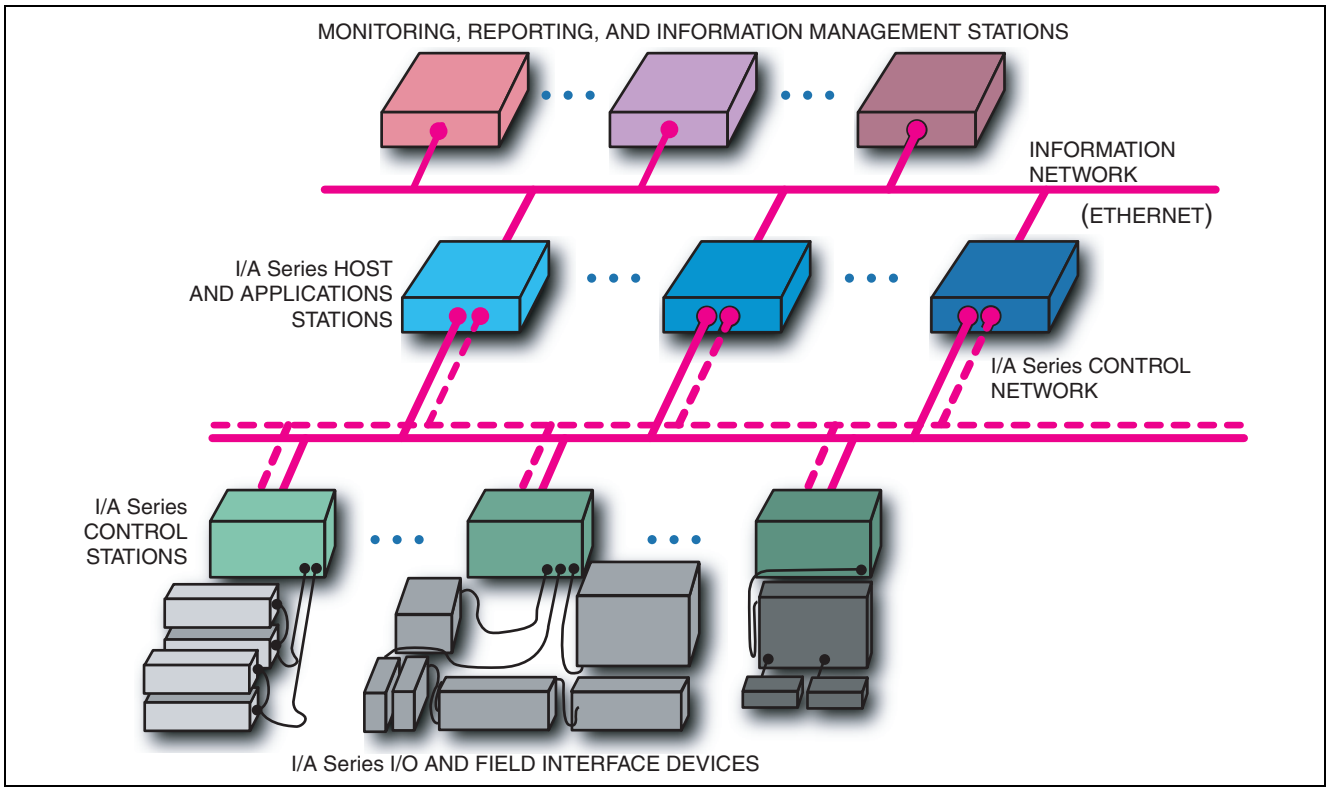
I/A Series® Hardware
Control Network Architecture



OVERVIEW OF NETWORK ARCHITECTURE

The I/A Series® Control Network architecture integrates powerful control stations and workstations with a high-speed Nodebus network and a 100 Mb/1 Gb Ethernet network. These control stations, workstations and networks comprise scalable systems for process monitoring, process control and integration with industrial information management.

Redundant Nodebus Characteristics

Nodebus provides high-speed, redundant, peer-to-peer communications between stations. High speed, coupled with redundancy and peer-to-peer characteristics, provides performance and security superior to that provided by communication media used in conventional systems. Station interfaces to Nodebus are also redundant, further ensuring secure communications between the stations.

Nodebus can be implemented in a basic, non-extended configuration or extended by use of interface modules for connection of fiber optic or copper cables.

Switched Ethernet Characteristics

Standard, low-cost Fast Ethernet switches and cabling provide versatile, low-cost solutions for building Ethernet networks using industry standard protocols. The 8-, 16- and 24-port Ethernet switches allow connection of multiple control stations, workstations and Ethernet switches to a central switch in a star topology. The network architecture also allows for up to five Ethernet switches and up to eight Control Segments which are interfaced using NCNI pairs.

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NODEBUS NETWORK FEATURES

The I/A Series Nodebus network offers:

- Single node system having up to 64 stations
- Multi-node system combining up to 30 nodes
- Redundant Nodebus extensions with copper coaxial or fiber optic Nodebus extenders to include up to three Nodebus segments, each supporting up to 32 modules, for maximum connectivity of 64 stations per node
- Redundant Nodebus with automatic switching from faulty cable to healthy cable providing communications integrity
- System Management software for monitoring the health of the control system and managing equipment in the system
- Maximum copper coaxial cable length of 697 m (2,300 ft) for the Nodebus with three segments
- Maximum fiber cable length of 2 km (6,560 ft) for the Nodebus through Nodebus Extenders
- Multi-node systems implementing Nodebus integration with a LAN-based communications network through Carrierband LAN Interface (CBLI) modules for coaxial and fiber optic cables
- Between any two stations, maximum of five Ethernet switches and up to eight Control Segments which are interfaced using NCNI pairs.

ETHERNET NETWORK FEATURES

The choice of 8-port, 16-port and 24-port Ethernet switches offers:

- System scalability by interconnecting Ethernet switches, each having 8, 16 or 24 ports for connecting stations in a bus, star, tree, or hybrid network topology
- Support for Ethernet (10 Mbps), Fast Ethernet (100 Mbps) and Gigabit Ethernet (1000 Mbps)
- Maximum CAT5® (100Base-T) cable length for interconnecting stations or Ethernet switches of 100 m (328 ft)
- Maximum fiber optic (100Base-FX) cable length for interconnecting stations or Ethernet switches of 2 km (6,560 ft)
- Auto-negotiation and full duplex operation based on the IEEE 802.1Q standard
- Network management and configuration via local console port for managed switches
- Plug-and-play for quick, easy installation
- Modular uplinks to high-speed backbones using 1 Gb 1000Base-T, 1000Base-SX and 1000Base-LX standards
- Maximum fiber connection length allowed between switches of 10 km (6.2 miles)
- Maximum of five Ethernet switches between any two stations.

OVERVIEW OF NETWORK STATIONS

The following station types are used for building an I/A Series Control Network:

- Control Stations
- Host Workstations
- Application Workstations
- Windows Workstations
- Information Workstations.

Control Stations

The following control stations are used in an I/A Series Control Network:

- Micro-I/A® Station
- Control Processor 60
- Control Processor 60 Simplex
- Integrator 30, Style B for Allen-Bradley® programmable logic controllers (PLCs)
- Integrator 30, Style B for Modbus® devices.

Micro-I/A Station

The Micro-I/A station runs real-time, control-related software packages for continuous, batch and discrete control, as well as for integration of field devices and Fieldbus technologies. It runs the I/A Series Integrated Control Block software, which integrates control with a selection of I/O subsystems including Invensys Foxboro, Eurotherm® 2500, GE® Field Control, Allen-Bradley Flex™ I/O, and Allen-Bradley PLCs via Ethernet, PROFIBUS-DP™ and Modbus.

The Micro-I/A station connects to an Ethernet network or optionally to a Nodebus network using an interface module. Ethernet switches and CAT5 cables with RJ-45 connectors offer an easy solution for connecting Micro-I/A stations to an I/A Series Control Network.

Control Processor 60

The Control Processor 60 (CP60) is an optionally fault-tolerant station that performs regulatory, logic, timing, and sequential control, together with connected Fieldbus Modules (FBMs). It also performs data acquisition, alarm detection and alarm notification. It connects to a redundant Nodebus network.

The fault-tolerant CP60 configuration consists of two processor modules operating in parallel, with redundant connections to the Nodebus and redundant connections to the I/A Series Ethernet I/O subsystem bus.

Control Processor 60 Simplex

The Control Processor 60 Simplex (CP60S) is a station that performs regulatory, logic, timing, and sequential control, together with connected FBMs. It also performs data acquisition, alarm detection and alarm notification. The CP60S does not offer fault-tolerant processor capability. It connects to a redundant Nodebus network and redundant I/A Series Ethernet I/O subsystem bus.

Integrator 30, Style B for Allen-Bradley PLCs

The Integrator 30, Style B for Allen-Bradley PLCs (AB30B) is an optionally fault-tolerant station for integrating data from Allen-Bradley PLCs into I/A Series databases, giving I/A Series control blocks access to the data. It has two RS-423/RS-232-C compatible serial ports for interfacing with synchronous or asynchronous devices. It connects to a redundant Nodebus network.

Integrator 30, Style B for Modbus Devices

The Integrator 30, Style B for Modbus devices (M30B) is an optionally fault-tolerant station for integrating data from third-party Modbus compatible devices into I/A Series databases, giving I/A Series control blocks access to the data. It has two RS-423/RS-232-C compatible serial ports for interfacing with synchronous or asynchronous devices. It connects to a redundant Nodebus network.

Host Workstations

The following scalable host workstations with versatile I/A Series software are used in an I/A Series Control Network:

- AW51, a UNIX® (Solaris®) based host workstation
- AW70, a Windows® based host workstation
- WINHST, a Windows based workstation that offers a specific set of I/A Series host application software capabilities
- Server 70, a Windows based host workstation with terminal server capabilities.

When hosting I/A Series control stations, the host workstations support a wide range of process control requirements, ranging from relatively simple data acquisition systems through elaborate sequential and batch control systems.

In addition to boot host services for I/A Series stations, these host workstations enable:

- Viewing real-time process data
- Creating or modifying dynamic displays
- Viewing alarm status and managing alarms
- Configuring control blocks
- Monitoring the health of the control system and managing equipment in the system.

The AW51 and Server 70 workstations also support viewing of I/A Series applications from remote client stations over local area networks and dial-up connections.

Application Workstations

The following scalable application workstations with versatile I/A Series software are used in an I/A Series Control Network:

- UNIX (Solaris) based workstation
- Windows XP based workstation
- WINAPP, a Windows based workstation that supports I/A Series application software.

The above application stations support a wide range of process monitoring and analysis requirements such as viewing real-time process data, alarm status and health of the control system.

Windows Workstations

The Windows workstation provides a Windows platform for loading optional software to create an application-specific station such as a Wonderware® client or server station in an information network. It connects to, but does not contain, I/A Series software.

Information Workstations

An information workstation is a commercial-off-the-shelf (COTS) computer that is compliant with Wonderware specifications. It provides a Windows platform for loading optional software to create an application-specific station such as a Wonderware client or server station in an information network. It connects to, but does not contain, I/A Series software.

OVERVIEW OF NETWORK I/O MODULES

The following input/output (I/O) modules are used in an I/A Series Control Network:

- Fieldbus Modules
- DIN rail mounted FBM subsystem.

Fieldbus Modules

Fieldbus Modules (FBMs) are the interface between process sensors and actuators and the I/A Series Fieldbus. They convert the electrical I/O signals used by field devices to enable control stations to communicate with these devices via the Fieldbus. They support analog measurement, discrete sensing, analog control, and discrete control.

DIN Rail Mounted FBM Subsystem

The DIN rail mounted FBM subsystem allows the distribution of I/O modules to strategic locations within the plant. It supports analog measurement, digital sensing, analog control, and discrete control. It comprises high-performance FBMs, Fieldbus Communication Modules (FCMs), I/A Series Ethernet Trunk Fieldbus, mounting baseplates, and enclosures.

I/O SUBSYSTEM INTEGRATION

I/O subsystems can be integrated into an I/A Series network using control stations such as the following:

- Micro-I/A station
- Control Processor 60
- Integrator 30, Style B for Allen-Bradley PLCs
- Integrator 30, Style B for Modbus devices.

Micro-I/A Station I/O Subsystem Integration

The example in Figure 1 comprises the following components:

- Eurotherm T630 controller for panel-mounted, single-loop control plus 2500 I/O Subsystem
- Fieldbus Module for distributed process I/O
- Allen-Bradley PLC-5® programmable logic controller
- Micro-I/A stations for distributed, field-based control functions interfacing to the field devices
- Ethernet switches for interconnection of I/A Series stations using CAT5 twisted-pair cable supporting 10/100Base-T Ethernet
- Fiber optic cabling between Ethernet switches
- Ethernet connections to host and application workstations

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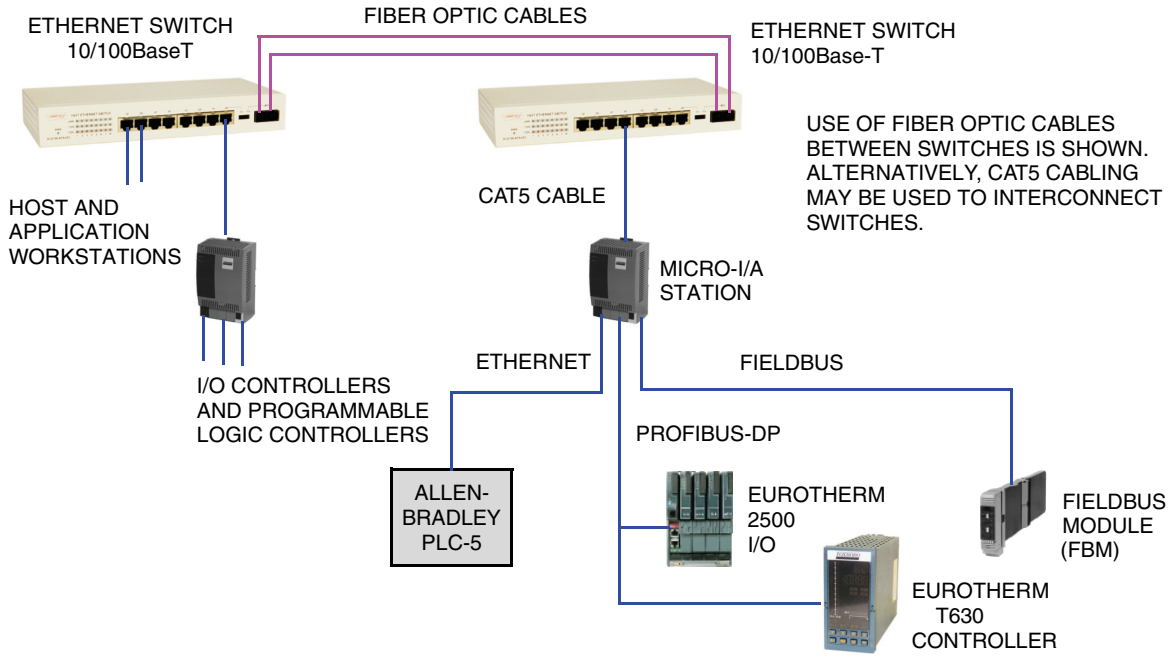

Figure 1. I/O Subsystem Integration via Micro-I/A Station - Example Diagram

CP60 I/O Subsystem Integration

Figure 2 shows an example of integrating I/O subsystems in an I/A Series dual Nodebus Control Network with the CP60 which supports I/A Series Fieldbus communications.

This example comprises the following components:

- DIN rail mounted FBM subsystem for rugged, high-performance, distributed process I/O
- Fieldbus Module for distributed process I/O
- CP60 for regulatory, logic, timing and sequential control together with connected FBMs.

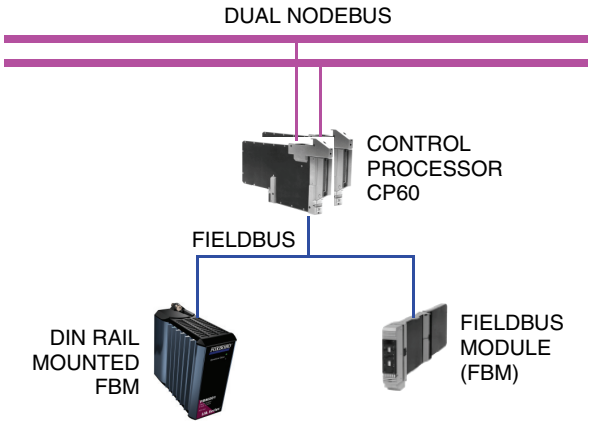

Figure 2. I/O Subsystem Integration via CP60

Integrator 30 I/O Subsystem Integration

Figure 3 shows an example of I/O subsystems in an I/A Series Nodebus Control Network with Integrator 30 modules supporting communications to various field devices.

This example comprises the following components:

- Integrator 30 for Allen-Bradley PLCs for integrating data from these PLCs into I/A Series databases, so that standard I/A Series control blocks can access the data. Optionally, this integrator can be made fault-tolerant with the addition of a second Integrator 30.
- Integrator 30 for Modbus devices for integrating data from these devices into I/A Series databases, so that standard I/A Series control blocks can access the data. Optionally, this integrator can be made fault-tolerant with the addition of a second Integrator 30.
- Allen-Bradley PLC-2®, PLC-3®, PLC-5 and SLC-5/04 programmable logic controllers.
- Modbus compatible devices such as the Modicon® 484, 584 and 984 programmable logic controllers.

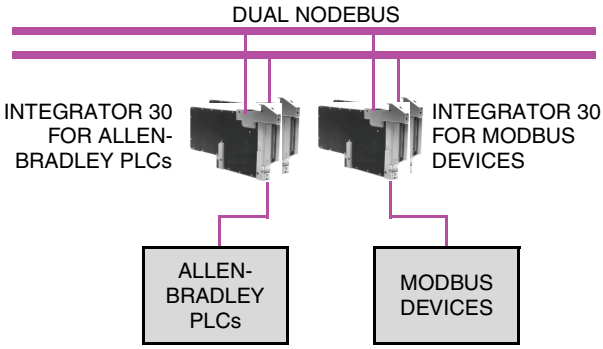

Figure 3. I/O Subsystem Integration via Integrator 30

I/A Series Control Network Example

The I/A Series control network utilizes off-the-shelf Ethernet switches in redundant configurations to form a highly robust fault-tolerant network. Figure 4 shows an example with several I/A Series workstations connected redundantly to the network.

Nodebus Control Segment Drop

A Nodebus control segment drop offers cable and station redundancy for a robust control system with high availability. Nodebus interface components provide easy connection of I/A Series stations to the Nodebus. The network architecture allows for up to five Ethernet switches and up to eight Control Segments which are interfaced using NCNI pairs.

Figure 5 shows details of an I/A Series Nodebus control segment comprising the following stations, I/O subsystems, and interface modules:

- I/O subsystems for distributed process I/O
- Stations, such as CP60 and Micro-I/A, for control of and integration with, various field subsystems such as I/O, PLCs, and intelligent devices
- Ethernet switches for interconnecting I/A Series stations using CAT5 cable and fiber optic cable supporting 10/100Base-T and 100Base-FX Ethernet communications
- Dual Nodebus 10Base-T Interface modules for interfacing to the Nodebus using CAT5 cable
- Workstations for viewing real-time process data, monitoring the health of the automation system, and executing applications
- Workstations for executing applications and interfacing to PLCs and other intelligent devices
- Workstations for monitoring system resources and providing host and management services to control stations
- COTS server as a web portal plus Internet/ Intranet connected browser computer.

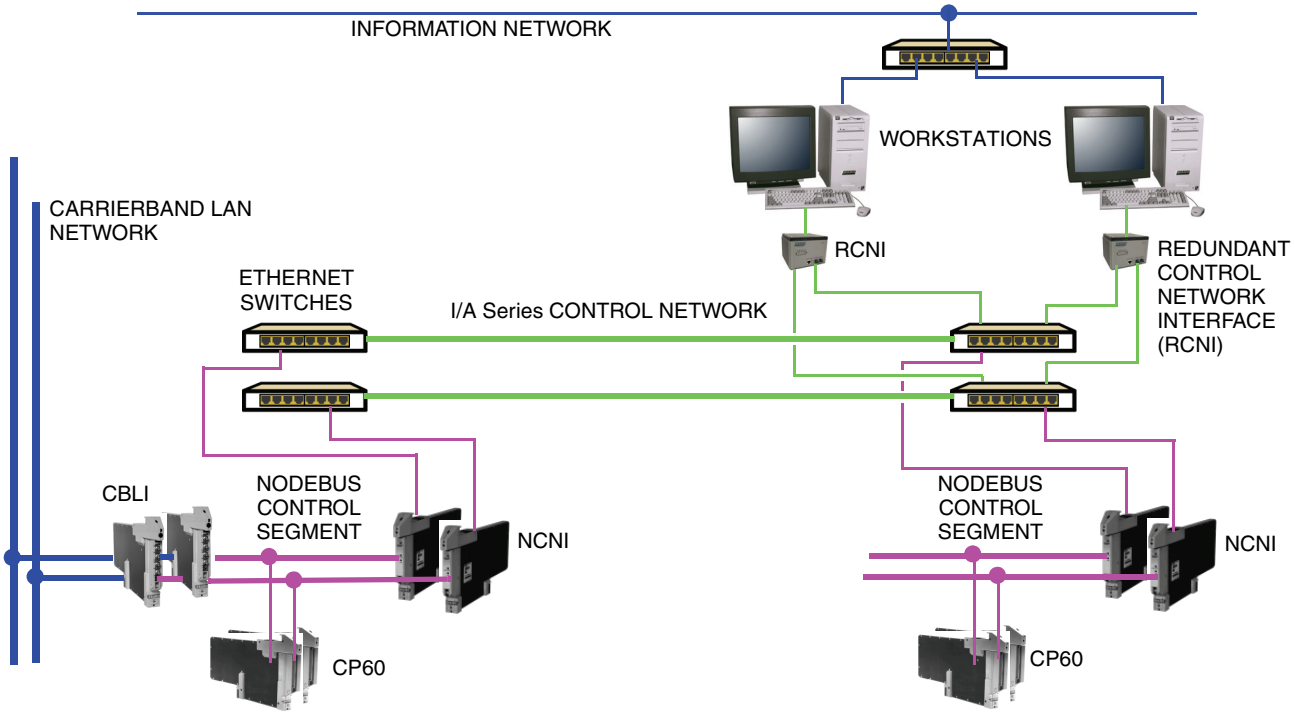

Figure 4. I/A Series Control Network with Nodebus Control Segment Drops

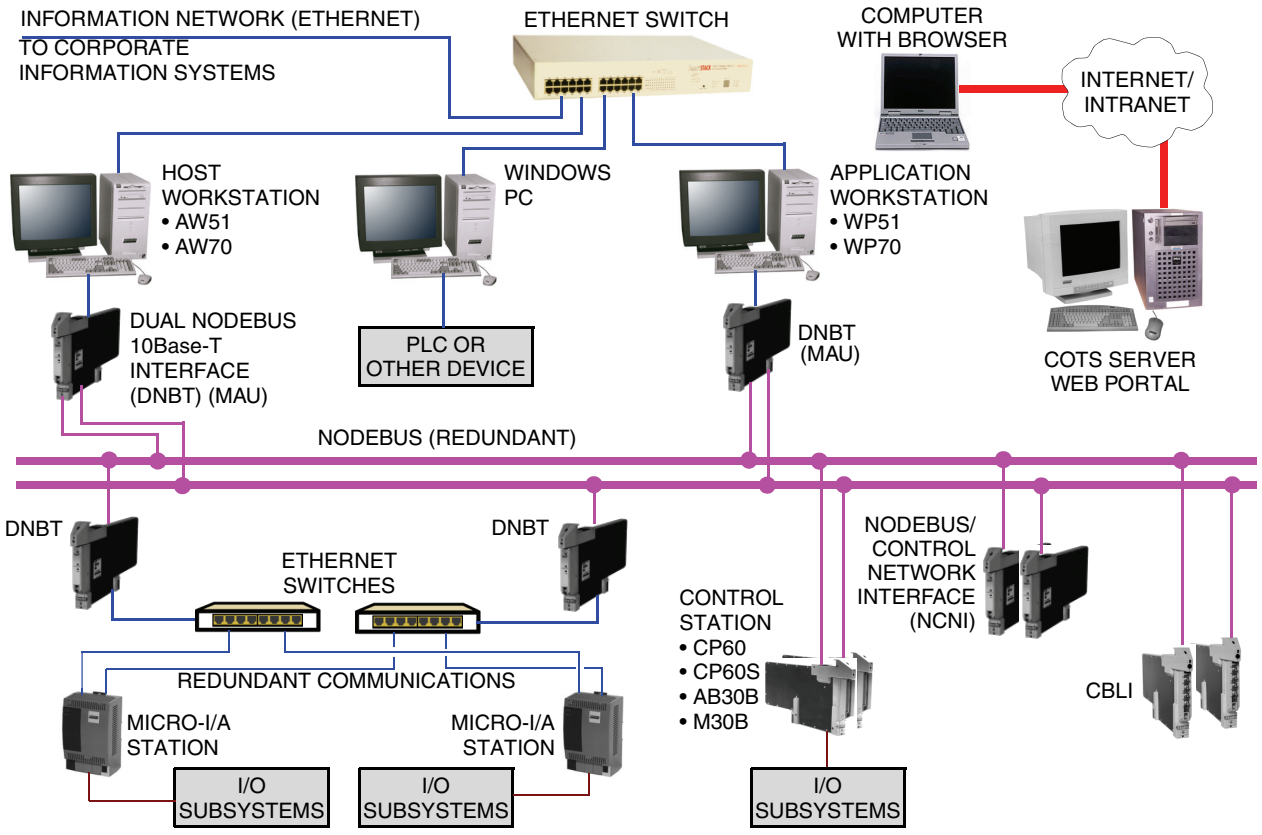

Figure 5. Details of I/A Series Redundant Nodebus Control - Example Diagram

Ethernet Control Network Example

The example in Figure 6 uses Ethernet switches for interconnection of up to 24 I/A Series stations and workstations per switch with CAT5 cable supporting 10/100Base-T Ethernet communications.

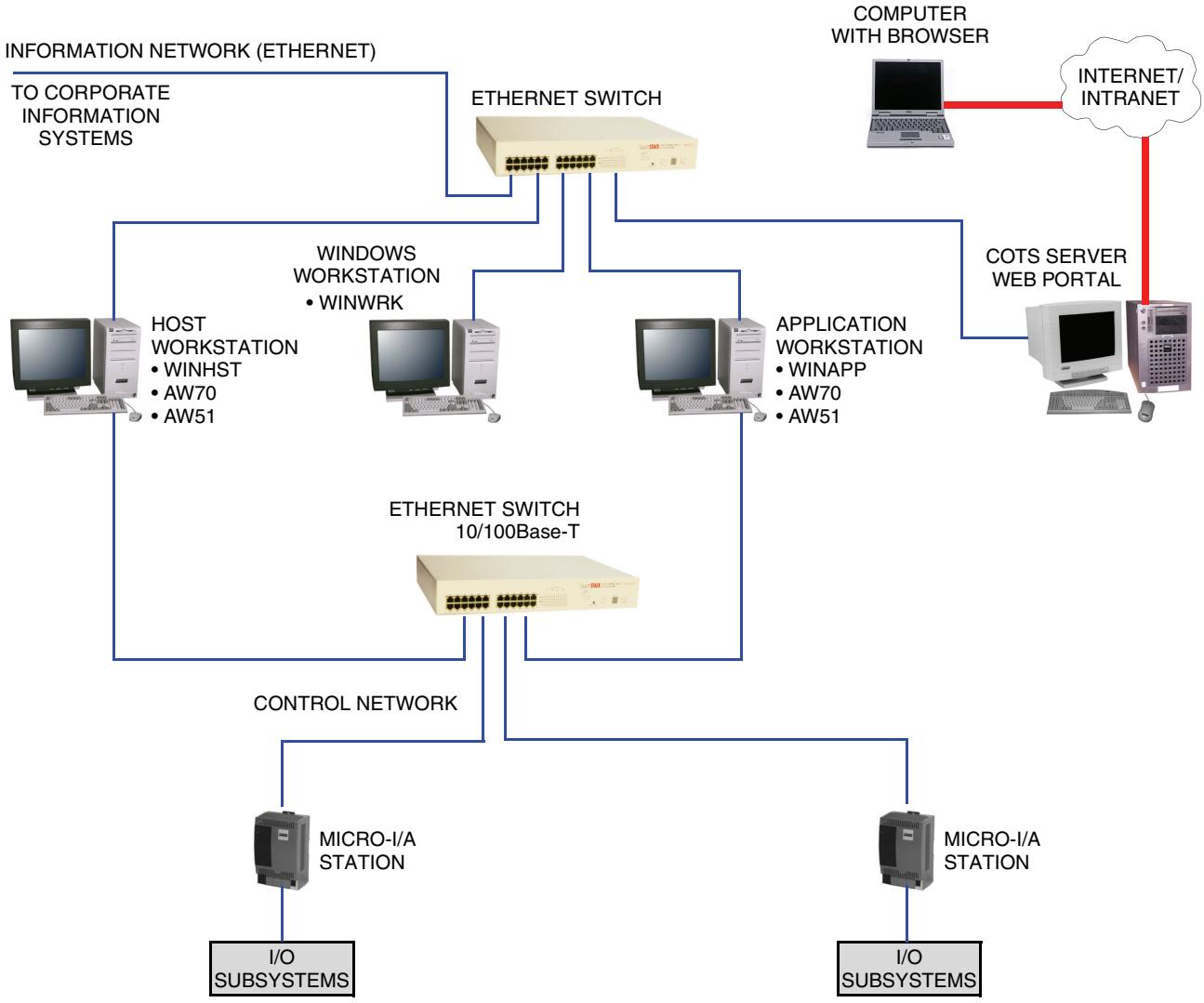

Figure 6. I/A Series Non-Redundant Ethernet Control Network - Example Diagram

The following components are depicted in the example:

- I/O subsystems for distributed process I/O and control of programmable logic controllers
- Micro-I/A stations for distributed, field-based control functions interfacing to I/O subsystems
- Ethernet switches for interconnecting I/A Series stations and workstations using CAT5 cable supporting 10/100BaseT Ethernet communications
- Host workstation for viewing real-time process data, managing the system, executing applications, and providing boot host services to Micro-I/A stations
- Application workstation for viewing real-time process data, monitoring the health of the control system, and executing applications
- Windows workstation for executing applications
- COTS server for providing Internet/Intranet web portal services and executing applications
- Computer for accessing information over the Internet or company Intranet via a web browser.

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