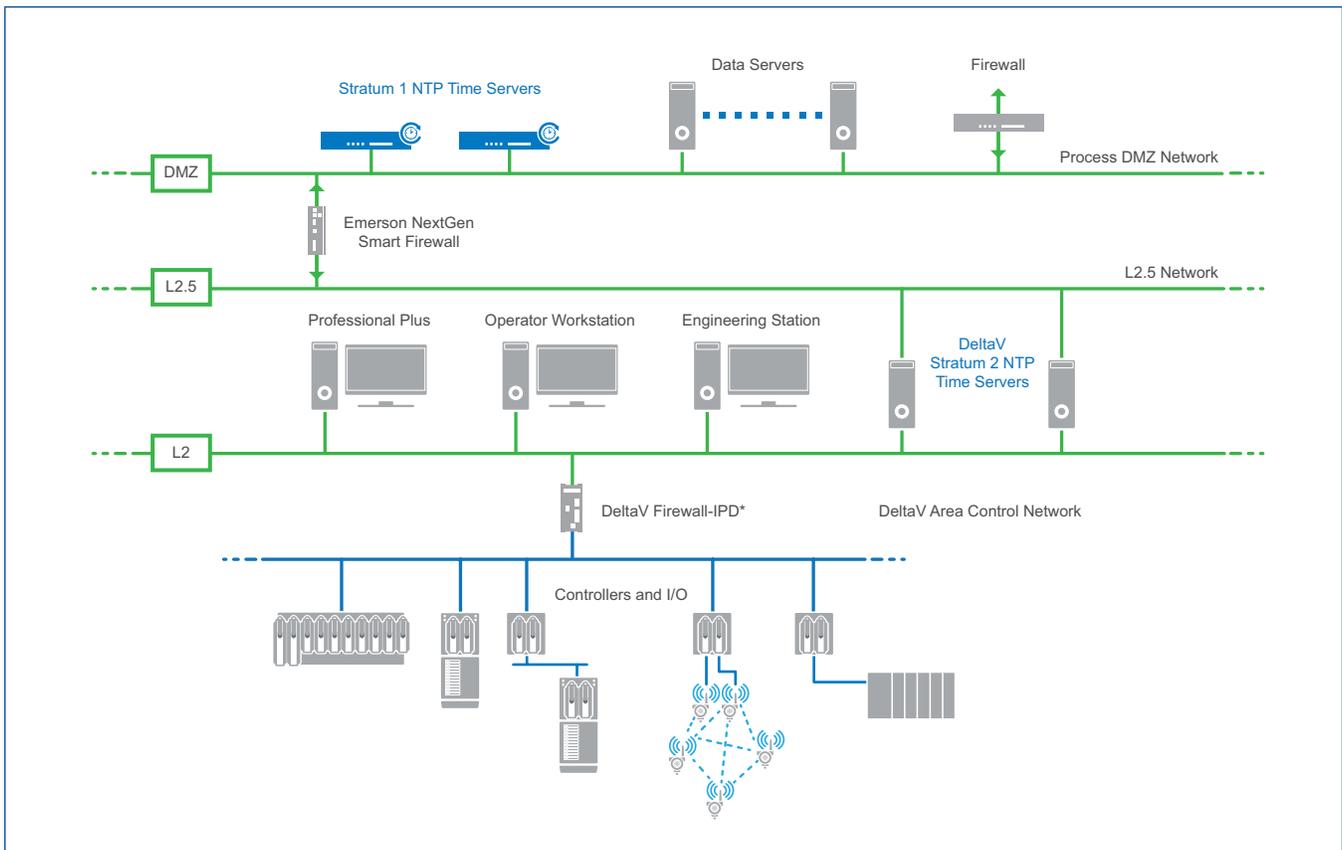


Figure 2. Typical configuration using Stratum 1 NTP Time Servers connected outside of DeltaV system boundaries.

*Redundancy not included for simplicity on this diagram.

Time Server Devices

The integration of NTP time servers within DeltaV systems is simple and pretty much non-intrusive, which basically means the time servers are only used to provide a time reference for DeltaV systems. The recommended Stratum 1 NTP time server devices for DeltaV systems are:

- Safran SecureSync: The Safran SecureSync 2400 has been tested with DeltaV systems using both Request/Response and Broadcast communication models, therefore it can be used in any of the topology types described in this white paper. For DeltaV v14.3 and lower, GPS Time Servers are required to support unauthenticated broadcast communications when they are connected directly to the DeltaV Area Control Network. Starting in DeltaV v14.LTS all NTP communications are based on request/response including the DeltaV Area Control Network.



Figure 3. Safran SecureSync 2400 front and rear views.

For additional information about how to set up the *Safran SecureSync* for time synchronization with DeltaV systems, please refer to the Guardian Support Knowledge Base Article NK-2200-0387.

Technical and commercial support is provided by Safran Group directly (<https://safran-navigation-timing.com>).

- Microchip SyncServer: Alternatively, we have also tested the Microchip SyncServer S650 as a drop-in replacement for the Symmetricon S250 that used to be the only supported time synchronization solution for DeltaV systems in the past. The S250 (or even the NS200) has reached end of life, and the Microchip SyncServer S650 is the currently available option.

Firmware version 3.1 and higher is available for the Microsemi S650 that supports unauthenticated broadcast communications which could potentially be used with DeltaV when connected to DeltaV systems v14.3 and lower, however this specific validation has not been done by Emerson. For DeltaV v14.LTS and higher, all NTP communications used in DeltaV are now based on request/response which is already compatible with the Microchip SyncServer S650 (this also applies to GPS Time Servers connected via remote networks.)



Figure 4. Illustration showing the Microchip SyncServer S650 front and back views.

For additional information about how to set up the Microsemi S650 for time synchronization with DeltaV systems, please refer to the Guardian Support Knowledge Base Article NK-1600-0238.

Technical and commercial support is provided by Microsemi directly (<https://www.microsemi.com>).

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