



Viva LAS fieldbus!



The link active scheduler (LAS) is the heartbeat of a Foundation fieldbus segment. It grants permission for every communication that occurs on the bus. The fieldbus segment includes a single twisted-wire pair to connect up to 32 devices, including field instruments and host computers.

Because only one device can use the bus at a time, proper scheduling is important for good process control. Each instrument must be given time to communicate control data, alarms, instrument stored trends, events, and other information necessary to maintain bus operation.

The LAS is a logical—software—entity that may reside in any fieldbus device, including the host. It operates like a traffic cop in an intersection, directing oncoming communications from each bus device.

SCHEDULED COMMUNICATION

The LAS algorithm used to establish fieldbus communications has two logical branches from the starting point. One is for high-priority scheduled communications, and the other is for lower-priority unscheduled communications.

Because deterministic execution of control algorithms is important, the LAS handles scheduled communications with millisecond accuracy. It first determines whether there is sufficient time for other bus traffic before the next scheduled communication.

If not, the LAS waits for precisely the right time. It periodically sends bus idle messages while waiting so other devices can see it has not failed. Then when the scheduled communication is due, the LAS sends a compel data. The publishing device receiving this message immediately sends its data to one or more subscribing devices.

This completes a publisher subscriber scheduled communication. Its sole purpose is to accommodate the periodic transfer of control data between instruments with precise timing.

UNSCHEDULED COMMUNICATION

The LAS repeats its scheduling algorithm indefinitely. As time permits, it directs other lower-priority unscheduled communications, which include client/server and report distribution. The most common communication is client/server, which can read or write data between any two fieldbus devices.

Configuration download and control loop tuning are examples of how it is used. The report distribution is a one-way communication. It allows field instruments to send process trend data, alarms, and event information to the host computers.

Before initiating these communications, each device must receive a token from the LAS for permission to use the bus. The LAS issues a pass token (PT) message in a round-robin fashion, granting each fieldbus device equal time for these unscheduled communications.

When finished using the bus, a device returns the token so the LAS can resume its scheduling process.

TIME SYNCHRONIZATION

To maintain scheduling accuracy, every fieldbus device must be periodically time synchronized. This is part of data link maintenance and is required because no two clocks can accurately keep the same time.

The LAS synchronizes the data link time using its clock as a reference. It periodically sends a time distribution (TD) so each device can update its internal clock. Typically, the LAS broadcasts a TD once every 5 seconds. However, the end user may set this period as part of the advanced stack configuration.

PLUG AND PLAY

The LAS plays an important role in the plug-and-play operation of a fieldbus segment. It dynamically identifies and activates new devices placed on the bus. The LAS searches for new devices by periodically sending a probe node (PN) to all unused addresses. Any new device automatically assumes one of these addresses on power up.

When it receives the PN, it replies with a probe response to inform the LAS of its presence. The LAS then activates the device allowing it to participate in bus communications and receive its configuration data.

The LAS also maintains a live list in its memory, which includes the addresses of all currently active bus devices. It adds newly activated devices to this list and dynamically removes failed or disconnected devices. The LAS determines a device is no longer present when it does not respond to PT messages on three consecutive attempts.

REDUNDANCY

A link master (LM) is a logical (software) entity that may reside in any fieldbus device to provide LAS redundancy. The LM maintains a copy of the schedule and stays current with bus communications. It watches for a LAS failure and can assume the scheduling role without loss of process control.

Several LMs may reside on a single segment to attain multiple levels of redundancy. This helps make Foundation fieldbus a robust and reliable process control choice. IT

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