Using Network Global Variable List Communications in Decentralized Control Solutions

Steel McCreery

INTRODUCTION

This application note describes the SEL Network Global Variable List (NGVL) communications protocol and how it can be used within a decentralized control application to share data between processes.

PROBLEM

For many modern manufacturing and process applications, a distributed or decentralized control solution is preferred over a central control solution because of the inherent simplicity and easy maintenance of the control programs. The decentralized solution also addresses redundancy concerns. The most common problem that arises with a decentralized control solution is the need to share interlock, synchronization, and process information between controllers.

SEL SOLUTION

The SEL NGVL communications protocol featured in products such as the SEL-3530 Real-Time Automation Controller (RTAC), SEL-2240 Axion®, and SEL-3505 Automation Controller is a powerful, fast, and economical way to address the sharing of data between controllers within a decentralized control architecture. The NGVL protocol allows a controller to transmit data over an Ethernet local-area network (LAN) to other controllers or receive data from other controllers that support the NGVL protocol. Data can be transmitted on a configurable cyclic transmission interval, on the change of a tag value, or on a configurable Boolean change of state. The data to be transmitted or received by this protocol appear in an NGVL, and therefore, they are available to all subprocesses within a controller, as shown in Figure 1. Note that for most applications, a local controller requires only one NGVL transmission in addition to an NGVL reception from each remote controller that the local controller requires data from.
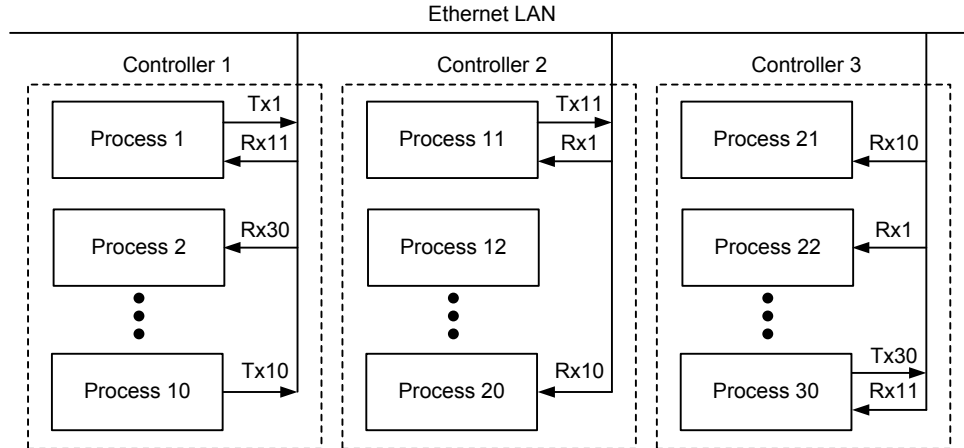
Ethernet LAN

Figure 1   Diagram of a Decentralized Control Solution Using the NGVL Communications Protocol

Two concerns arise with a peer-to-peer communications service: message confirmation and verification that the communication to a remote device is active.

Message Confirmation

When using a protocol such as NGVL, confirmation of message reception by a remote process can be achieved by configuring the remote device to echo back the critical data in a second NGVL transmission. The local controller checks this second transmission to ensure that the critical data have been echoed back. If not, the local controller takes remedial action.

Verification That NGVL Communication to a Remote Device Is Active

The verification that NGVL communication between two devices or subprocesses is active can be achieved through what is commonly referred to as a heartbeat. Each device or process that is configured for an NGVL transmission oscillates a heartbeat bit on and off at a known rate. Devices or processes receiving NGVL transmissions check to ensure that the heartbeat bit of the NGVL data received is oscillating at the correct rate. If the bit has not changed state after a preconfigured time (usually two to three times the rate of oscillation), the remote device or process is declared offline and remedial action is taken by the local controller.

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