

# **FBN Network Documentation**

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## Overview

This document contains detailed information about the network at the Boulder office of FBN Industries. PC Consulting was contracted to install new LAN switches from Cisco Systems and provide documentation of the new network configuration.

## Equipment

This section describes the new network equipment installed in the FBN network.

### Core

The core switch is a Cisco Catalyst 6509 with dual supervisors (in slots 1 and 2). Each supervisor includes a Multi-layer Switch Feature Card 2 (MSFC2) for Layer 3 switching. Each supervisor also includes two Gigabit Ethernet ports. There are four 6416 blades (in slots 3 through 6), each of which contains 16 Gigabit Ethernet ports. (All of the Gigabit Ethernet ports require Gigabit Interface Converter (GBIC) modules for connectivity.) There are two 6348 blades (in slots 7 and 8), each of which contains 48 Fast Ethernet ports.

The Cat6509 is running IOS v5.5(3), and the MSFC2s are running IOS v12.1(2)E Desktop Edition.

### Distribution

The closet switches are all Cisco Catalyst 3500-series switches. There are three Catalyst 3524s, each of which has 24 Fast Ethernet ports and two Gigabit Ethernet ports. These switches are also capable of providing in-line power to IP telephones. There are also 14 Catalyst 3548s, each of which has 48 Fast Ethernet ports and two Gigabit Ethernet ports. These are not capable of providing in-line power.

All of the Cat3500s are running IOS v12.0(5.2)XU. In addition to the 17 switches in production, there are two spare Cat3524s and one spare Cat3548.

## Physical Topology

The following section describes the physical layout of the switches in the network, along with the cabling.

### Server Room

The server room contains the Cat6509 core switch. The servers connect to the Fast Ethernet ports on the Cat6509, and some servers also have Gigabit Ethernet interfaces that connect to the Cat6509.

## Floor Closets

Each closet contains several Cat3500 switches. The closet layouts are as follows:

- 1<sup>st</sup> Floor East – two Cat3548s
- 1<sup>st</sup> Floor West – one Cat3548, one Cat3524
- 2<sup>nd</sup> Floor East – two Cat3548s
- 2<sup>nd</sup> Floor West – three Cat3548s, one Cat3524
- 3<sup>rd</sup> Floor East – two Cat3548s, one Cat3524
- 3<sup>rd</sup> Floor West – four Cat3548s

There are two active connections from the core switch to each closet. In each closet, the fiber connections terminate in the GigabitEthernet0/1 interfaces in the top and bottom switches in each closet. In each closet, inter-switch connections are made through GigaStack GBICs, which use short-distance copper cabling as a transport, rather than fiber. The switches are linked together by connecting each switch to its two nearest neighbors (the switches directly above and below) in the closet.

## Logical Topology

This section outlines the logical topology (Layer 3) of the FBN network.

### VLANs

The FBN network is divided into several VLANs, and all of the VLANs correspond to a single wiring closet. The following are the VLAN assignments for the closets:

- VLAN 86 – 1<sup>st</sup> Floor West
- VLAN 87 – 1<sup>st</sup> Floor East
- VLAN 88 – 2<sup>nd</sup> Floor West
- VLAN 89 – 2<sup>nd</sup> Floor East
- VLAN 91 – 3<sup>rd</sup> Floor East
- VLAN 92 – 3<sup>rd</sup> Floor West
- 

There are two VLANs used in the server room—VLANs 93 and 94. There is also a test VLAN that is not routed to the rest of the network, which is VLAN 100.

### Network Addressing

IP and IPX are the two network protocols in use on the FBN network. The following table lists the IP and IPX networks assigned to various part of the FBN network:

IP Network	IPX Network	Location/Purpose
192.168.86.0/24	86	1 <sup>st</sup> Floor West
192.168.87.0/24	87	1 <sup>st</sup> Floor East
192.168.88.0/24	88	2 <sup>nd</sup> Floor West

192.168.89.0/24	89	2 <sup>nd</sup> Floor East
192.168.91.0/24	91	3 <sup>rd</sup> Floor East
192.168.92.0/24	92	3 <sup>rd</sup> Floor West
192.168.93.0/24	1002	Server Room
192.168.94.0/24	1003	Server Room
192.168.100.0/24	N/A	Test VLAN – NOT ROUTED

Each switch has an IP address assigned for management purposes. The IP address for each switch is assigned from the VLAN for the closet in which it resides. The list of switches in Appendix A includes the IP address of each switch.

Hot Standby Router Protocol (HSRP) is enabled on VLANs for failover between the two MSFC2s in the Cat6509, which act as the default gateway on each subnet. As a general rule, Router 1 (the primary HSRP router) uses the IP address .2 for each VLAN, and Router 2 (the secondary router) uses .3. The virtual router IP address is .1 for each of the VLANs.

## Technical Considerations

This section contains information about the technical considerations that influenced the configurations of the switches and the routers.

### Technical Considerations for Switches

The following considerations were taken into account when creating the switch configurations.

#### *Redundancy*

The dual supervisors in the Cat6509 provide redundancy in the core switch. Only one supervisor is active at any time, and the other remains in standby mode. They are configured such that all changes to the active supervisor configuration will also update the standby supervisor. Should the active supervisor fail, the standby supervisor immediately takes over the switching functions of the Cat6509. The interruption to the network traffic should be less than one second.

The Cat6509 also contains dual power supplies, which share the power load when both are on. If one of the power supplies fails or is removed, the other power supply can support all of the power load. Each interface blade in the Cat6509 is independent, so failure of one blade should not affect any others. The only critical part of the Cat6509 that is not redundant is the backplane.

The trunks to the closet switches are redundant through use of the GigaStack modules that connect all of the switches in a closet together. With the two fiber connections back to the core from two different switches in the closet, all users should be able to access the network if any one cable fails or is removed. Under normal operating conditions, half of the switches in a closet use one fiber link, and the other half of the switches use the other

link. Should either fiber link fail, the switches automatically change over to the other fiber connection out of the closet. This failover requires a recalculation of the Spanning Tree Protocol, which required about 45 seconds in testing. To prevent the failure of any one blade in the Cat6509 from isolating a group of users, the two fiber connections from each closet connect to two independent blades.

### ***Spanning Tree Protocol***

The Spanning Tree Protocol (STP) is used by switches to detect and disable physical loops in the Layer 2 network. Although loops are detrimental to Layer 2 networks, they are desirable for their fault tolerance capabilities. STP permits Layer 2 networks to be built with loops while preventing the negative impact loops normally have. STP allows switches to calculate the structure of the network and disable ports as needed to eliminate loops.

The most important switch on any network is the STP root bridge. The root bridge is the reference point for every other switch on the network to calculate STP. Explicitly choosing a root bridge is important to ensure optimal path selection by STP. Selection of an appropriate root bridge will also minimize the impact of network failures on other parts of the network. A switch can be given preference in the root selection process by configuring it with a priority lower than that of all other switches on the network.

On the FBN network, the Cat6509 is configured to be the root bridge on all VLANs. (Every VLAN has its own instance of STP.) The priority configured on the Cat6509 is 8192, while the default for the other switches is 32,768.

Because the Cat6509 is the root bridge, each closet switch prefers the most direct route to it. Therefore, when the network is stable, every Cat3500 should use the shortest path to reach the Cat6509. Only if there is a problem with that connection should a switch failover to the other fiber connection in the closet.

The only exception to this rule is in the 3<sup>rd</sup> Floor East closet, in which there are three switches. This gives the middle switch in that closet two connections of equal cost to the core. In order to optimize traffic and eliminate guesswork, that switch has been explicitly configured to prefer the fiber link through the bottom switch in the closet, rather than the top switch.

### ***STP Portfast Mode***

By default, STP is enabled on all switch ports. When a port becomes active, the switch must cycle through listening and learning states before it can forward packets on those ports. This results in at least a 30-second delay in the station receiving any traffic. In that time, usually DHCP has already attempted to lease an IP address, and the NetWare Client has tried to identify a logon server. If these things happen before a port is in the STP forwarding state, network services can fail. Therefore, every port connected to an end station should be put into portfast mode. In portfast mode, the port does not run STP, so it becomes active immediately.

It is important to note that connecting switches via ports that are in portfast mode can be detrimental to the network. If a loop is introduced on a portfast port, the switches may

not detect it and respond accordingly. If the loop is not disabled, the network will likely suffer a debilitating broadcast storm.

All of the Fast Ethernet ports on all of the switches are set to portfast mode. All of the Gigabit Ethernet ports on all of the Cat3500s are included in STP (they are not in portfast mode). On the Cat6509, the Gigabit Ethernet ports in blades 3 and 4 are included in STP, but the ports in blade 6 are in portfast mode, as they are reserved for servers with Gigabit Ethernet Connections.

### ***Port VLAN Assignment***

By default, every port on a switch is in VLAN 1. VLAN 1 is not used for any ports in the FBN production network, so all switch ports must be assigned to other VLANs. This change is configured manually on each switch. This is done for every host port on the closet switches and the core switch. The only ports not assigned to VLANs are trunk ports (explained next).

### ***Trunk Creation***

By default, all switch ports are access ports, which means they belong to only one VLAN. Generally this is the correct mode for all ports connecting to hosts. Connections between switches can be configured as access ports or trunk ports. When configured as a trunk, a switch includes VLAN information along with the frames that are sent from that port. This allows VLANs to exist across multiple switches. All inter-switch connections on the FBN network are configured as trunks. They use 802.1q encapsulation for trunking, which is an open standard.

On the Cat6509, the default trunking configuration is to auto-negotiate. Nontrunk ports (such as those that connect to servers) should be configured with trunking explicitly off. This makes the ports become active faster when a host boots. Ports that are to be trunk ports should all be explicitly configured as well, making them activate more quickly. Cat3500 switches cannot auto-negotiate trunking, so they require no configuration changes on their nontrunk ports. They do need trunking explicitly configured on trunk ports.

### ***Native VLANs on Trunks***

Trunks using the 802.1q trunking protocol only tag frames that are not in the native VLAN of the port. For example, if an 802.1q trunk is in VLAN 1, then all frames for VLAN 1 sent on that port are not tagged. However, frames for every other VLAN are tagged with the appropriate identifying information. Therefore, it is important that two switches that share a trunk are configured with the same native VLAN on directly connected interfaces.

The default native VLAN for all ports is VLAN 1. For ease of administration, this has not been changed on the trunk ports on the FBN network. However, it is important to note this setting for future changes to the network. Whenever creating a trunk port, make sure the native VLAN is set to VLAN 1.



### ***VTP***

Switches can share VLAN information with each other using the VLAN Trunking Protocol (VTP). VTP carries VLAN information across trunking interfaces of adjacent switches. This saves time and effort, because without VTP, every VLAN would have to be configured on every switch. VTP transfers useful information about each VLAN, including its name, which makes troubleshooting easier.

VLAN information can be updated only on VTP servers. There can be an unlimited number of VTP servers on a network, but it is a good idea to limit the exposure to VLAN changes. On the FBN network, the Cat6509 switch is the only VTP server, and every Cat3500 switch is a VTP client. Therefore, all VLANs must be created on the Cat6509 before any ports on any switch can be made members of the VLANs.

### ***VTP Pruning***

When using trunks to carry traffic for multiple VLANs between switches, the default behavior is to send traffic from every VLAN across every trunk. This behavior is inefficient and defeats some of the purpose of creating VLANs. If there is a broadcast storm on any one subnet, that traffic would cross every trunk port on the network, using significant bandwidth.

VTP pruning allows the switches to communicate which VLANs they need to receive traffic for. If a switch has ports in VLAN 91, it requests traffic for VLAN 91. If it has no ports in VLAN 92, it requests that VLAN 92 be pruned by the upstream switch. This way, only required traffic crosses the trunk.

The one exception to pruning is VLAN 1. VLAN 1 is used for control purposes and can never be pruned. However, VLAN 1 is not used for any production subnets at FBN, so there should be no traffic on it.

### ***EtherChannel configuration***

EtherChannels allow two adjacent Cisco switches to exchange traffic over more than one physical interface, thereby increasing the bandwidth available between the switches. For example, if two Gigabit Ethernet ports on one switch connect to two Gigabit Ethernet ports on another switch, they can be bonded to provide twice the bandwidth (effectively 4 Gbps, since the ports are running in full duplex mode).

By default, all ports on a Cat6509 switch are set to auto-negotiate EtherChannels. The FBN network is not using EtherChannels, so this functionality is explicitly turned off on all ports. This prevents delays in the time it takes the ports to become active.

Cat3500 switches cannot auto-negotiate EtherChannels, so they require no configuration changes to disable EtherChannels.

### **Technical Considerations for Routers**

The following considerations were taken into account when creating the router configurations.

### ***Redundancy***

In a Cat6509 switch with dual supervisors and dual MSFC2s, both MSFC2s are active concurrently. (This differs from the switching software, for which only one supervisor is active.) Having both routers active offers the advantage that the routers and switches can failover independently of each other.

For IP and IPX, having two routers poses no problem, as traffic destined for other VLANs simply has two possible routers to go through. However, for non-routing IP hosts on the networks, this can be a problem, because they are generally configured with only one default gateway. In order to allow these hosts to communicate via their configured default gateway, Cisco routers use the Hot Standby Router Protocol (HSRP) to share virtual IP and MAC addresses. The virtual IP address is configured to be the default gateway on every VLAN. If either MSFC2 fails, the other router still answers for the virtual IP address, so client machines can still route through their default gateways.

For information about the IP addresses in use, see the “Network Addressing” section earlier in this document.

### ***Helper Addresses***

In order to use DHCP across IP subnets, helper addresses must be configured on the router interfaces attached to subnets that do not have a DHCP server of their own. On the FBN network, DHCP packets need to be forwarded to the DHCP server on VLAN 94. The configuration of the helper address is required on the VLAN interface for every other VLAN.

When configured with helper addresses, Cisco routers forward eight protocols to those addresses by default. To prevent extra protocol traffic from being forwarded, the unnecessary this is explicitly disabled in the router configurations—only DHCP traffic should be forwarded.

### ***Classless IP Routing***

Cisco routers can make routing decisions using two different methods—classful and classless. (The default depends on the version of IOS on a router.) In most cases, classless routing is preferable, and it is the default in the IOS on the FBN MSFC2s.

When a router is using classless routing, its routing decisions are very simple. If a packet arrives for which the router has no matching route, it will forward the packet via the default route. When a router is using classful IP routing, it follows a more complicated procedure when making routing decisions. First, the router looks for any routes to any part of the classful network to which the packet is destined. If no such routes are found, the packet is sent via the default route. However, if the classful network has one or more subnet routes, the router checks if any routes match the destination of the packet. If not, the router discards the packet rather than forwarding it.

### ***Fast Switching***

Fast switching allows the 6509 to take advantage of the Layer 3 Switching feature of the IOS. After a packet is routed the first time two hosts exchange traffic, additional packets with the same header information will not be processed by the MSFC2. Instead, the

switching cache can determine which port should receive the frame, even across VLANs. Fast switching speeds the traffic between VLANs, and it is enabled by default.

Because fast switching prevents the MSFC2 from processing packets, the packets cannot receive any special processing from the router IOS. This can be a problem in some environments. In the case of Novell networks, odd-length IPX packets need to be padded to be received by hosts. This can be done in the router, but IPX fast switching must be explicitly disabled.

The IP traffic at FBN should not require any special processing by the MSFC2, so it can be fast switched. Therefore, this setting does not need to be changed for IP.

### ***IPX Encapsulation***

The FBN IPX traffic uses 802.3 encapsulation, which is the default on Cisco routers. Therefore, the 'ipx network' interface configuration command does not need to specify the encapsulation.

## **Standards**

This section describes the standards that have been created for the FBN network. These have been followed in the migration to the new network, and every effort should be made to ensure that they are followed as the network changes.

### **Closet Switches Port Speeds and Duplex**

On all Cat3500 closet switches, almost all interfaces have been configured for autosensing speed and duplex. This should work fine with most end stations, but it may result in problems for some hosts. As necessary, a few ports have been manually configured to a particular speed and duplex. This should be done for any other ports that do not function correctly in autosensing mode.

### **Core Switch Port Speeds and Duplex**

On the Cat6509 core switch, all of the Fast Ethernet ports have been configured to operate at 100Mbps and full duplex by default. Some of the ports currently in use require other settings, and these have been changed manually. It is important to verify the speed and duplex requirements of every host to be connected to the core switch. For all hosts that will not work at 100Mbps and full duplex, the port configurations should be changed manually.

### **Core Switch Port Names**

On the Cat6509 core switch, ports can be configured with named. At FBN, all used ports have been configured with descriptive port names that indicate their purpose. In most cases, the port name is the name of the server or closet switch to which the port connects. Although port names are not required for proper operation of the switch, this information can be extremely helpful when troubleshooting. It is strongly recommended that FBN continue to keep this information updated.

## VTP Configuration

The VTP domain on the network is 'fbn', and a VTP password is in use on that domain. All new switches added to the network should be configured with this information. The core switch is the only VTP server; all other switches are VTP clients. Any new closet switches should also be configured as VTP clients only. If another core switch is added, it could be configured as a VTP server, in which case VLAN changes could be made from either VTP server on the network.

## Common Changes

This section describes changes that are common to many networks and how they should be handled on the FBN network.

### Changing Speed and/or Duplex

On the Cat3500 closet switches, you must enter interface configuration mode for the interface for which you wish to change the settings. To change the speed and/or duplex settings of the interface, use the following commands:

```
FBN-3548-1e-1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
FBN-3548-1e-1(config)#interface FastEthernet 0/1
FBN-3548-1e-1(config-if)#speed 10
FBN-3548-1e-1(config-if)#duplex half
FBN-3548-1e-1(config-if)#end
FBN-3548-1e-1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...

FBN-3548-1e-1#
```

On the Cat6509 core switch, use the following commands to change the speed and/or duplex settings of particular ports:

```
FBN-6509-Core> (enable) set port speed 8/40 10
Port(s) 3/9 speed set to 10Mbps.
FBN-6509-Core > (enable) set port duplex 8/40 half
Port(s) 3/9 set to half-duplex.
FBN-6509-Core> (enable)
```

On the Cat6509, you can change the speed and/or duplex of more than one port at a time by specifying a port range with these commands.

### Changing VLAN Membership of Ports

On the Cat3500 closet switches, you must enter interface configuration mode for the interface for which you wish to change the settings. To change the VLAN membership of the interface, use the following configuration commands:

```
FBN-3548-1e-1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
FBN-3548-1e-1(config)#interface FastEthernet 0/1
FBN-3548-1e-1(config-if)#switchport access vlan 100
FBN-3548-1e-1(config-if)#end
FBN-3548-1e-1#copy running-config startup-config
```

```
Destination filename [startup-config]?  
Building configuration...
```

```
FBN-3548-1e-1#
```

On the Cat6509 core switch, use the following command to change the VLAN membership of a particular port:

```
FBN-6509-Core> (enable) set vlan 100 8/40  
VLAN 100 modified.  
VLAN 94 modified.  
VLAN Mod/Ports  
-----  
100 3/1-6,4/1-6,8/40  
15/1  
FBN-6509-Core> (enable)
```

On the Cat6509, you can change the VLAN membership of more than one port at a time by specifying a port range with this command.

### Adding Names to Ports on the Core Switch

Port names are used only on the Cat6509 core switch. To change the name of a port on the Cat6509, enter the following command:

```
FBN-6509-Core> (enable) set port name 8/40 NewServer  
FBN-6509-Core> (enable)
```

### Adding and Removing VLANs on the Network

New VLANs can only be added to a VTP server. On the FBN network, the Cat6509 core switch is the only VTP server, and the other switches are all VTP clients. Therefore, to create new VLANs, use the following command on the Cat6509:

```
FBN-6509-Core> (enable) set vlan 150 name NewVLAN  
Vlan 150 configuration successful  
FBN-6509-Core> (enable)
```

Although a VLAN name is optional, it is a good idea to use descriptive names for all VLANs. Once this command is entered, all switches on the network should show the new VLAN in their VLAN databases.

To delete a VLAN, make sure that no ports remain in that VLAN on any switches, and enter the following command:

```
FBN-6509-Core> (enable) clear vlan 150  
This command will deactivate all ports on vlan 150  
in the entire management domain  
Do you want to continue(y/n) [n]?y  
Vlan 150 deleted  
FBN-6509-Core> (enable)
```

This command removes the VLAN from all switches on the network. If any switch has ports in that VLAN, those ports will be immediately disabled when the VLAN is removed.

## Adding New Switches to the Network

When adding new switches to the network, make sure that they are configured to the standards listed in this document. The following properties should all be configured on every new switch:

- Host name
- Telnet and enable passwords
- Speed and duplex on every Fast Ethernet port
- VLAN of every Fast Ethernet port
- Trunk configuration on Gigabit Ethernet port(s), including 802.1q encapsulation
- Management VLAN interface, along with IP address
- Default IP gateway

It is important to note that the configuration of the management VLAN interface requires the use of the '**management**' configuration command. This command does not appear in the configuration, but it is required to use any VLAN other than VLAN 1 for management purposes. If a configuration from another switch is pasted into a new switch (for example, if the old switch dies and is being replaced), the '**management**' command must still be entered manually. This command enables the VLAN interface in question and shuts down the VLAN 1 interface. (This is the only way to accomplish these tasks. Attempting to shutdown the VLAN 1 interface with the '**shutdown**' command does not have the desired result.) Please see the sample configuration for the Cat3524s for additional information on the '**management**' configuration command, such as the appropriate place to use it.

In addition to the configuration changes, the VTP settings on new switches must be updated. This is done outside of the configuration for Cat3500s. There is a special mode called the VLAN database mode, and it is updated using the following commands:

```
FBN-3548-1e-3#vlan database
FBN-3548-1e-3(vlan)#vtp client
Setting device to VTP CLIENT mode.
FBN-3548-1e-3(vlan)#vtp domain fbn
Changing VTP domain name from NULL to fbn
FBN-3548-1e-3(vlan)#vtp password rusleeping
Setting device VLAN database password to rusleeping.
FBN-3548-1e-3(vlan)#exit
In CLIENT state, no apply attempted.
Exiting....
FBN-3548-1e-3#
```

It is important to note that because the VLAN database is independent of the switch configuration, erasing the configuration has no effect on the VLAN database. It is important that this information be updated to match the rest of the network, because otherwise new switches will not have the appropriate VLANs available to them.

## Sample Configuration

This section contains a sample configuration from FBN-6509-Core. Per the Cisco default, only the non-default configuration commands are listed. Each line of the configuration is also includes a comment with important information about that command.

begin	Automatically added by the switch.
set password \$2\$kKsj4kelSvnmwoo7prja02jv set enablepass \$2\$ao5H2pbmz/wLow2kajoOKjjwq02L	Set the console/telnet password and the enable (privileged access) passwords. Passwords are encrypted. To change passwords, enter these commands without typing a password, and the switch will prompt for passwords.
set system name FBN-6509-Core	Set the host name of the switch.
set system highavailability enable	Enable the automatic update of the configuration of the standby supervisor, so configuration changes affect both supervisors.
set vtp domain FBN set vtp passwd fbn	Set the VTP domain name and domain password.
set vtp pruning enable	Enables VTP pruning. This feature prevents VLAN traffic from being forwarded unnecessarily across trunk links. Only frames from the VLANs required by each closet switch will be forwarded to that switch.
set vlan 1 name default type ethernet mtu 1500 said 100001 state active set vlan 86 name 1st-Floor-West type ethernet mtu 1500 said 100086 state active set vlan 87 name 1st-Floor-East type ethernet mtu 1500 said 100087 state active set vlan 88 name 2nd-Floor-West type ethernet mtu 1500 said 100088 state active set vlan 89 name 2nd-Floor-East type ethernet mtu 1500 said 100089 state active set vlan 91 name 3rd-Floor-East type ethernet mtu 1500 said 100091 state active set vlan 92 name 3rd-Floor-West type ethernet mtu 1500 said 100092 state active set vlan 93 name Server-Net93 type ethernet mtu 1500 said 100093 state active set vlan 94 name Server-Net94 type ethernet mtu 1500 said 100094 state active set vlan 100 name TestNetwork type ethernet mtu 1500 said 100100 state active	Configure the Ethernet VLANs in use on the FBN network. (VLAN 1 is the default VLAN and is automatically added by the switch.)
set vlan 1002 name fddi-default type fddi mtu 1500 said 101002 state active set vlan 1004 name fddinet-default type fddinet mtu 1500 said 101004 state active stp ieee set vlan 1005 name trnet-default type trbrf mtu 1500 said 101005 state active stp ibm set vlan 1003 name token-ring-default type trcrf mtu 1500 said 101003 state active mode srb aremaxhop 7 stemaxhop 7 backupcrf off	Automatically added by the switch. (These are the configurations for the default VLANs for other media types.)
set interface sc0 94 10.10.94.5/255.255.255.0 10.10.94.255	Set the management interface (sc0) IP address.
set ip route 0.0.0.0/0.0.0.0 10.10.94.1	Configure a default route for the management interface.

<pre> set spantree priority 8192 1 set spantree priority 8192 86 set spantree priority 8192 87 set spantree priority 8192 88 set spantree priority 8192 89 set spantree priority 8192 91 set spantree priority 8192 92 set spantree priority 8192 93 set spantree priority 8192 94 set spantree priority 8192 100 </pre>	Set the STP priority for this switch to 8192 (sufficient to be the root bridge) for each VLAN.
<pre> set timezone CST -6 0 set summertime enable CDT </pre>	Configure the clock settings.
<pre> set boot config-register 0x2 set boot system flash bootflash:cat6000-supcv.5-5-3.bin </pre>	Set the boot settings for the switch, including the file name of the IOS in bootflash.
<pre> set mls enable ipx ! set port channel 3/1-4 4 set port channel 3/5-8 5 set port channel 3/9-12 6 set port channel 3/13-16 7 set port channel 4/1-4 8 set port channel 4/5-8 9 set port channel 4/9-12 10 set port channel 4/13-16 11 set port channel 5/1-4 12 set port channel 5/5-8 13 set port channel 5/9-12 14 set port channel 5/13-16 15 set port channel 6/1-4 16 set port channel 6/5-8 17 set port channel 6/9-12 18 set port channel 6/13-16 19 set port channel 7/1-4 20 set port channel 7/5-8 21 set port channel 7/9-12 22 set port channel 7/13-16 23 set port channel 7/17-20 24 set port channel 7/21-24 25 set port channel 7/25-28 26 set port channel 7/29-32 27 set port channel 7/33-36 28 set port channel 7/37-40 29 set port channel 7/41-44 30 set port channel 7/45-48 31 set port channel 8/1-4 32 set port channel 8/5-8 33 set port channel 8/9-12 34 set port channel 8/13-16 35 set port channel 8/17-20 36 set port channel 8/21-24 37 set port channel 8/25-28 38 set port channel 8/29-32 39 set port channel 8/33-36 40 set port channel 8/37-40 41 set port channel 8/41-44 42 set port channel 8/45-48 43 </pre>	Automatically added by the switch. (The port channel commands establish the administrative groups for use with EtherChannels. These are not used on the FBN network.)
<pre> set port name 3/1 1st-East-1 set port name 3/2 1st-West-1 set port name 3/3 2nd-East-1 set port name 3/4 2nd-West-1 set port name 3/5 3rd-East-1 set port name 3/6 3rd-West-1 </pre>	Set the port name for each port on module 3.



<pre> set trunk 3/1 on dot1q 1-1005 set trunk 3/2 on dot1q 1-1005 set trunk 3/3 on dot1q 1-1005 set trunk 3/4 on dot1q 1-1005 set trunk 3/5 on dot1q 1-1005 set trunk 3/6 on dot1q 1-1005 set trunk 3/7 on dot1q 1-1005 set trunk 3/8 on dot1q 1-1005 set trunk 3/9 on dot1q 1-1005 set trunk 3/10 on dot1q 1-1005 set trunk 3/11 on dot1q 1-1005 set trunk 3/12 on dot1q 1-1005 set trunk 3/13 on dot1q 1-1005 set trunk 3/14 on dot1q 1-1005 set trunk 3/15 on dot1q 1-1005 set trunk 3/16 on dot1q 1-1005 </pre>	Enable 802.1q trunking on all ports on module 3.
<pre> set port channel 3/1-16 mode off </pre>	Disable auto-negotiation of EtherChannels on all ports on module 3.
	(The previous commands to configure the ports on module 3 are repeated for the other ports on modules 4. These two blades contain all of the trunk connections between switches.)
<pre> set port channel 5/1-16 mode off </pre>	Disable auto-negotiation of EtherChannels on all ports on module 5. (This module is currently unused.)
<pre> set vlan 93 6/1-4,6/15 </pre>	Set the VLAN for the ports on module 6. The ports on module 6 connect to the servers with Gigabit Ethernet NICs.
<pre> set port name 6/1 Server_01 set port name 6/2 Server_02 set port name 6/3 Server_03 set port name 6/4 Router </pre>	Set the port name for each port on module 6 in use.
<pre> set trunk 6/1 off negotiate 1-1005 set trunk 6/2 off negotiate 1-1005 set trunk 6/3 off negotiate 1-1005 set trunk 6/4 off negotiate 1-1005 set trunk 6/5 off negotiate 1-1005 set trunk 6/6 off negotiate 1-1005 set trunk 6/7 off negotiate 1-1005 set trunk 6/8 off negotiate 1-1005 set trunk 6/9 off negotiate 1-1005 set trunk 6/10 off negotiate 1-1005 set trunk 6/11 off negotiate 1-1005 set trunk 6/12 off negotiate 1-1005 set trunk 6/13 off negotiate 1-1005 set trunk 6/14 off negotiate 1-1005 set trunk 6/15 off negotiate 1-1005 set trunk 6/16 off negotiate 1-1005 </pre>	Disable auto-negotiation of trunks on all ports on module 6.
<pre> set spantree portfast 6/1-16 enable </pre>	All ports on module 6 are in STP portfast mode. STP will not run on these ports.
<pre> set port channel 6/1-16 mode off </pre>	Disable auto-negotiation of EtherChannels on all ports on module 6.
<pre> set vlan 89 7/47 set vlan 92 7/48 set vlan 93 7/1-46 </pre>	Set the VLAN for the ports on module 7. The ports on module 7 connect to hosts in the server room.
<pre> set port speed 7/3,7/6-7,7/9-10,7/22,7/27-28,7/48 10 set port speed 7/1-2,7/4-5,7/8,7/11-21,7/23-26,7/29-47 100 set port duplex 7/1-2,7/4-5,7/8,7/11-21,7/23-26,7/29-47 full </pre>	Set the port speed and duplex for the (Fast Ethernet) ports on module 7. These settings should match the settings of the servers.

<pre> set port name      7/3  Firewall set port name      7/4  Gateway_01 set port name      7/5  Fax Server set port name      7/6  Server A set port name      7/7  Server B set port name      7/8  Server C set port name      7/9  Server D set port name      7/10 Server E set port name      7/11 Server F set port name      7/12 Server G set port name      7/13 Server H set port name      7/14 Server I set port name      7/16 Server J set port name      7/17 Server K set port name      7/18 Server L set port name      7/19 Server M </pre>	Set the port name for each port on module 7 in use.
<pre> set trunk 7/1  off negotiate 1-1005 set trunk 7/2  off negotiate 1-1005 set trunk 7/3  off negotiate 1-1005 set trunk 7/4  off negotiate 1-1005 set trunk 7/5  off negotiate 1-1005 set trunk 7/6  off negotiate 1-1005 set trunk 7/7  off negotiate 1-1005 set trunk 7/8  off negotiate 1-1005 set trunk 7/9  off negotiate 1-1005 set trunk 7/10 off negotiate 1-1005 set trunk 7/11 off negotiate 1-1005 set trunk 7/12 off negotiate 1-1005 set trunk 7/13 off negotiate 1-1005 set trunk 7/14 off negotiate 1-1005 set trunk 7/15 off negotiate 1-1005 set trunk 7/16 off negotiate 1-1005 set trunk 7/17 off negotiate 1-1005 set trunk 7/18 off negotiate 1-1005 set trunk 7/19 off negotiate 1-1005 set trunk 7/20 off negotiate 1-1005 set trunk 7/21 off negotiate 1-1005 set trunk 7/22 off negotiate 1-1005 set trunk 7/23 off negotiate 1-1005 set trunk 7/24 off negotiate 1-1005 set trunk 7/25 off negotiate 1-1005 set trunk 7/26 off negotiate 1-1005 set trunk 7/27 off negotiate 1-1005 set trunk 7/28 off negotiate 1-1005 set trunk 7/29 off negotiate 1-1005 set trunk 7/30 off negotiate 1-1005 set trunk 7/31 off negotiate 1-1005 set trunk 7/32 off negotiate 1-1005 set trunk 7/33 off negotiate 1-1005 set trunk 7/34 off negotiate 1-1005 set trunk 7/35 off negotiate 1-1005 set trunk 7/36 off negotiate 1-1005 set trunk 7/37 off negotiate 1-1005 set trunk 7/38 off negotiate 1-1005 set trunk 7/39 off negotiate 1-1005 set trunk 7/40 off negotiate 1-1005 set trunk 7/41 off negotiate 1-1005 set trunk 7/42 off negotiate 1-1005 set trunk 7/43 off negotiate 1-1005 set trunk 7/44 off negotiate 1-1005 set trunk 7/45 off negotiate 1-1005 set trunk 7/46 off negotiate 1-1005 set trunk 7/47 off negotiate 1-1005 set trunk 7/48 off negotiate 1-1005 </pre>	Disable auto-negotiation of trunks on all ports on module 7.
<pre> set spantree portfast 7/1-48 enable </pre>	All ports on module 7 are in STP portfast mode. STP will not run on these ports.
<pre> set port channel 7/1-48 mode off </pre>	Disable auto-negotiation of EtherChannels on all ports on module 7.

	(The previous commands to configure the ports on module 7 are repeated for the other ports on module 8. These two blades contain the connections for servers.)
end	Automatically added by the switch.

## Conclusion

The information contained in this document reflects the state of the FBN network after the installation of the new Cisco infrastructure by PC Consulting. This document or another one with this type of information should continue to be updated as changes are made to the network.

## Appendix A: Switch Information

The Cat6509 core switch is named FBN-6509-Core, and its IP address 10.10.94.5. The following is the information for the Cat3500 closet switches:

Name	IP Address	Connection at Core
FBN-3548-1e-1	10.10.87.5	3/1
FBN-3548-1e-2	10.10.87.6	4/1
FBN-3548-1w-1	10.10.86.5	3/2
FBN-3524-1w-2	10.10.86.6	4/2
FBN-3548-2e-1	10.10.89.5	3/3
FBN-3548-2e-2	10.10.89.6	4/3
FBN-3548-2w-1	10.10.88.5	3/4
FBN-3548-2w-2	10.10.88.6	
FBN-3548-2w-3	10.10.88.7	
FBN-3524-2w-4	10.10.88.8	4/4
FBN-3548-3e-1	10.10.91.5	3/5
FBN-3548-3e-2	10.10.91.6	
FBN-3524-3e-3	10.10.91.7	4/5
FBN-3548-3w-1	10.10.92.5	3/6
FBN-3548-3w-2	10.10.92.6	
FBN-3548-3w-3	10.10.92.7	
FBN-3548-3w-4	10.10.92.8	4/6