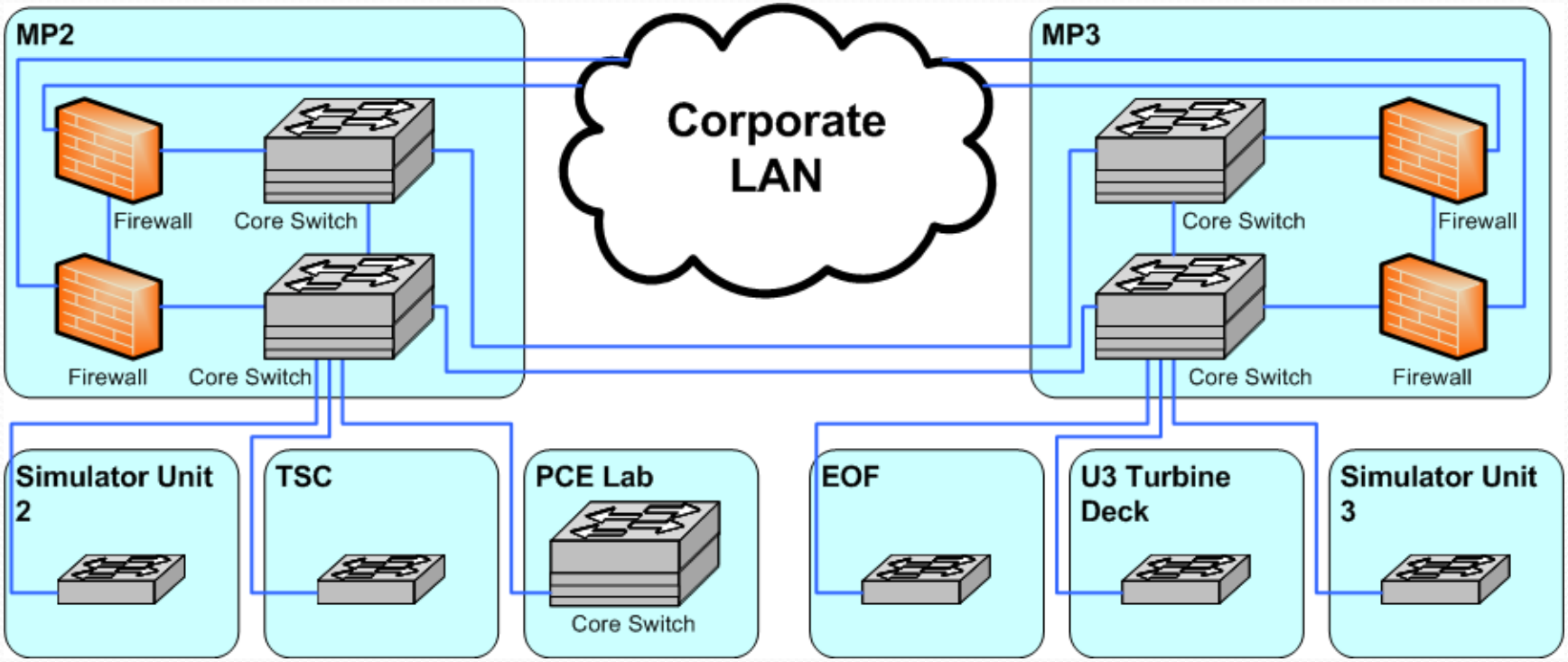
Millstone PPC Network Design and Security

Cisco Network Switches

Juniper Firewall Clusters

Cisco Network Infrastructure



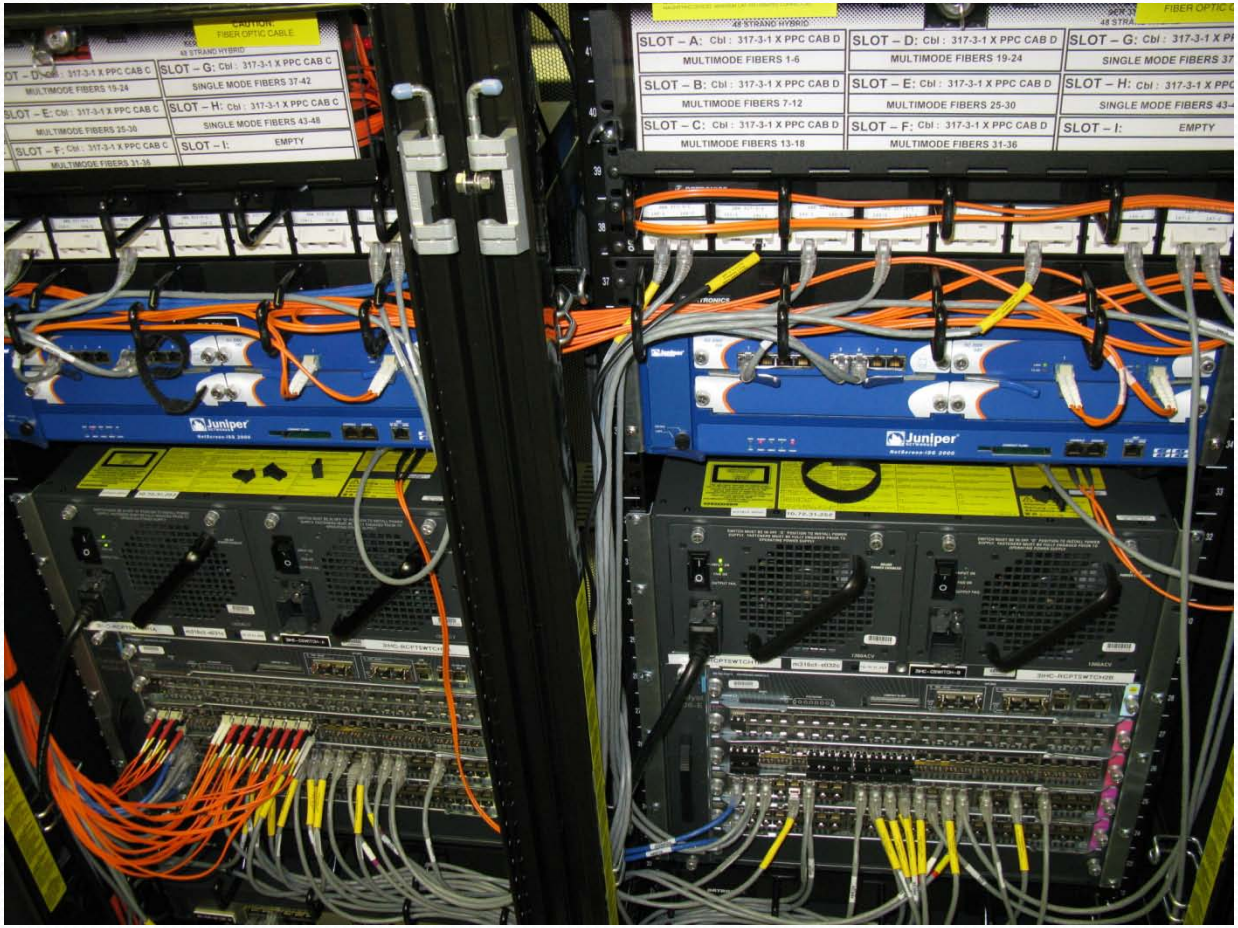
Cisco Network Infrastructure

- Core Network Consists of 4 Cisco 4506 switches
- 10 Gig E Fiber Optic Connections between switches
- Multiple blades provide various connection capabilities at core network locations
- From 10mb Copper or Fiber to 1 gb
- Provides Future Expansion Capabilities Redundantly

Cisco Network Infrastructure

- Distribution to Various Secured Areas via Cisco 3750's
- Distributed Switches Provide Local Connection Needs
- All Distributed Networks Installed in Locked Cabinets.
- Distributed Network Provides Multiple VLANs for Network Isolation.

Cisco Network Infrastructure



Cisco Network Infrastructure

- PPC Network Provides Complete Isolation of PPC Systems From Business LAN/ WAN

- PPC Network Provides Secure Connections to our Emergency Operations Facility, EOF, and Technical Support Facility, TSC
- PPC Simulators are included in PPC Network
- Network Includes Long Reach Ethernet
- Remote Offsite Connections use VPN Thru Corporate Gateways

Fiber Optic Backbone Support

- Millstone Site Contains 3 Nuclear Units (MP2 and MP3 Operational)
- Approx 500 Acres on long Island Sound
- Millstone Site Support Includes Simulators, Training Facility, Emergency Facilities, and Fire Training Building
- Large Fiber Optic Infrastructure to Support Interconnection of Buildings

Fiber Optic Backbone Support

- Majority of Buildings Interconnected by Fiber optic Cables.
- 62.5/125 micron Multimode Provides Majority of Fiber
- 50/125 micron Single mode Provides gb optical Connections
- Optical infrastructure Supports WAN/LAN Process Computer Network and Security Network.

Fiber Optic Backbone Support

- Centrally Located Connection Points MP2 and MP3
- New Systems being added to PPC Network Utilize F/O
- Expansion of PPS Network to new areas of Plant considers future growth needs
- Termination, Testing and Validation of cabling provided by outside and in house support.

Network Routing

- PPC Network routing is provided by two independent clusters
- MP2 and MP3
- Juniper Firewalls provide all route paths for PPC network traffic
- Independent Routers provide Automatic Failover ability

Domain Name System

- PPC Network use Windows 2008 servers for DNS
- Four DNS servers exist in PPC network
- PPC Lab, MP2, MP3 provide primary and secondary Servers
- Lab DNS provides secondary for MP2 and MP3
- Simulator contains fourth DNS as a read only

Domain Name System

- ALL PPC Device Nodes use static IP addresses
- DHCP is disabled
- DNS Servers are connected on private Vlan or DMZ
- DNS Servers are located in three area's of the site MP2 computer room, MP3 computer room and PPC Lab
- Emergency Power is provided to Primary DNS servers

Network Support For Active Directory Servers

4 Severs Provide Active Directory Services

- Mp2 DC, MP3 DC, Lab DC, and Simulator RODC
- Active Directory Servers located in separate buildings
- AD Servers are on vital power supplies
- Domain Controllers are in private VLAN
- Active directory services allowed to operations workstations and PPC servers

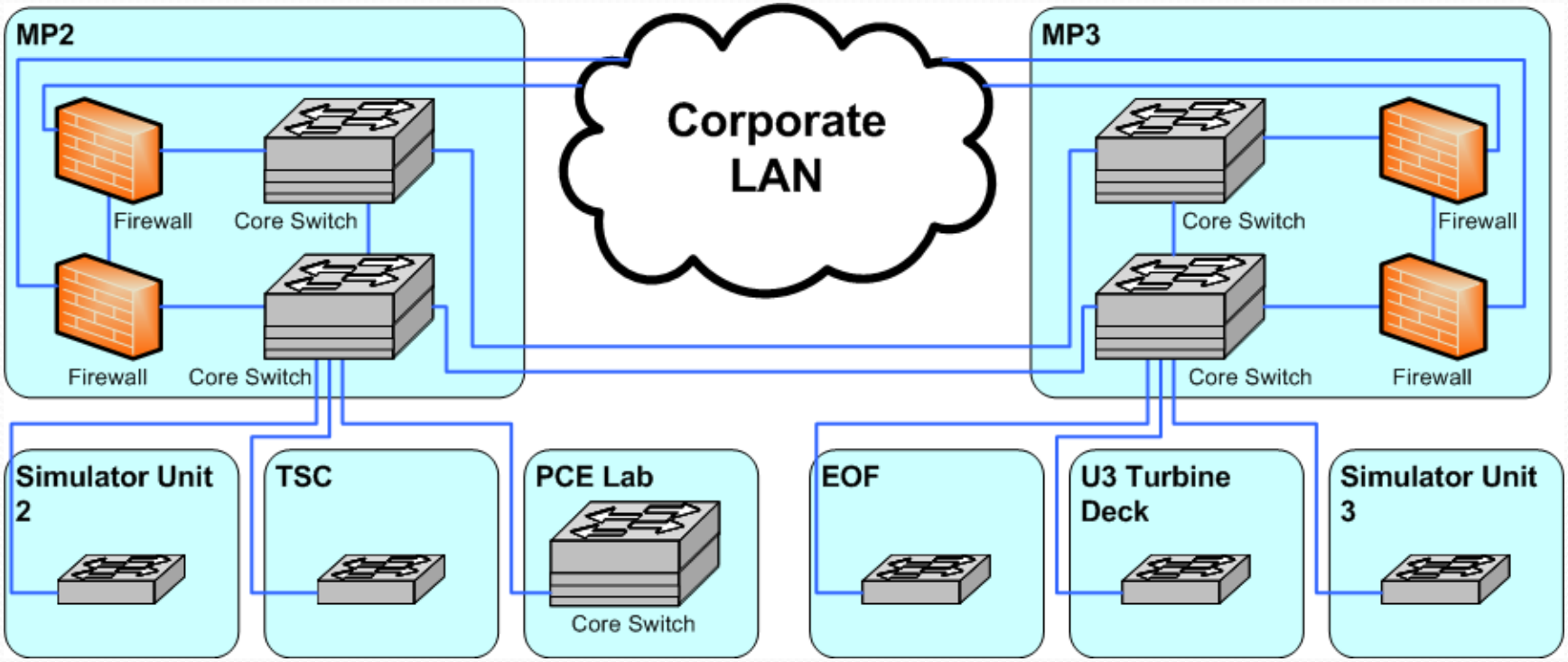
Network Support For Active Directory Servers

- Domain Roles are shared between Lab DC and MP3DC

Shared Active directory roles

- Domain naming FSMO Holder (LabDC)
- RID Operations Master (LabDC)
- PDC Operations Master (Lab DC)
- Infrastructure Operations Master (MP3)

Integration Of Firewalls into PPC Network



Integration Of Firewalls into PPC Network

Network Isolation and Security provided by two independent Juniper ISG2000 clusters

- Each Unit, MP2, and MP3, contain 1 cluster
- Unit clusters manage all discrete unit traffic to Plant Process Computers
- Unit Clusters provide network route paths (network routers)
- Clusters also provide Intrusion Detection and Prevention (IDP), for allowed traffic

Integration Of Firewalls into PPC Network

- Juniper Firewalls provide network security, alert notifications, and IDP protection for network nodes

- Firewalls allow for future expansion and network changes
- Firewalls are centrally managed, from secured PPC Lab area
- All firewall logs are stored on management station
- Database is centrally managed

Integration Of Firewalls into PPC Network

- Firewalls contain local copies of all configurations and security policies
- Firewalls can be managed individually
- Individual cluster management, can also be done by, command line interface, or Web interface thru secure connections
- Management station utilizes standalone Linux Server
- Management station system backups performed backup utility, from backup server

Firewall Fundamental Policy And IPD Practices

- Each Firewall Cluster contain discrete security policies
- Allowed traffic is specific

  Source --- Destination --- Service

- Connections are initiated from higher security level
- Allowed traffic is filtered thru firewall IDP blade
- Administrator sessions require user authentication

Firewall Fundamental Policy And IPD Practices

- Firewall practices are governed by Dominion cyber security policy
- System administrators for PPC network are part of Plant Process computer group
- Firewall administrators require FW training
- Plant Process Computer personnel require more stringent security checks

Introduction of New Systems Into Plant Process Computers

- New IP based systems added to redundant core network switches
- Core switches provide variety of connection types
- Plant design supports new fiber optic cable installations
- Plant Process computers support legacy RS232 connections thru IP to serial converters
- Multimode and single mode optical support thru hybrid cabling

Introduction of New Systems Into Plant Process Computers

- New cabling now entering remote area's of plant
- Allows for future distribution of Data Acquisition system components
- Allows for multiplexing of Network based systems
- Mp3 added six new IP based systems last outage, now interfaces with over 18 systems
- MP2 adding several new systems as well, all IP based

Introduction of New Systems Into Plant Process Computers

Types of new systems being integrated in MP PPC's

- Main Transformers
- Turbine Vibration Monitoring
- Vital Buss Power Monitors
- Solar Flare Monitors
- Variable Frequency Drives (circ water)
- ISO Buss Cooling Systems
- RCP Vibration Monitors
- Chemistry Sample Sink Data