Buses 101

Field Level Networks

- Overview
- Types of buses
- Sensor bus
- Device bus
- Fieldbus
- Using multiple buses

Overview

What's the right field-level bus for process control?

Digital field networks or buses typically connect sensors, actuators, and other I/O devices with a multi-drop wiring scheme.

Because different network technologies have different capabilities, choosing the right bus (or buses) for your operation can help minimize project cost and maximize operational benefits. Making the wrong choice will, at best, cost you money — and it can keep you from achieving the higher yield, better quality, and lower operating costs your plant or mill is capable of.

This course explains key differences between field-level networks.

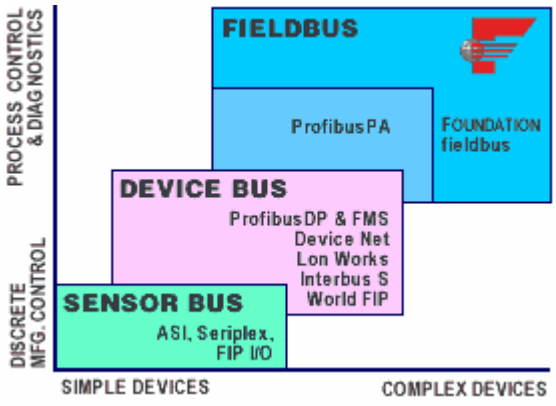
Hint: As you go through the topics in this course, watch for answers to these questions:

- *What are the three main types of field-level networks?*
- *Which bus is best suited for process control*?

Types of buses

Field-level buses can be grouped in three categories, depending on the device type and application for which they were designed:

- Sensor bus
- Device bus
- Fieldbus



The next three topics in this course cover each bus type in more detail.

The PlantWeb advantage

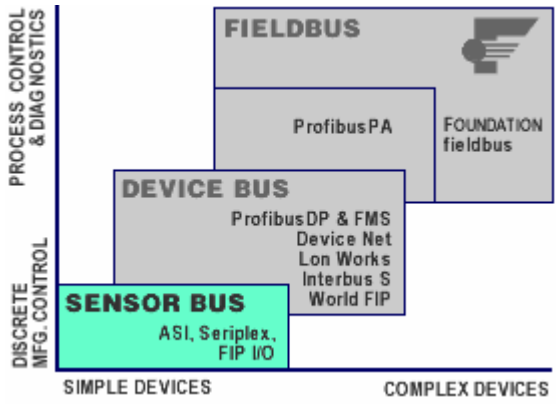
The DeltaV and Ovation automation systems support buses in each category — from HART and FOUNDATION fieldbus to ASI bus, Modbus, DeviceNet, and Profibus DP— so you can choose the right buses for your applications.

More important, these buses are treated as native to the architecture. Instead of having to configure each bus separately, then configure the host system, and then manually map data between each bus and the host, with PlantWeb you configure field points on the bus the same way you configure points obtained by dedicated wiring. No duplicate configuration. No mapping.

This approach reduces project costs and schedules, and eases future maintenance and upgrades.

Sensor Bus

Sensor buses are common in discrete manufacturing. They're used with proximity switches, pushbuttons, motor starters, and other simple devices where costs must be minimized and only a few bits of information need to be transmitted.



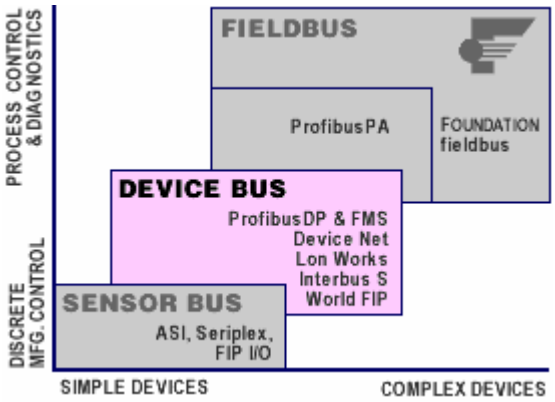
Sensor buses are designed to handle these "bit-level" communications for simple, transaction-based control and sensing, such as turning something on or off, or indicating an on-off state.

These buses usually cover short to medium distances, using either 2 or 4 wires. They typically are not intrinsically safe.

Although designed for discrete manufacturing, some sensor buses are used in process plants.

Device bus

Device buses are designed to meet the needs of more-complex devices, often in fast-moving discrete operations requiring short, fast communications. Paper machines, packaging lines, and motor control centers often use this type of bus.



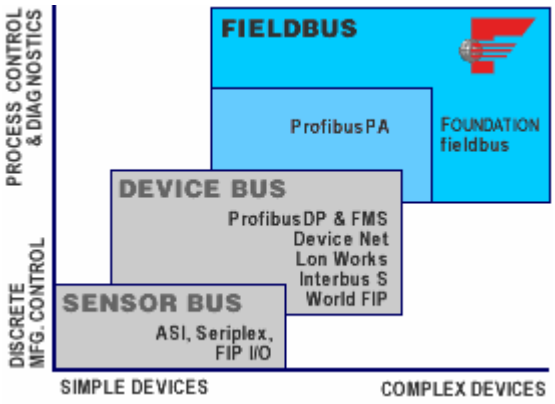
With message capacities from several bytes to over 200 bytes, depending on the protocol, device buses can handle more information than sensor buses — not only discrete "on" and "off" signals, but also periodic adjustments and some ancillary analog information.

Device buses are usually 4-wire and not intrinsically safe. They can communicate at high speed for short distances, and slower speeds for longer distances.

Two examples of device buses — DeviceNet and Profibus-DP — were designed for discrete manufacturing but have been adapted for use in process plants.

Fieldbus

The third type of field network is the most appropriate for control and diagnostics in process operations.



That's because fieldbuses provide highly reliable two-way communications between "smart" devices and systems in time-critical applications. They're optimized for messages containing several floating-point variables — all sampled at the same time — and the status of each variable.

Fieldbuses can be a digital replacement for analog 4-20 mA communications in process operations. Because requirements in these operations are different from those in discrete manufacturing, fieldbuses typically have slower transmission rates than device or sensor buses.

Other differences include support for intrinsic safety and the ability to run on existing field-instrument wiring. In the case of FOUNDATION fieldbus, the technology also includes standard and open function blocks that support distributed control in the field. Profibus PA also runs on existing instrument wires and supports intrinsic safety. However, it lacks open function blocks for distributed control in the field.

Using multiple buses

Many plants use multiple field-level networks, with different types of buses to meet different needs.

That makes sense — but the added complexity can increase implementation and maintenance costs unless you are using a system that works with different categories of buses without mapping or gateways.

You can minimize those added costs by limiting the number of network types at each level of the plant hierarchy.

Because system and business networks are also part of the hierarchy, this topic is covered in more detail in the next course, "Understanding Ethernet."