User's Guide

Alteon OS™ 21.0

Port Aggregator for IBM BladeCenter

Version 90.0

Part Number: 24R9729, December 2005

4655 Great America Parkway
Santa Clara, CA 95054
www.nortelnetworks.com
Reference: 321269-A

Contents

Preface

The *Port Aggregator User's Guide* describes how to configure and use the software on the Port Aggregator for IBM BladeCenter. For documentation on installing the module physically, see the *Installation Guide* for your Port Aggregator.

Who Should Use This Guide

This *User's Guide* is intended for server administrators who need to connect the BladeCenter to a data network. The administrator does not require extensive knowledge of Ethernet or IP networking concepts to install and configure the Port Aggregator. The Port Aggregator's static configuration provides basic connectivity to the data network.

What You'll Find in This Guide

This guide will help you plan, implement, and administer Alteon OS software. Where possible, each section provides feature overviews, usage examples, and configuration instructions.

- Chapter 1, "Overview of Port Aggregator Operation," provides a general theory of operation for the Port Aggregator Module.
- Chapter 2, "Accessing the Port Aggregator," describes how to access the Port Aggregator to configure, view information and run statistics. This chapter also discusses different methods to manage the Port Aggregator for remote administrators using specific IP addresses, RADIUS authentication, Secure Shell (SSH), and Secure Copy (SCP).
- Chapter 3, "Ports, VLANs, and Trunking," describes how to group multiple physical ports together to aggregate the bandwidth between large-scale network devices.
- Chapter 4, "Command Reference," provides an overview of menu commands that enable you to view information and statistics about the Port Aggregator, and to perform any necessary configuration.

Typographic Conventions

The following table describes the typographic styles used in this book.

Table 1 Typographic Conventions

Typeface or Symbol	Meaning	Example
`AaBbCc123`	This type is used for names of commands, files, and directories used within the text.	View the `readme.txt` file.
	It also depicts on-screen computer output and prompts.	`Main#`
`AaBbCc123`	This bold type appears in command examples. It shows text that must be typed in exactly as shown.	`Main#` **`sys`**
<AaBbCc123>	This italicized type appears in command examples as a parameter placeholder. Replace the indicated text with the appropriate real name or value when using the command. Do not type the brackets.	To establish a Telnet session, enter: `host#` **`telnet`** *<IP address>*
	This also shows book titles, special terms, or words to be emphasized.	Read your *User's Guide* thoroughly.
[ ]	Command items shown inside brackets are optional and can be used or excluded as the situation demands. Do not type the brackets.	`host#` **`ls`** [**`-a`**]

How to Get Help

If you need help, service, or technical assistance, see the "Getting help and technical assistance" appendix in the *Port Aggregator Module for IBM BladeCenter Installation Guide*.

CHAPTER 1

Overview of Port Aggregator Operation

The Port Aggregator provides a simple Ethernet interface option for connecting the IBM BladeCenter system to the network infrastructure. The administrative effort and network skills required to connect to the network are minimized. The number and type of configuration options on the Port Aggregator are restricted to reduce the initial setup complexity and to minimize the impact on upstream networking devices.

The Port Aggregator requires basic administration tasks similar to those required to connect a single multilinked server to the network. Connecting the BladeCenter with up to fourteen (14) server blades becomes as easy as connecting a single server to the network.

The network configuration of the Port Aggregator is limited to a single, untagged Virtual Local Area Network (VLAN). All of the ports available for connecting to upstream networking devices are aggregated together into a static Link Aggregation Group (LAG, or trunk group), which is fully compatible with Cisco EtherChannel technology. This configuration eliminates the need for Spanning Tree Protocol to prevent network loops, since the uplink ports act as a single link.

The Port Aggregator provides improved network reliability. Each uplink port participates in a static LAG, so if a link fails, the existing traffic is redirected to the other links.

The Port Aggregator software permits the copper TX uplink ports to auto-negotiate the speed (1Gbps/100Mbps), duplex (full/half) and flow-control settings of each link (the default setting). You can also fix these port characteristics to specified values. All of the uplink ports must be configured to the same port characteristics.

With Network Adaptor Teaming configured on the server blade Ethernet NICs, the servers can maintain redundant links to multiple Port Aggregators within the BladeCenter chassis to provide enhanced reliability. The L2 Failover option allows the Port Aggregator to disable the server-blade ports when all of its external uplinks are inactive. This causes the Network Adaptor Teaming software to failover to the other Port Aggregator(s) in the BladeCenter chassis.

The Port Aggregator permits effective management of the server blades using the Serial Over LAN (SOL) feature over a VLAN dedicated to the BladeCenter management module.

Most users will find the Browser-based Interface (BBI) adequate for configuring and using the Port Aggregator. However, a command-line interface (CLI) is available for users familiar with the CLI, or who want to use scripting facilities.

Port Aggregator Quick Start

The Port Aggregator is shipped with a default configuration that allows you to plug it into the BladeCenter Chassis and function correctly with no configuration changes. You must make some configuration changes to the upstream network device and the blades in the BladeCenter Chassis, as follows:

Configuring the BladeCenter Management Module

The link through the management module is used to connect to the Port Aggregator. The management module is also used to control several operational characteristics of the Port Aggregator:

- Plug the Ethernet cable into the management module and verify that you get link and can connect to the management module.
- Configure the Port Aggregator IP Address, Network Mask and Default Gateway (refer to "Accessing the Port Aggregator" on page 13).
- Verify that the External Ports are enabled.
- Verify that "Preserve new IP configuration on all switch resets" is enabled.

Configuring the Upstream Networking Device

If only one link is required to the Port Aggregator, do the following:

- Plug in the Ethernet cable (straight through or crossover) that connects the Port Aggregator to the upstream networking device.
- Configure the upstream networking device to transmit the desired data on a single untagged (native) VLAN.
- Verify that the upstream networking device is configured to auto-negotiate the link's speed, duplex and flow control. If fixed port characteristics are desired, configure the Port Aggregator port characteristics using the appropriate BBI or CLI interfaces.

If more than one link is required to the Port Aggregator, configure a static link aggregation group (also referred to as a trunk group or EtherChannel) to include all of the ports that are being connected.

Configuring the BladeCenter Processor Blades

The operating system should be configured to have a single 802.1Q untagged interface. If two Port Aggregators are used in the chassis, the blades can be configured to support Network Adaptor Teaming Failover (refer to the appropriate documentation for your operating system).

CHAPTER 2

Accessing the Port Aggregator

The Alteon OS software provides means for accessing, configuring, and viewing information and statistics about the Port Aggregator. This chapter discusses different methods of accessing the Port Aggregator and ways to secure it for remote administrators:

Management module setup

The BladeCenter Port Aggregator is an integral subsystem within the overall BladeCenter system. The BladeCenter chassis includes a management module as the central element for overall chassis management and control.

The 100-Mbps Ethernet port on the management module is used to configure and manage the Port Aggregator. The Port Aggregator communicates with the management module through its internal port 15 (MGT1) or port 16 (MGT2), which is accessible through the 100 Mbps Ethernet port on the management module. The Port Aggregator will permit *only* management and control access to the Port Aggregator through the 10/100 Mbps Ethernet port on the management module, or the built-in serial port. The six external 10/100/1000 Mbps Ethernet ports on the Port Aggregator cannot be used for management and control. Selecting this mode as an option through the management module configuration utility program has no effect (see the applicable *BladeCenter Installation and User's Guide* publications on the IBM *BladeCenter Documentation* CD for more information).

Factory-Default vs. MM assigned IP Addresses

Each Port Aggregator must be assigned its own Internet Protocol address, which is used for communication with Transmission Control Protocol/Internet Protocol (TCP/IP) applications (for example, Telnet or TFTP). The factory-default IP address is 10.90.90.9x, where x corresponds to the number of the bay into which the Port Aggregator is installed. For additional information, see the *Installation Guide*). The management module assigns an IP address of 192.168.70.1*xx*, where *xx* corresponds to the number of the bay into which each Port Aggregator is installed, as shown in the following table:

Table 2-1 Port Aggregator IP addresses, based on BladeCenter bay numbers

Bay number	Factory-default IP address	IP address assigned by MM
Bay 1	10.90.90.91	192.168.70.127
Bay 2	10.90.90.92	192.168.70.128
Bay 3	10.90.90.94	192.168.70.129
Bay 4	10.90.90.97	192.168.70.130

NOTE – Port Aggregator Modules installed in Bay 1 and Bay 2 connect to server NICs 1 and 2, respectively. However, Windows operating systems show that Port Aggregator Modules installed in Bay 3 and Bay 4 connect to server NICs 4 and 3, respectively.

Default Gateway

The default Gateway IP address determines where packets with a destination address outside the current subnet should be sent. Usually, the default Gateway is a router or host acting as an IP gateway to handle connections to other subnets of other TCP/IP networks. If you want to access the Port Aggregator from outside your local network, use the management module to assign a default Gateway address to the Port Aggregator. Choose **I/O Module Tasks > Management** from the navigation pane on the left, and enter the default Gateway IP address (for example, 192.168.70.125). Click **Save**.

Configuring management module for access

Complete the following initial configuration steps:

1. **Connect the Ethernet port of the management module to a 10/100 Mbps network (with access to a management station) or directly to a management station.**
2. **Access and log on to the management module, as described in the *BladeCenter Management Module User's Guide* on the IBM *BladeCenter Documentation* CD. The management module provides the appropriate IP addresses for network access (see the applicable *BladeCenter Installation and User's Guide* publications on the IBM *BladeCenter Documentation* CD for more information).**
3. **Select** Configuration **on the** I/O Module Tasks **menu on the left side of the BladeCenter Management Module window. See** Figure 2-1.

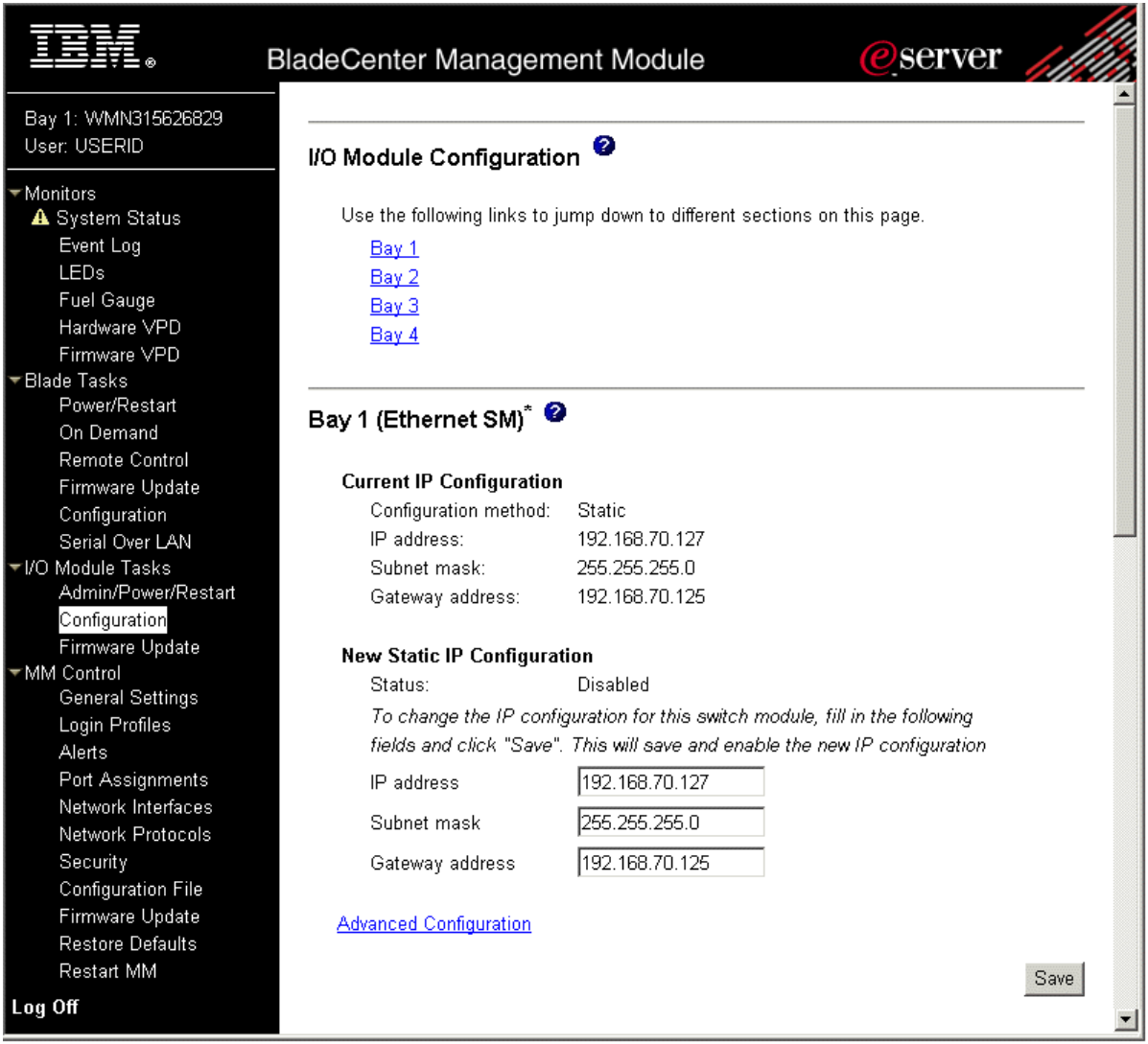


Figure 2-1 Port Aggregator management on the BladeCenter management module

4. **You can use the default IP addresses provided by the management module, or you can assign a new IP address to the Port Aggregator through the management module.**

NOTE – If you change the IP address of the Port Aggregator, make sure that the Port Aggregator and the management module both reside on the same subnet.

5. **Enable the following features in the management module:**

   - External Ports
     From the navigation pane on the left, choose **I/O Module Tasks > Admin/Power/Restart > I/O Module Advanced Setup** and select the appropriate switch module.
     The default value is **`Disabled`**. If the feature is not already enabled, change the value to **`Enabled`**, then **`Save`**.

   - Preserve new IP configuration on all switch resets
     From the navigation pane on the left, choose **I/O Module Tasks > Configuration > Advanced Configuration** and ensure this setting is **`Enabled`**. If the feature is not already enabled, change the value to **`Enabled`**, then **`Save`**.
     This setting causes the management module to retain the Port Aggregator's IP interface when you restore factory defaults. It preserves the management port's IP address in the management module's memory, so you maintain connectivity to the management module after a reset.

NOTE – The feature "External Management Over All Ports" is not available for the Port Aggregator.

You can now start a Telnet session, Browser-Based Interface (Web) session, a Secure Shell session, or a secure HTTPS session to the Port Aggregator. For TCP/IP applications to work with the Port Aggregator, a route path must exist both from your workstation to the Port Aggregator, and from the Port Aggregator to your workstation.

Using Telnet

Telnet is used to access the Port Aggregator's command-line interface. Telnet can be launched from the management module interface, or by using a local Telnet application on your workstation.

NOTE – If you cannot access the Port Aggregator using Telnet or the Browser-Based Interface (web), try to ping the Port Aggregator's IP address from your workstation. If the ping fails, the Port Aggregator's IP information is not configured correctly.

To use Telnet from the management module, choose **I/O Module Tasks > Configuration** from the navigation pane on the left. Select a bay number and click **Advanced Configuration > Start Telnet/Web Session > Start Telnet Session**. A Telnet window opens a connection to the Port Aggregator (requires Java 1.4 Plug-in).

To establish a Telnet connection with the Port Aggregator from your workstation, you can run the Telnet program and issue the Telnet command, followed by the IP address of the Port Aggregator:

```
telnet <Port Aggregator IP address>
```

Connect to the Port Aggregator via SSH

The SSH (Secure Shell) protocol enables you to securely log into another computer over a network to execute commands remotely. As a secure alternative to using Telnet to manage Port Aggregator configuration, SSH ensures that all data sent over the network is encrypted and secure. For more information, see "Secure Shell and Secure Copy" on page 31. For more information on the CLI, see *"Command Reference" on page 47*.

Using the Browser-Based Interface

Use the management module to access the Port Aggregator through a Web session. Choose **I/O Module Tasks > Configuration** from the navigation pane on the left. Select a bay number and click **Advanced Configuration > Start Telnet/Web Session > Start Web Session**. A browser window opens a connection to the Port Aggregator (requires Java 1.4 Plug-in).

The Browser-based Interface (BBI) provides access to the common configuration, management and operation features through your Web browser.

By default, BBI access is enabled (`/cfg/sys/access/http ena`).

Configuring BBI Access via HTTP

To enable BBI access via HTTP, use the following command:

```
/cfg/sys/access/http ena
```

To change the HTTP web server port from the default port 80, use the following command:

```
/cfg/sys/access/wport <x>
```

To access the Port Aggregator via the Browser-Based Interface, open a Web browser window and type in the URL using the IP interface address of the Port Aggregator, such as http://10.10.10.1.

Configuring BBI Access via HTTPS

The BBI can also be accessed through a secure HTTPS connection over the management module interface or the console port.

To enable BBI Access via HTTPS, use the following command:

```
/cfg/sys/access/https/https ena
```

To change the HTTPS Web server port number from the default port 443, use the following command:

```
/cfg/sys/access/https/port <x>
```

Accessing the BBI via HTTPS requires that you generate a certificate to be used during the key exchange. A default certificate is created the first time HTTPS is enabled, but you can create a new certificate defining the information you want to be used in the various fields.

```
>> /cfg/sys/access/https/generate
Country Name (2 letter code) [  ]:  <country code>
State or Province Name (full name) []:  <state>
Locality Name (eg, city) []:  <city>
Organization Name (eg, company) []:  <company>
Organizational Unit Name (eg, section) []:  <org. unit>
Common Name (eg, YOUR name) []:  <name>
Email (eg, email address) []:  <email address>
Confirm generating certificate? [y/n]: y
Generating certificate. Please wait (approx 30 seconds)
restarting SSL agent
```

The certificate can be saved to flash for use if the Port Aggregator is rebooted by using the apply and save commands.

When a client (e.g. web browser) connects to the Port Aggregator, the client is asked to accept the certificate and can verify that the fields are what the client expected. Once BBI access is granted to the client, you can use the BBI as described in the *BBI CHAPTER*

Securing Access to the Port Aggregator

Secure management is needed for environments that perform significant management functions across the Internet. The following are some of the functions for secured management:

- Limiting management users to a specific IP address range. See "Setting Allowable Source IP Address Ranges" on page 21
- Authentication and authorization of remote administrators: see "RADIUS Authentication and Authorization" on page 22
- Encryption of management information exchanged between the remote administrator and the Port Aggregator: see "Secure Shell and Secure Copy" on page 31

The following sections are addressed in this section:

Setting Allowable Source IP Address Ranges

To limit access to the Port Aggregator, you can set a source IP address (or range) that will be allowed to connect to the Port Aggregator IP interface through Telnet, SSH, or the Browser-Based Interface (BBI). This also helps to prevent spoofing or attacks on the Port Aggregator's TCP/IP stack.

When an IP packet reaches the Port Aggregator, the source IP address is checked against the range of addresses defined by the management networks and masks, (`/cfg/sys/access/mgmt`). If the source IP address of the host or hosts are within the defined ranges, they are allowed to attempt to log in. Any packet addressed to a Port Aggregator IP interface with a source IP address outside these ranges are discarded.

Configuring an IP Address Range for the Management Network

Configure Management network IP address and mask from the System menu in the Command Line Interface (CLI).

```
>> Main# /cfg/sys/access/mgmt/add
Enter Management Network Address:  192.192.192.0
Enter Management Network Mask:  255.255.255.128
```

In this example, the management network is set to 192.192.192.0 and management mask is set to 255.255.255.128. This defines the following range of allowed IP addresses: 192.192.192.1 to 192.192.192.127. The following source IP addresses are granted or not granted access to the Port Aggregator:

- A host with a source IP address of 192.192.192.21 falls within the defined range and would be allowed to access the Port Aggregator.
- A host with a source IP address of 192.192.192.192 falls outside the defined range and is not granted access. To make this source IP address valid, you would need to shift the host to an IP address within the valid range specified by the **`mgmt`** setting, or modify the management address to be 192.192.192.128. This would put the 192.192.192.192 host within the valid range allowed by the configured management network (192.192.192.128-255).

RADIUS Authentication and Authorization

Alteon OS supports the RADIUS (Remote Authentication Dial-in User Service) method to authenticate and authorize remote administrators for managing the Port Aggregator. This method is based on a client/server model. The Remote Access Server (RAS)—the Port Aggregator—is a client to the back-end database server. A remote user (the remote administrator) interacts only with the RAS, not the back-end server and database.

RADIUS authentication consists of the following components:

- A protocol with a frame format that utilizes UDP over IP (based on RFC 2138 and 2866)
- A centralized server that stores all the user authorization information
- A client, in this case, the Port Aggregator

The Port Aggregator—acting as the RADIUS client—communicates to the RADIUS server to authenticate and authorize a remote administrator using the protocol definitions specified in RFC 2138 and 2866. Transactions between the client and the RADIUS server are authenticated using a shared key that is not sent over the network. In addition, the remote administrator passwords are sent encrypted between the RADIUS client (Port Aggregator) and the back-end RADIUS server.

How RADIUS Authentication Works

1. **Remote administrator connects to the Port Aggregator and provides user name and password.**
2. **Using Authentication/Authorization protocol, the Port Aggregator sends request to authentication server.**
3. **Authentication server checks the request against the user ID database.**
4. **Using RADIUS protocol, the authentication server instructs the Port Aggregator to grant or deny administrative access.**

Configuring RADIUS

Use the following procedure to configure Radius authentication on the Port Aggregator.

1. **Turn RADIUS authentication on, then configure the Primary and Secondary RADIUS servers.**

```
>> Main# /cfg/sys/radius                          (Select the RADIUS Server menu)
>> RADIUS Server# on                              (Turn RADIUS on)
Current status: OFF
New status:     ON
>> RADIUS Server# prisrv 10.10.1.1                (Enter primary server IP)
Current primary RADIUS server:     0.0.0.0
New pending primary RADIUS server: 10.10.1.1
>> RADIUS Server# secsrv 10.10.1.2                (Enter secondary server IP)
Current secondary RADIUS server:     0.0.0.0
New pending secondary RADIUS server: 10.10.1.2
```

2. **Configure the RADIUS secret.**

```
>> RADIUS Server# secret
Enter new RADIUS secret: <1-32 character secret>
```

CAUTION—If you configure the RADIUS secret using any method other than through the console port or management module, the secret may be transmitted over the network as clear text.

3. **If desired, you may change the default TCP port number used to listen to RADIUS.**

The well-known port for RADIUS is 1645.

```
>> RADIUS Server# port
Current RADIUS port: 1645
Enter new RADIUS port [1500-3000]: <port number>
```

4. **Configure the number retry attempts for contacting the RADIUS server, and the timeout period.**

```
>> RADIUS Server# retries
Current RADIUS server retries: 3
Enter new RADIUS server retries [1-3]:     < server retries>
>> RADIUS Server# time
Current RADIUS server timeout: 3
Enter new RADIUS server timeout [1-10]: 10 (Enter the timeout period in minutes)
```

RADIUS Authentication Features in Alteon OS

Alteon OS supports the following RADIUS authentication features:

- Supports RADIUS client on the Port Aggregator, based on the protocol definitions in RFC 2138 and RFC 2866.
- Allows RADIUS secret password up to 32 bytes and less than 16 octets.
- Supports *secondary authentication server* so that when the primary authentication server is unreachable, the Port Aggregator can send client authentication requests to the secondary authentication server. Use the `/cfg/sys/radius/cur` command to show the currently active RADIUS authentication server.
- Supports user-configurable RADIUS server retry and time-out values:
  - Time-out value = 1-10 seconds
  - Retries = 1-3

  The Port Aggregator will time out if it does not receive a response from the RADIUS server in 1-3 retries. The Port Aggregator will automatically retry connecting to the RADIUS server before it declares the server down.
- Supports user-configurable RADIUS application port.
  The default is 1645/UDP-based on RFC 2138. Port 1812 is also supported.
- Allows network administrator to define privileges for one or more specific users to access the Port Aggregator at the RADIUS user database.
- SecurID is supported if the RADIUS server can do an ACE/Server client proxy. The password is the PIN number, plus the token code of the SecurID card.

User Accounts

The user accounts listed in Table 2-2 can be defined in the RADIUS server dictionary file.

Table 2-2 User Access Levels

User Account	Description and Tasks Performed	Password
User	The User has no direct responsibility for Port Aggregator management. The User can view all status information and statistics but cannot make any configuration changes to the Port Aggregator.	`user`
Operator	The Operator manages all functions of the Port Aggregator. The Operator can reset ports or the entire Port Aggregator.	`oper`
Administrator	The super-user Administrator has complete access to all menus, information, and configuration commands on the Port Aggregator, including the ability to change both the user and administrator passwords.	`admin`

RADIUS Attributes for Alteon OS User Privileges

When the user logs in, the Port Aggregator authenticates his/her level of access by sending the RADIUS access request, that is, the client authentication request, to the RADIUS authentication server.

If the remote user is successfully authenticated by the authentication server, the Port Aggregator verifies the *privileges* of the remote user and authorize the appropriate access. The administrator has an option to allow *backdoor* access via Telnet. The default is `disable` for Telnet access. Backdoor access is always enabled on the console port.

NOTE – To obtain the RADIUS backdoor password for your Port Aggregator, contact your IBM Service and Support line.

All user privileges, other than those assigned to the Administrator, have to be defined in the RADIUS dictionary. RADIUS attribute 6 which is built into all RADIUS servers defines the administrator. The file name of the dictionary is RADIUS vendor-dependent. The following RADIUS attributes are defined for Alteon OS user privileges levels:

Table 2-3 Alteon OS-proprietary Attributes for RADIUS

User Name/Access	User-Service-Type	Value
User	*Vendor-supplied*	255
Operator	*Vendor-supplied*	252
Admin	*Vendor-supplied*	250

TACACS+ Authentication

Alteon OS supports authentication and authorization with networks using the Cisco Systems TACACS+ protocol. The Port Aggregator functions as the Network Access Server (NAS) by interacting with the remote client and initiating authentication and authorization sessions with the TACACS+ access server. The remote user is defined as someone requiring management access to the Port Aggregator either through a data or management port.

TACACS+ offers the following advantages over RADIUS:

- TACACS+ uses TCP-based connection-oriented transport; whereas RADIUS is UDP-based. TCP offers a connection-oriented transport, while UDP offers best-effort delivery. RADIUS requires additional programmable variables such as re-transmit attempts and time-outs to compensate for best-effort transport, but it lacks the level of built-in support that a TCP transport offers.
- TACACS+ offers full packet encryption whereas RADIUS offers password-only encryption in authentication requests.
- TACACS+ separates authentication, authorization and accounting.

How TACACS+ Authentication Works

TACACS+ works much in the same way as RADIUS authentication as described on page 22.

1. **Remote administrator connects to the Port Aggregator and provides user name and password.**
2. **Using Authentication/Authorization protocol, the Port Aggregator sends request to authentication server.**
3. **Authentication server checks the request against the user ID database.**
4. **Using TACACS+ protocol, the authentication server instructs the Port Aggregator to grant or deny administrative access.**

During a session, if additional authorization checking is needed, the Port Aggregator checks with a TACACS+ server to determine if the user is granted permission to use a particular command.

TACACS+ Authentication Features in Alteon OS

Authentication is the action of determining the identity of a user, and is generally done when the user first attempts to log in to a device or gain access to its services. Alteon OS supports ASCII inbound login to the device. PAP, CHAP and ARAP login methods, TACACS+ change password requests, and one-time password authentication are not supported.

Authorization

Authorization is the action of determining a user's privileges on the device, and usually takes place after authentication.

The mapping between TACACS+ authorization levels and Alteon OS management access levels is shown in Table 2-4. The authorization levels must be defined on the TACACS+ server.

Table 2-4 Alteon OS-Proprietary Attributes for TACACS+

Alteon OS User Access Level	TACACS+ level
`user`	0
`oper`	3
`admin`	6

If the remote user is successfully authenticated by the authentication server, the Port Aggregator verifies the *privileges* of the remote user and authorize the appropriate access. The administrator has an option to allow *backdoor* access via Telnet. The default is `disable` for Telnet access. Backdoor access is always enabled on the console port.

NOTE – To obtain the TACACS+ backdoor password for your Port Aggregator, contact your IBM Service and Support line.

Accounting

Accounting is the action of recording a user's activities on the device for the purposes of billing and/or security. It follows the authentication and authorization actions. If the authentication and authorization is not performed via TACACS+, there are no TACACS+ accounting messages sent out.

You can use TACACS+ to record and track software logins, configuration changes, and interactive commands.

The Port Aggregator supports the following TACACS+ accounting attributes:

- protocol (console/telnet/ssh/http)
- start_time
- stop_time
- elapsed_time
- disc-cause

NOTE – When using the Browser-Based Interface, the TACACS+ Accounting Stop records are sent only if the **`Quit`** button on the browser is clicked.

Command Authorization and Logging

When TACACS+ Command Authorization is enabled (`/cfg/sys/tacacs/cauth ena`), Alteon OS configuration commands are sent to the TACACS+ server for authorization. When TACACS+ Command Logging is enabled (`/cfg/sys/tacacs/clog ena`), Alteon OS configuration commands are logged on the TACACS+ server.

The following examples illustrate the format of Alteon OS commands sent to the TACACS+ server:

```
authorization request, cmd=cfgtree, cmd-arg=/cfg/sys/access/user/uid
accounting request, cmd=/cfg/sys/access/user/uid, cmd-arg=1
authorization request, cmd=cfgtree, cmd-arg=/cfg/sys/access/user/
uid/ena
accounting request, cmd=/cfg/sys/access/user/uid/ena
authorization request, cmd=cfgtree, cmd-arg=/cfg/access/user/uid/
name
accounting request, cmd=/cfg/sys/access/user/uid/name, cmd-arg=bill

authorization request, cmd=apply
accounting request, cmd=apply
```

The following rules apply to TACACS+ command authorization and logging:

- Only commands from a Console, Telnet, or SSH connection are sent for authorization and logging. BBI, or file-copy commands (for example, TFTP or sync) are not sent.
- Only leaf-level commands are sent for authorization and logging.
  For example, `/cfg` is not sent, but `/cfg/sys/access/user/uid` is sent.
- The full path of each command is sent for authorization and logging.
  For example, `/cfg/sys/tacacs/cauth`.
- Command arguments are not sent for authorization. For `/cauth ena`, only `/cauth` is authorized. The command and its first argument are logged, if issued on the same line.
- Only executed commands are logged.
- Invalid commands are checked by Alteon OS, and are not sent for authorization or logging.
- Authorization is performed on each leaf-level command separately. If the user issues multiple commands at once, each command is sent separately as a full path.
- Only the following global commands are sent for authorization and logging:
  `apply`
  `diff`
  `ping`
  `revert`
  `save`
  `telnet`
  `traceroute`

Configuring TACACS+ Authentication

1. **Turn TACACS+ authentication on, then configure the Primary and Secondary TACACS+ servers.**

```
>> Main# /cfg/sys/tacacs+                          (Select the TACACS+ Server menu)
>> TACACS+ Server# on                              (Turn TACACS+ on)
Current status: OFF
New status:     ON
>> TACACS+ Server# prisrv 10.10.1.1                (Enter primary server IP)
Current primary TACACS+ server:     0.0.0.0
New pending primary TACACS+ server: 10.10.1.1
>> TACACS+ Server# secsrv 10.10.1.2                (Enter secondary server IP)
Current secondary TACACS+ server:     0.0.0.0
New pending secondary TACACS+ server: 10.10.1.2
```

2. **Configure the TACACS+ secret and second secret.**

```
>> TACACS+ Server# secret
Enter new TACACS+ secret: <1-32 character secret>
>> TACACS+ Server# secret2
Enter new TACACS+ second secret: <1-32 character secret>
```

CAUTION—If you configure the TACACS+ secret using any method other than a direct console connection or through a secure management module connection, the secret may be transmitted over the network as clear text.

3. **If desired, you may change the default TCP port number used to listen to TACACS+.**

   The well-known port for TACACS+ is 49.

```
>> TACACS+ Server# port
Current TACACS+ port: 49
Enter new TACACS+ port [1-65000]: <port number>
```

4. **Configure the number retry attempts and the timeout period.**

```
>> TACACS+ Server# retries
Current TACACS+ server retries: 3
Enter new TACACS+ server retries [1-3]:    < server retries>
>> TACACS+ Server# time
Current TACACS+ server timeout: 5
Enter new TACACS+ server timeout [4-15]: 10(Enter the timeout period in minutes)
```

5. **Apply and save the configuration.**

Secure Shell and Secure Copy

Secure Shell (SSH) and Secure Copy (SCP) use secure tunnels to encrypt and secure messages between a remote administrator and the Port Aggregator. Telnet does not provide this level of security. The Telnet method of managing a Port Aggregator does not provide a secure connection.

SSH is a protocol that enables remote administrators to log securely into the Port Aggregator over a network to execute management commands.

SCP is typically used to copy files securely from one machine to another. SCP uses SSH for encryption of data on the network. SCP is used to download and upload the Port Aggregator configuration via secure channels.

The benefits of using SSH and SCP are listed below:

- Authentication of remote administrators
- Identifying the administrator using Name/Password
- Authorization of remote administrators
- Determining the permitted actions and customizing service for individual administrators
- Encryption of management messages
- Encrypting messages between the remote administrator and the Port Aggregator
- Secure copy support

The Alteon OS implementation of SSH supports both versions 1.5 and 2.0. and supports SSH clients version 1.5—2.x. The following SSH clients have been tested:

- SSH 1.2.23 and SSH 1.2.27 for Linux (freeware)
- SecureCRT 3.0.2 and SecureCRT 3.0.3 for Windows NT (Van Dyke Technologies, Inc.)
- F-Secure SSH 1.1 for Windows (Data Fellows)
- Putty SSH
- Cygwin OpenSSH
- Mac X OpenSSH
- Solaris 8 OpenSSH
- AxeSSH SSHPro
- SSH Communications Vandyke SSH A
- F-Secure

Configuring SSH/SCP features

Before you can use SSH commands, use the following commands to turn on SSH/SCP. SSH and SCP are disabled by default.

To enable or disable the SSH feature:

Begin a Telnet session from the management module and enter the following commands:

```
>> # /cfg/sys/sshd/on                    (Turn SSH on)
Current status: OFF
New status: ON

>> # /cfg/sys/sshd/off                   (Turn SSH off)
Current status: ON
New status: OFF
```

To enable or disable SCP apply and save:

Enter the following commands from the CLI to enable the SCP `putcfg_apply` and `putcfg_apply_save` commands:

```
>> # /cfg/sys/sshd/ena                   (Enable SCP apply and save)
SSHD# apply                             (Apply the changes to start generating RSA
                                         host and server keys)
RSA host key generation starts
.........................................................
.........................................................
RSA host key generation completes (lasts 212549 ms)
RSA host key is being saved to Flash ROM, please don't reboot
the box immediately.
RSA server key generation starts
.........................................................
RSA server key generation completes (lasts 75503 ms)
RSA server key is being saved to Flash ROM, please don't reboot
the box immediately.
-----------------------------------------------------------------
Apply complete; don't forget to "save" updated configuration.

>> # /cfg/sys/sshd/dis                   (Disable SSH/SCP apply and save)
```

Configuring the SCP Administrator Password

To configure the `scpadm` (SCP Administrator) password, first connect to the Port Aggregator via the management module. For security reasons, the scpadm password may only be configured when connected through the management module.

To configure the password, enter the following command via the CLI. At factory default settings, the current SCP administrator password is `admin`.

```
>> /cfg/sys/sshd/scpadm
Changing SCP-only Administrator password; validation required...
Enter current administrator password: <password>
Enter new SCP-only administrator password: <new password>
Re-enter new SCP-only administrator password: <new password>
New SCP-only administrator password accepted.
```

Using SSH and SCP Client Commands

This section shows the format for using some client commands. The examples below use 205.178.15.157 as the IP address of a sample Port Aggregator.

To log in to the Port Aggregator:

Syntax:

```
ssh <Port Aggregator IP address> or ssh -l <login-name> <Port Aggregator IP address>
```

Example**:**

```
>> # ssh 205.178.15.157
>> # ssh -l <login-name> 205.178.15.157        (Login to the Port Aggregator)
```

To download the Port Aggregator configuration using SCP:

Syntax**:**

```
scp <Port Aggregator IP address>:getcfg <local filename>
```

Example:

```
>> # scp 205.178.15.157:getcfg ad4.cfg
```

To upload the configuration to the Port Aggregator:

Syntax:

```
scp <local filename> <Port Aggregator IP address>:putcfg
```

Example:

```
>> # scp ad4.cfg 205.178.15.157:putcfg
```

To apply and save the configuration

The `apply` and `save` commands are still needed after the last command (`scp ad4.cfg 205.178.15.157:putcfg`). Or, instead, you can use the following commands:

```
>> # scp ad4.cfg 205.178.15.157:putcfg_apply
>> # scp ad4.cfg 205.178.15.157:putcfg_apply_save
```

- The `diff` command is automatically executed at the end of `putcfg` to notify the remote client of the difference between the new and the current configurations.
- `putcfg_apply` runs the `apply command` after the `putcfg` is done.
- `putcfg_apply_save` saves the new configuration to the flash after `putcfg_apply` is done.
- The `putcfg_apply` and `putcfg_apply_save` commands are provided because extra `apply` and `save` commands are usually required after a `putcfg`; however, an SCP session is not in an interactive mode at all.

SSH and SCP Encryption of Management Messages

The following encryption and authentication methods are supported for SSH and SCP:

Server Host Authentication:	Client RSA authenticates the Port Aggregator at the beginning of every connection
Key Exchange:	RSA
Encryption:	3DES-CBC, DES
User Authentication:	Local password authentication, RADIUS, `SecurID` (via RADIUS, TACACS+, for SSH only—does not apply to SCP)

Generating RSA Host and Server Keys for SSH Access

To support the SSH server feature, two sets of RSA keys (host and server keys) are required. The host key is 1024 bits and is used to identify the Port Aggregator. The server key is 768 bits and is used to make it impossible to decipher a captured session by breaking into the Port Aggregator at a later time.

When the SSH server is first enabled and applied, the Port Aggregator automatically generates the RSA host and server keys and is stored in the FLASH memory.

NOTE – To configure RSA host and server keys, first connect to the Port Aggregator through the console port or the management module (commands are not available via external Telnet connection), and enter the following commands to generate them manually.

```
>> # /cfg/sys/sshd/hkeygen        (Generates the host key)
>> # /cfg/sys/sshd/skeygen        (Generates the server key)
```

These two commands take effect immediately without the need of an `apply` command.

When the Port Aggregator reboots, it retrieves the host and server keys from the FLASH memory. If these two keys are not available in the flash and if the SSH server feature is enabled, the Port Aggregator automatically generates them during the system reboot. This process may take several minutes to complete.

The Port Aggregator can also automatically regenerate the RSA server key. To set the interval of RSA server key autogeneration, use this command:

```
>> # /cfg/sys/sshd/intrval <number of hours (0-24)>
```

A value of 0 denotes that RSA server key autogeneration is disabled. When greater than 0, the Port Aggregator autogenerates the RSA server key every specified interval; however, RSA server key generation is skipped if the Port Aggregator is busy doing other key or cipher generation when the timer expires.

NOTE – The Port Aggregator performs only one session of key/cipher generation at a time. Thus, an SSH/SCP client will not be able to log in if the Port Aggregator is performing key generation at that time, or if another client has logged in immediately prior. Also, key generation will fail if an SSH/SCP client is logging in at that time.

SSH/SCP Integration with Radius Authentication

SSH/SCP is integrated with RADIUS authentication. After the RADIUS server is enabled on the Port Aggregator, all subsequent SSH authentication requests will be redirected to the specified RADIUS servers for authentication. The redirection is transparent to the SSH clients.

SSH/SCP Integration with TACACS+ Authentication

SSH/SCP is integrated with TACACS+ authentication. After the TACACS+ server is enabled on the Port Aggregator, all subsequent SSH authentication requests will be redirected to the specified TACACS+ servers for authentication. The redirection is transparent to the SSH clients.

SecurID Support

SSH/SCP can also work with SecurID, a token card-based authentication method. The use of SecurID requires the interactive mode during login, which is not provided by the SSH connection.

NOTE – There is no Browser-Based Interface (BBI) support for SecurID because the SecurID server, ACE, is a one-time password authentication and requires an interactive session.

Using SecurID with SSH

Using SecurID with SSH involves the following tasks.

- To log in using SSH, use a special user name, "ace," to bypass the SSH authentication.
- After an SSH connection is established, you are prompted to enter the user name and password (the SecurID authentication is being performed now).
- Provide your user name and the token in your SecurID card as a regular Telnet user.

Using SecurID with SCP

Using SecurID with SCP can be accomplished in two ways:

- Using a RADIUS server to store an administrator password.

  You can configure a regular administrator with a fixed password in the RADIUS server if it can be supported. A regular administrator with a fixed password in the RADIUS server can perform both SSH and SCP with no additional authentication required.

- Using an SCP-only administrator password.

  Use the command, `/cfg/sys/sshd/scpadm` to bypass the checking of SecurID.

An SCP-only administrator's password is typically used when SecurID is used. For example, it can be used in an automation program (in which the tokens of SecurID are not available) to back up (download) the Port Aggregator configurations each day.

NOTE – The SCP-only administrator's password must be different from the regular administrator's password. If the two passwords are the same, the administrator using that password will not be allowed to log in as an SSH user because the Port Aggregator will recognize him as the SCP-only administrator. The Port Aggregator allows only the administrator access to SCP commands.

End User Access Control

The administrator can define user accounts that permit end users to access the Port Aggregator using the CLI commands. Once end-user accounts are configured and enabled, the Port Aggregator requires user name/password authentication.

Considerations for Configuring End User Accounts

- A maximum of 10 user IDs are supported on the Port Aggregator.
- The Port Aggregator does not automatically validate configurations.
- Port Aggregator software supports end user support for Console and Telnet access to the Port Aggregator. As a result, only very limited access is granted to the primary administrator under the BBI/SSH1 mode of access.
- If RADIUS authentication is used, the user password on the Radius server overrides the user password on the Port Aggregator. Also note that the password change command only modifies the Port Aggregator password and has no effect on the user password on the Radius server. RADIUS authentication and user password cannot be used concurrently to access the Port Aggregator.
- Passwords can be up to 128 characters in length for TACACS, RADIUS, Telnet, SSH, Console, and Web access.

User Access Control menu commands

Enter the following command to displays the end user access control menu.

```
>> # /cfg/sys/access/user
```

The following command allows you to configure one of the 10 user IDs.

```
/cfg/sys/access/user/uid 1
```

The following command sequence allows you to define a user name and password.

```
>> User ID 1 # name bill                    (Assign name "bill" to user ID 1)
Current user name:
New user name:     bill
```

The following command sequence allows you to change the user's password.

```
>> User ID 1 # passwd
Changing user password; validation required:
Enter current admin password: <current administrator password>
Enter new user password: <new user password>
Re-enter new user password: <new user password>
New user password accepted.
```

Defining a User's Access Level

By default, the end user is assigned to the user access level (also known as Class of Service, or CoS). CoS for all user accounts have global access to all resources except for User CoS, which has access only to view resources that the user owns.

To change the user's access level, enter the `cos` command, and select one of the available options:

```
>> User ID 1 # cos <user|oper|admin>
```

Validating a User's Configuration

```
User ID 2 # cur
     name jane     , dis, cos user     , password valid, offline
```

Listing Current Users

The `cur` command displays defined user accounts and whether or not each user is currently logged into the Port Aggregator.

```
# /cfg/sys/access/user/cur

Usernames:
  user      - Enabled
  oper      - Disabled
  admin     - Always Enabled

Current User ID table:
  1: name bill     , ena, cos user, password valid, online

  2: name jane     , ena, cos user, password valid, online
```

Enabling or Disabling a User

An end user account must be enabled before the Port Aggregator recognizes and permits login under the account. Once enabled, the Port Aggregator requires any user to enter both user name and password.

```
>> # /cfg/sys/access/user/uid <#>/ena
>> # /cfg/sys/access/user/uid <#>/dis
```

Logging into an End User Account

Once an end user account is configured and enabled, the user can login using the username/password combination. The level of access is determined by the CoS established for the end-user account.

CHAPTER 3

Ports, VLANs, and Trunking

This chapter describes the port, VLAN, and Trunking configuration of the Port Aggregator. Most of the configuration is static, and cannot be changed.

- " Port Aggregator VLANs"
- " Port Aggregator Trunking"

Port Aggregator VLANs

Virtual LANs (VLANs) are commonly used to split up groups of network users into manageable broadcast domains, to create logical segmentation of workgroups, and to enforce security policies among logical segments.

The Port Aggregator has two static VLANS:

- VLAN 1 is used for data traffic, and contains both external ports and internal server-blade ports.
- VLAN 4095 is used by the management network, which includes the management ports and (by default) the internal blade ports. This configuration allows Serial over LAN (SoL) management, a feature available on certain server blades.

PVID Numbers

Each port in the Port Aggregator has a default VLAN number, known as the *PVID*. The PVID is used to identify the default VLAN number used each port. The PVID for all non-management ports is statically configured as 1. The PVID for management ports is statically configured as 4095.

802.1q VLAN Tagging

802.1q VLAN *tagging* provides standards-based VLAN support for Ethernet systems. This standard permits multiple VLANs to be transmitted over a single Ethernet connection.

Tagging places the VLAN identifier in the frame header of a packet, allowing each port to belong to multiple VLANs. When you add a port to multiple VLANs, you must also enable tagging on that port.

NOTE – The Port Aggregator does not permit configuration of tagged VLANs. Data traffic is transmitted only over the static, untagged VLAN 1.

The static VLAN configuration settings for Port Aggregators have all ports set as untagged members of VLAN 1 with all ports configured as PVID = 1. In this configuration, all incoming packets are assigned to VLAN 1 by the default port VLAN identifier (PVID =1).

Port Aggregator Trunking

Trunk groups provide super-bandwidth, multi-link connections between Port Aggregators or other trunk-capable devices. A trunk group is a group of ports that act together, combining their bandwidth to create a single, larger virtual link.

The Port Aggregator trunk group is a static link aggregation group that is compatible with CisCo's EtherChannel technology. This section describes the Port Aggregator trunk group.

The Port Aggregator is statically configured to place all external ports (EXT1-EXT6) in a single trunk group.

NOTE – Because all external ports belong to the trunk group, individual external ports cannot be used as a regular 802.3 link. Do not plug a workstation directly into one of the Port Aggregator's external ports, unless that is the only device plugged into the ports.

When using port trunk groups between the Port Aggregator and a switch, as shown in Figure 3-1, you can create a virtual link, operating at up to 6 Gig per second, depending on how many physical ports are combined.

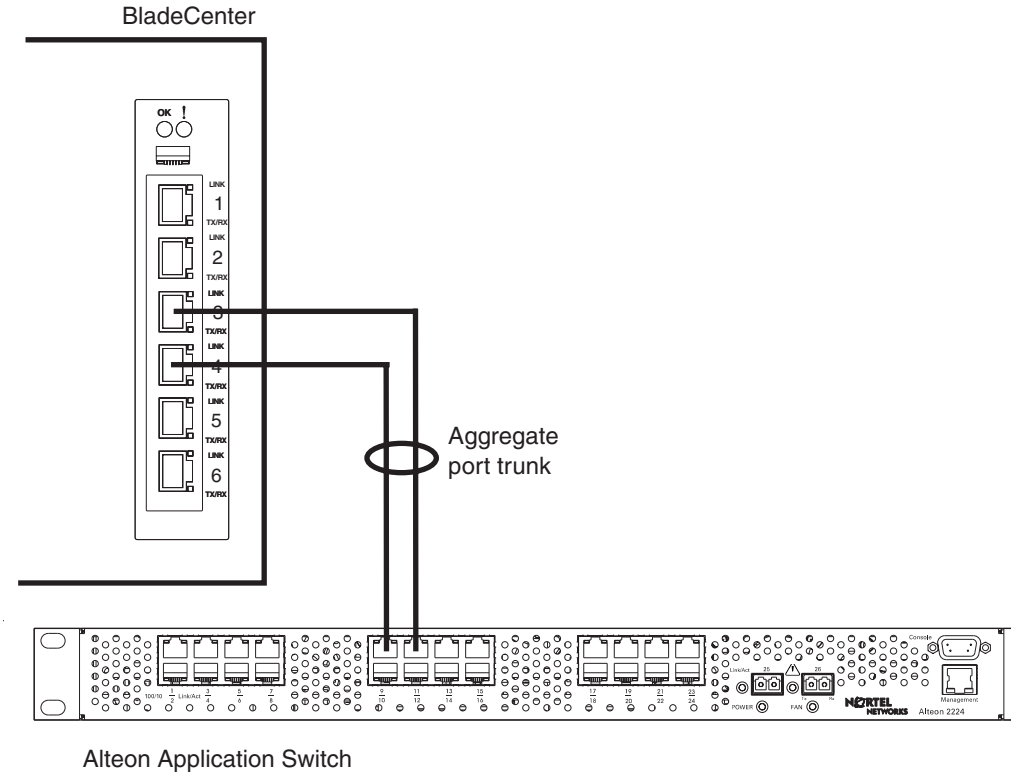


Figure 3-1 Port Trunk Group

The trunk group is also useful for connecting a Port Aggregator to third-party devices that support link aggregation, such as Cisco routers and switches with EtherChannel technology (*not* ISL trunking technology) and Sun's Quad Fast Ethernet Adapter. Nortel Networks trunk group technology is compatible with these devices when they are configured manually.

Statistical Load Distribution

Network traffic is statistically distributed between ports in the trunk group. The Port Aggregator uses the source and destination IP address information present in each transmitted IP frame to determine load distribution. If the frame is not an IP frame, then Layer 2 MAC addresses are used.

Each packet's particular combination of source and destination addresses results in selecting one line in the trunk group for data transmission. If there are enough devices feeding the trunk lines, then traffic distribution becomes relatively even.

Built-In Fault Tolerance

Since the trunk group is comprised of multiple physical links, the trunk group is inherently fault tolerant. As long as one connection is available, the trunk remains active.

Statistical load balancing is maintained whenever a port in a trunk group is lost or returned to service.

Trunk group configuration rules

The trunking feature operates according to specific configuration rules. When creating trunks, consider the following rules that determine how the a trunk group reacts in any network topology:

- All trunks must originate from one device, and lead to one destination device.
- Trunking from third-party devices must comply with Cisco® EtherChannel® technology.
- To guarantee proper trunking behavior, configure all ports in the trunk for full-duplex mode (`cfg/port x/gig/mode full`).
- Best performance is achieved when all ports in the trunk group are configured for the same speed.

Layer 2 Failover

The primary application for Layer 2 Failover is to support Network Adapter Teaming. With Network Adapter Teaming, the NICs on each server all share the same IP address, and are configured into a team. One NIC is the primary link, and the other is a standby link. For more details, refer to "Configuring Teaming" in the Broadcom NetXtreme™ Gigabit Ethernet Adapter User Guide (http://www.ibm.com/pc/support/site.wss/MIGR-43152.html).

Layer 2 Failover is statically enabled on the Port Aggregator. If some (or all) of the links fail in the failover trigger, the Port Aggregator disables all internal ports. When the internal ports are disabled, it causes the NIC team on the affected server blades to failover from the primary to the backup NIC. This process is called a failover event.

When the appropriate number of links return to service, the Port Aggregator enables the internal ports. This causes the NIC team on the affected server blades to fail back to the primary Port Aggregator (unless Auto-Fallback is disabled on the NIC team). The backup processes traffic until the primary's internal links come up, which takes up to five seconds.

Setting the Failover Limit

The failover limit lets you specify the minimum number of operational links required within the failover trigger before the trigger initiates a failover event. For example, if the limit is four (`/cfg/failover/limit 4`), a failover event occurs when the number of operational links in the trigger is four or fewer. When you set the limit to zero, the Port Aggregator triggers a failover event only when no links in the trigger are operational.

L2 Failover Configuration

Figure 3-2 is a simple example of Layer 2 Failover. One Port Aggregator is the primary, and the other is used as a backup. In this example, all external ports on the primary Port Aggregator belong to a single trunk group, with Layer 2 Failover enabled, and Failover Limit set to 2. If two or fewer links in trigger 1 remain active, the Port Aggregator temporarily disables all internal server-blade ports. This action causes a failover event on Server 1 and Server 2.

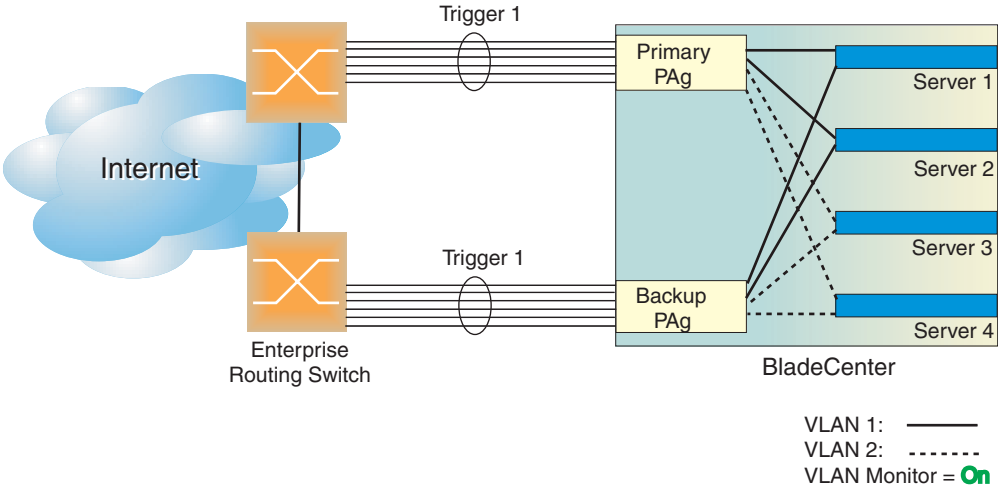


Figure 3-2 Basic Layer 2 Trunk Failover

CHAPTER 4
Command Reference

Your Port Aggregator is ready to perform basic switching functions right out of the box. Some of the more advanced features, however, require some administrative configuration before they can be used effectively.

The command line interface is the most direct method for collecting information and performing configuration tasks. Using a basic terminal, you are presented with a hierarchy of menus that enable you to view information and statistics about the Port Aggregator, and to perform any necessary configuration.

The various commands have been logically grouped into a series of menus and sub-menus. Each menu displays a list of commands and sub-menus that are available, along with a summary of each command. Below each menu is a prompt where you can enter appropriate commands.

You can view configuration information for the Port Aggregator in both the user and administrator command modes. This chapter discusses how to use the command line interface for the Port Aggregator.

This chapter provides an overview of menu commands. For details on the individual commands, refer to the *Layer 2/3 GbE Switch Module Command Reference*.

CLI Menus

The Main Menu appears after a successful connection and login. The following table shows the Main Menu for the administrator login. Some features are not available under the user login.

```
[Main Menu]
      info    - Information Menu
      stats   - Statistics Menu
      cfg     - Configuration Menu
      oper    - Operations Command Menu
      boot    - Boot Options Menu
      maint   - Maintenance Menu
      diff    - Show pending config changes  [global command]
      apply   - Apply pending config changes [global command]
      save    - Save updated config to FLASH [global command]
      revert  - Revert pending or applied changes [global command]
      exit    - Exit  [global command, always available]
```

Menu Summary

- **Information Menu**

  The Information Menu (`/info`) allows you to display information about the current status of the Port Aggregator.

```
[Information Menu]
     sys       - System Information Menu
     l2        - Layer 2 Information Menu
     l3        - Layer 3 Information Menu
     link      - Show link status
     port      - Show port information
     geaport   - Show system port and gea port mapping
     sfp       - Show Fiber External Port SFP status
     dump      - Dump all information
```

- **Statistics Menu**

  The statistics menu (`/stats`) allows you to view performance statistics for the Port Aggregator.

```
[Statistics Menu]
     port      - Port Stats Menu
     l2        - Layer 2 Stats Menu
     l3        - Layer 3 Stats Menu
     mp        - MP-specific Stats Menu
     ntp       - Show NTP Stats
     dump      - Dump all stats
```

- **Configuration Menu**

  The Configuration Menu (`/cfg`) allows an administrator to configure Port Aggregator parameters. Configuration changes are not active until explicitly applied. You can save changes to non-volatile memory.

```
[Configuration Menu]
     sys       - System-wide Parameter Menu
     port      - Port Menu
     failover  - Failover Menu
     dump      - Dump current configuration to script file
     ptcfg     - Backup current configuration to FTP/TFTP server
     gtcfg     - Restore current configuration from FTP/TFTP server
```

- **Operations Command Menu**

  The Operations Command menu (`/oper`) is used for making immediate and temporary changes to the configuration. For example, you can immediately disable a port (without the need to apply or save the change), with the understanding that when the Port Aggregator is reset, the port returns to its normally configured operation.

```
[Operations Menu]
     port      - Operational Port Menu
     passwd    - Change current user password
     clrlog    - Clear syslog messages
     conlog    - Enable/Disable Session Console Logging
     cfgtrk    - Track last config change made
```

- **Boot Options Menu**

  The Boot Options menu (/boot) is used for upgrading Port Aggregator software, selecting configuration blocks, and for resetting the Port Aggregator when necessary.

```
[Boot Options Menu]
        sched - Scheduled Switch Reset Menu
        image - Select software image to use on next boot
        conf  - Select config block to use on next boot
        gtimg - Download new software image via TFTP
        ptimg - Upload selected software image via TFTP
        reset - Reset switch
        cur   - Display current boot options
```

To use the Boot Options Menu, you must be logged in as the administrator. The Boot Options Menu provides options for:

- Selecting a software image to be used when the Port Aggregator is next reset
- Selecting a configuration block to be used when the Port Aggregator is next reset
- Downloading or uploading a new software image to the Port Aggregator via TFTP

- **Maintenance Menu**

The Maintenance menu (/maint) allows you to generate a dump of the critical state information, and to clear entries in the forwarding database and the ARP and routing tables.

```
[Maintenance Menu]
     sys      - System Maintenance Menu
     fdb      - Forwarding Database Manipulation Menu
     debug    - Debugging Menu
     arp      - ARP Cache Manipulation Menu
     igmp     - IGMP Multicast Group Menu
     uudmp    - Uuencode FLASH dump
     ptdmp    - Upload FLASH dump via FTP/TFTP
     cldmp    - Clear FLASH dump
     tsdmp    - Tech support dump
```

Viewing, Applying, and Saving Changes

As you use the configuration menus to set parameters, the changes you make do not take effect immediately. All changes are considered "pending" until you explicitly apply them. Also, any changes are lost the next time the Port Aggregator boots unless the changes are explicitly saved.

NOTE – Some operations can override the settings in the Configuration menu. Therefore, settings you view in the Configuration menu (for example, port status) might differ from run-time information that you view in the Information menu or on the management module. The Information menu displays current run-time information of parameters.

While configuration changes are in the pending state, you can do the following:

- View the pending changes
- Apply the pending changes
- Save the changes to flash memory

Viewing Pending Changes

You can view all pending configuration changes by entering **`diff`** at the menu prompt.

NOTE – The `diff` command is a global command. Therefore, you can enter **`diff`** at any prompt in the CLI.

Applying Pending Changes

To make your configuration changes active, you must apply them. To apply configuration changes, enter **`apply`** at any prompt in the CLI.

```
# apply
```

NOTE – The `apply` command is a global command. Therefore, you can enter **`apply`** at any prompt in the administrative interface.

Saving the Configuration

In addition to applying the configuration changes, you can save them to flash memory on the Port Aggregator.

NOTE – If you do not save the changes, they will be lost the next time the system is rebooted.

To save the new configuration, enter the following command at any CLI prompt:

```
# save
```

When you save configuration changes, the changes are saved to the *active* configuration block. The configuration being replaced by the save is first copied to the *backup* configuration block. If you do not want the previous configuration block copied to the backup configuration block, enter the following instead:

```
# save n
```

You can decide which configuration you want to run the next time you reset the Port Aggregator. Your options include:

- The active configuration block
- The backup configuration block
- Factory default configuration

You can view all pending configuration changes that have been applied but not saved to flash memory using the `diff flash` command. It is a global command that can be executed from any menu.

Updating the Software Image

The software image is the executable code running on the Port Aggregator. A version of the image ships with the Port Aggregator, and comes pre-installed. As new versions of the image are released, you can upgrade the software running on the Port Aggregator. To get the latest version of software available, go to:

`http://www.ibm.com/pc/support`

Click on software updates. Use the `/boot/cur` command to determine the current software version.

Upgrading the software image on the Port Aggregator requires the following:

- Loading the new image onto a FTP or TFTP server on your network
- Transferring the new image from the FTP or TFTP server to the Port Aggregator
- Selecting the new software image to be loaded into the Port Aggregator the next time it is reset

Loading New Software

The Port Aggregator can store up to two different software images, called `image1` and `image2`, as well as boot software, called `boot`. When you load new software, you must specify where it should be placed: either into `image1`, `image2`, or `boot`.

For example, if your active image is currently loaded into `image1`, you probably want to load the new image software into `image2`. This lets you test the new software and reload the original active image (stored in `image1`), if needed.

NOTE – The switch image type is checked during download onto the Port Aggregator, to validate that the image is compatible. If the image is incompatible, an error message is displayed.

Using the CLI

To load a new software image to the Port Aggregator, you need the following:

- The image or boot software loaded on a TFTP server on your network
- The IP address of the TFTP server
- The name of the new software image or boot file

When the above requirements are met, use the following procedure to download the new software to the Port Aggregator.

1. **At the `Boot Options#` prompt, enter:**

```
Boot Options# gtimg
```

2. **Enter the name of the software to be replaced:**

```
Enter name of switch software image to be replaced
 ["image1"/"image2"/"boot"]: <image>
```

3. **Enter the IP address of the FTP or TFTP server.**

```
Enter hostname or IP address of FTP/TFTP server: <IP address>
```

4. **Enter the name of the new software file on the server.**

```
Enter name of file on FTP/TFTP server: <filename>
```

The exact form of the name will vary by server. However, the file location is normally relative to the FTP or TFTP directory (usually `/tftpboot`).

5. **Enter your username for the server, if applicable.**

```
Enter username for FTP server or hit return for TFTP server:
<username> or <Enter>
```

6. **The system prompts you to confirm your request.**

You should next select a software image to run, as described below.

Selecting a Software Image to Run

You can select which software image (`image1` or `image2`) you want to run after the next reboot.

1. **At the `Boot Options#` prompt, enter:**

```
Boot Options# image
```

2. **Enter the name of the image you want the Port Aggregator to use upon the next boot.**

The system informs you of which image is currently set to be loaded at the next reset, and prompts you to enter a new choice:

```
Currently set to use switch software "image1" on next reset.
Specify new image to use on next reset ["image1"/"image2"]:
```

Uploading a Software Image from the Port Aggregator

You can upload a software image from the Port Aggregator to a FTP or TFTP server.

1. **At the `Boot Options#` prompt, enter:**

```
Boot Options# ptimg
```

2. **The system prompts you for information. Enter the desired image:**

```
Enter name of switch software image to be uploaded
["image1"|"image2"|"boot"]: <image> <hostname or server-IP-addr> <server-file-
name>
```

3. **Enter the IP address of the FTP or TFTP server:**

```
Enter hostname or IP address of FTP/TFTP server: <IP address>
```

4. **Enter the name of the file into which the image will be uploaded on the FTP or TFTP server:**

```
Enter name of file on FTP/TFTP server: <filename>
```

5. **The system then requests confirmation of what you have entered. To have the file uploaded, enter Y.**

```
image2 currently contains Software Version 90.0.1
Upload will transfer image2 (1889411 bytes) to file "test"
 on TFTP server 192.1.1.1.
Confirm upload operation [y/n]: y
```

Selecting a Configuration Block

When you make configuration changes to the Port Aggregator, you must save the changes so that they are retained beyond the next time the Port Aggregator is reset. When you perform the `save` command, your new configuration changes are placed in the *active* configuration block. The previous configuration is copied into the *backup* configuration block.

There is also a *factory* configuration block. This holds the default configuration set by the factory when your Port Aggregator was manufactured. Under certain circumstances, it may be desirable to reset the configuration to the default.

Use the following procedure to set which configuration block you want the Port Aggregator to load the next time it is reset:

1. **At the `Boot Options#` prompt, enter:**

```
Boot Options# conf
```

2. **Enter the name of the configuration block you want the Port Aggregator to use:**

The system informs you of which configuration block is currently set to be loaded at the next reset, and prompts you to enter a new choice:

```
Currently set to use active configuration block on next reset.
Specify new block to use ["active"/"backup"/"factory"]:
```

Resetting the Port Aggregator

You can reset the Port Aggregator to make your software image file and configuration block changes occur.

NOTE – Resetting the Port Aggregator causes the date and time to revert to default values. Use `/cfg/sys/date` and `/cfg/sys/time` to reenter the current date and time, unless you have configured an NTP server.

To reset the Port Aggregator, at the `Boot Options#` prompt, enter:

```
>> Boot Options# reset
```

You are prompted to confirm your request.

CHAPTER 5

Using the BBI

This chapter briefly describes the software features and requirements for the Browser-Based Interface (BBI), and explains how to access the BBI.

NOTE – You can perform most configuration and monitoring tasks through the BBI. For a comprehensive set of commands, use the command-line interface.

Requirements

- Port Aggregator
- Installed Alteon OS software
- PC or workstation with network access to the Port Aggregator's management interface as configured using the management module
- Frame-capable Web-browser software, such as the following:
  - Netscape Navigator 4.7x or higher
  - Internet Explorer 6.0x or higher
- JavaScript enabled in your Web browser

Port Aggregator Set Up

Before you can access the BBI, minimal configuration is required on the Port Aggregator.

Enabling/Disabling BBI Access

By default, BBI access is enabled. If you need to disable or re-enable access, use the following command from the command-line interface:

```
>> Main# /cfg/sys/access/http <disable|enable (or just d|e)>
```

For more information on the accessing and configuring the Port Aggregator through the command-line interface, see your Port Aggregator *Installation Guide*.

Web Browser Set Up

Most modern Web browsers work with frames and JavaScript by default, and require no additional set up. However, you should check your Web browser's features and configuration to make sure frames and JavaScript are enabled.

NOTE – JavaScript is not the same as Java. Please make sure that JavaScript is enabled in your Web browser.

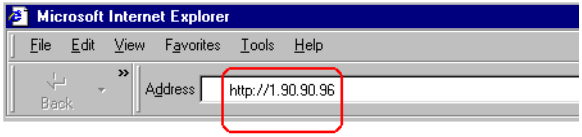
Starting the BBI

When the Port Aggregator and browser set up is done, follow these steps to launch the BBI:

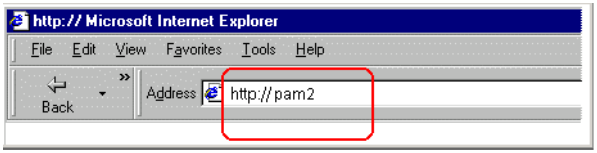
1. **Start your Web browser.**

2. **Enter the Port Aggregator IP interface address in the Web browser's URL field.**

   For example, consider an IP interface with a network IP address of 1.90.90.96. Using Netscape Navigator, you could enter the following:

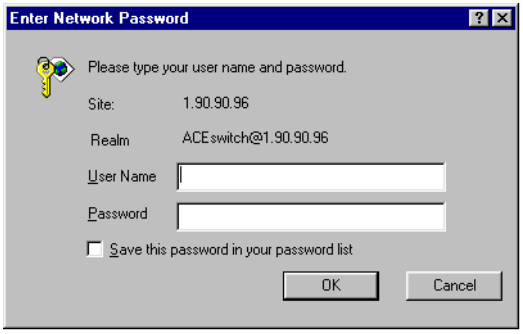


   If the IP interface's address has a name on your local domain name server, you could enter the name instead. For example, with Internet Explorer, you could enter the following:



3. **Log in to the Port Aggregator.**

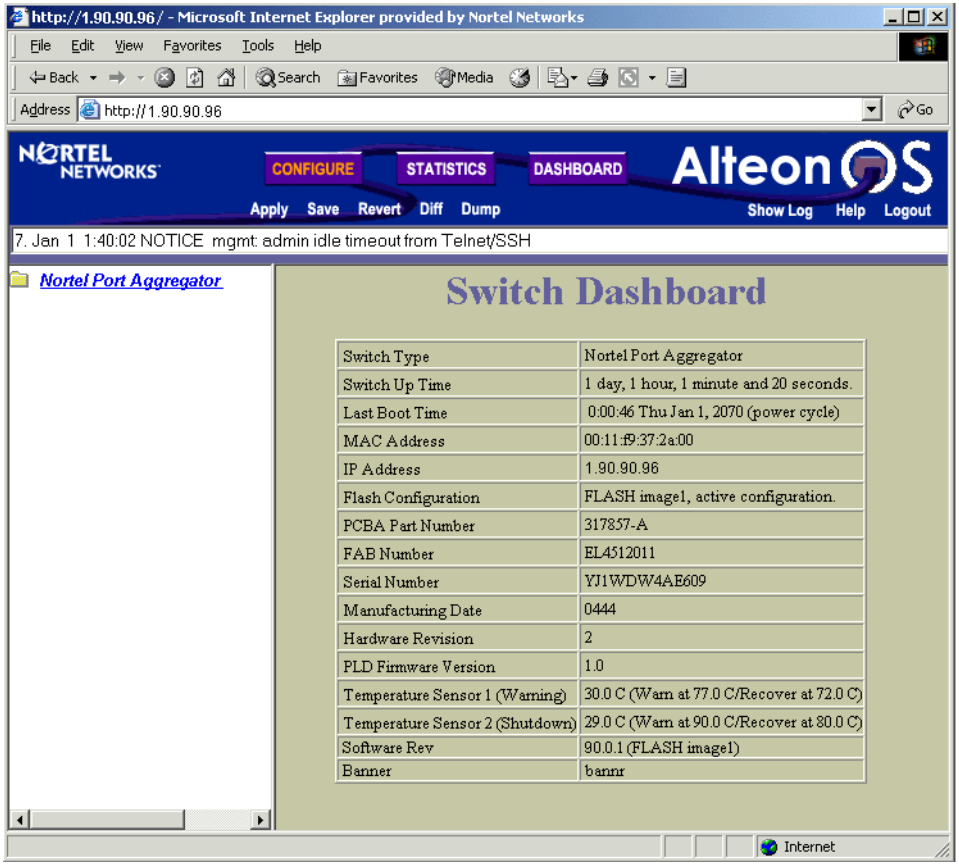
   If the Port Aggregator and browser are properly configured, you will be asked to enter a password:



   Enter the account name and password for the Port Aggregator's administrator or user account. The default account name is *admin*, and the default password is *admin*. For more password information, see your *Command Reference* manual.

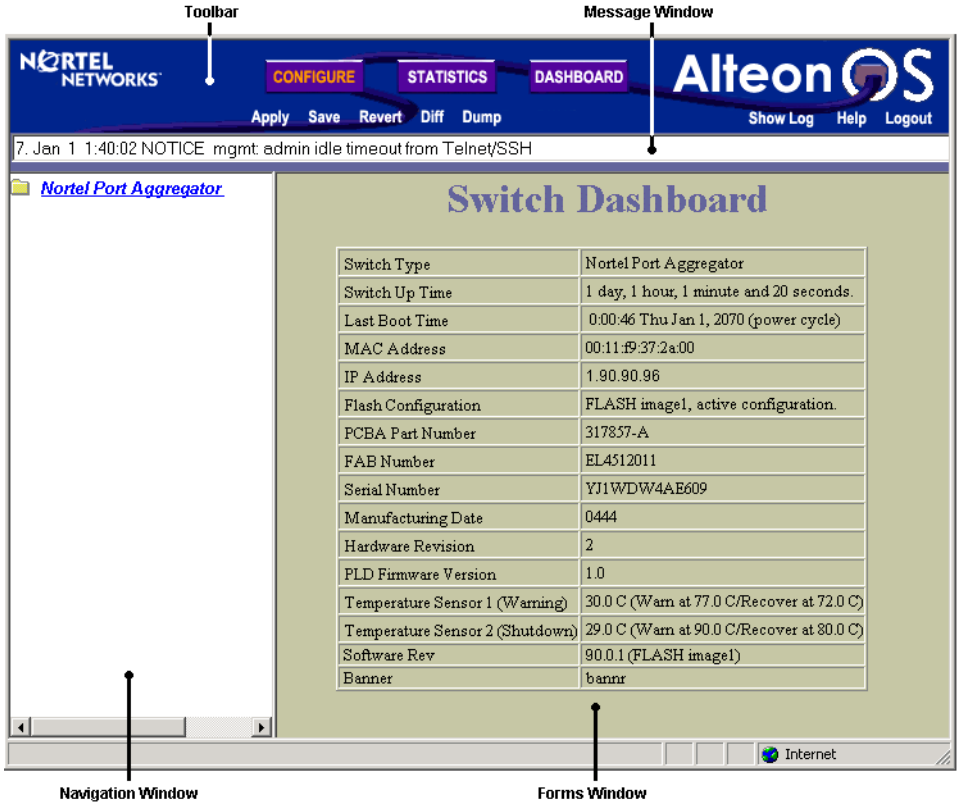
4. **Allow the BBI Dashboard page to load.**

When the proper account name and password combination is entered, the BBI Dashboard page is displayed in your browser's viewing area:



NOTE – There may be a slight delay while the Dashboard page is being initialized. You should not stop the browser while loading is in progress. When loading is complete, a folder icon appears in the left-hand navigation window.

Once you are properly logged in, the Alteon OS Browser-Based Interface (BBI) appears in your Web browser's viewing window:



There are four main regions on the screen:

- The toolbar is used for selecting the context for your actions in the other windows.
- The navigation window is used for selecting particular items or features to act upon.
- The forms window is used for viewing or altering Port Aggregator information.
- The message window is used for displaying the 64 latest `syslog` messages and events.

Toolbar

Context Buttons

The toolbar is used for setting the context for your actions in the application. There are three context buttons:

Configure	When selected, you can access the Port Aggregator configuration forms. Configuration forms can be altered only if you are logged in using the administrator account. Select an item in the navigation window to display the desired configuration form in the forms window.
Statistics	When selected, you can view information about Port Aggregator performance. Select an item in the navigation window to display the desired statistics in the forms window.
Dashboard	This context button is selected by default when the BBI is first activated. When selected, basic information and status can be viewed in the forms window. Select an item in the navigation window to display the desired dashboard information in the forms window.

When a context icon is selected, the button will be highlighted as a reminder of the current context mode.

Commands

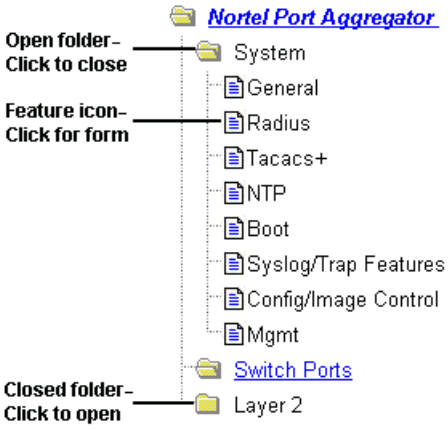
The following general commands are available on the toolbar:

Apply	Pending configuration changes do not take effect until the Apply command is selected. Once applied, all changes take effect on the Port Aggregator immediately. If you do not save the changes, however, they will be lost the next time the Port Aggregator is rebooted.
Save	Writes applied configuration changes to non-volatile flash memory on the Port Aggregator.
Help	Opens a new Web-browser window for displaying the basic online help information. Close the help browser when finished.
Show Log	Opens a new Web-browser window for displaying the 64 most recent log messages. Close the log browser when finished.
Logout	Log off the Port Aggregator and exit the BBI.
Diff	Show any pending configuration changes.
Revert	Remove pending configuration changes between **Apply** commands. Use this command to restore configuration parameters set since last **Apply** command.

Navigation Window

The navigation window is used for selecting a particular feature to act upon. Status, statistics, or configuration forms for the selected item appear in the forms window, depending on the context chosen on the toolbar.

The navigation window contains a tree of folders, sub-folders, and feature icons:



You can click on any closed folder to open it and reveal its contents. Click on any open folder to close it. Click on any feature icon to load the appropriate status, statistics, or configuration form in the forms window.

Some folders also have forms. If the name of the folders is underlined, click on the name to display the appropriate form.

Forms Window

When a feature icon is selected on the navigation window, a status, statistics, or configuration form is displayed in the forms window. The exact nature of the form depends on the current context selected on the toolbar, as well as the type of information available. Not all feature icons have forms for all contexts.

Some forms display information such as settings, status, or statistics. Others allow you to make configuration changes to Port Aggregator parameters.

Message Window

Port Aggregator log messages are generated by events such as login/logout activity, password changes, configuration changes, and reboot. The BBI records the ten most recent messages and displays each one briefly in the message window. When the tenth message has been displayed, the cycle is repeated.

To view all 64 messages at the same time, select the Show Log command on the toolbar. A new Web-browser window will be opened to display the log information. Close the window when finished.