

An Overview of Factory Networks

Requirements

- *What do you want to do with the equipment*
- *Act as controller or device*
- *Control and/or monitor it*
- *Access from LAN or Internet*
- *Goals*
 - *Cost*
 - *Scalability*
 - *Ease of Implementation*
 - *Fit with other components in the system*

Three Different Networks in Factory Automation

- *Device Network – Links Sensors & Actuators to controllers*
- *Control Network – Links Controllers*
- *Information Network – Links Controllers to Enterprise level Info System*

Device Network

- *Replaces 4-20ma control loops*
- *Communications between controller and sensors/actuator*
- *Communications are usually short, fast & frequent – 125K to 500K bits/S*
- *Data usually sent as needed*
- *Typical networks*
 - *CAN / DeviceNet*
 - *LONWorks*

Control Network

- *Communications between controllers*
- *Messages are longer than Device network, and may be faster – 5M bits/S*
- *Communications must be dependable and predictable – deterministic*
- *Typical networks*
 - *ARCNet*
 - *ControlNet*

Information Network

- *Communications between controllers and Enterprise Wide Information System*
- *Messages may be very long, at fast speeds – 10M to 100M bits/S*
- *Timeliness of Communications is not usual important*
- *Connectivity to Worldwide standards is important - Internet*
- *Typical networks*
 - *Ethernet/IP*

CAN Network

- *Originally developed by BOSCH for Automotive use in 1986*
- *Adopted by ISO in ??*
- *Lot of products & tools available*
- *Protocol is implemented in silicon*

- **Error handling & retransmission handled by CAN hardware**
 - **Faulty nodes will not cripple system**
- **Transmission medium is typically twisted pair**

ARCNet Network

- **Developed in the 70's as an Office Automation Network**
- **Token Ring Network**
- **Deterministic Performance - Users Can Calculate the Worst Case Node to Node Message Time**
- **Error Checking, Flow Control & Network Configuration are performed by the chip without any software overhead**
- **Logical Ring - Nodes Automatically Find Their Neighbor to Create A Ring**
- **Automatic Reconfiguration - A New Node Joins the Ring Automatically Without Software Intervention**
- **Broadcast and Directed Messages**
- **Multi-Master with Automatic Token Generation**
- **Cabling Options - Coax, Fiber, RS485 Twisted Pair**
- **High Speed - Standard 2.5 Mbps, Optionally 19 Kbps to 10 Mbps**
- **Low Cost Chips**
- **Low Protocol Overhead - 3 or 4 Bytes**
- **Packet Size - 0 to 507 Bytes**

ControlNet

- **Bandwidth for I/O, real-time interlocking, peer-to-peer messaging and programming - all on the same link**
- **Deterministic, repeatable performance for both discrete and process applications**
- **Multiple controllers controlling I/O on the same link**
- **Multicast of both inputs and peer-to-peer data**
- **Media redundancy and intrinsically safe options**
- **Simple installation requiring no special tools to install or tune the network**
- **Network access from any node**
- **Flexibility in topology options (bus, tree, star) and media types (coax, fiber, other)**
- **5.0 megabit/sec (maximum)**