25 Managing WAN Switching Submodules

Introduction

The OmniAccess 512 WAN Switching submodules are a family of submodules that enable the creation of WANs by providing connectivity between geographically-distanced LANs. These submodules support a variety of protocols, including Frame Relay, synchronous Point to Point Protocol (PPP), and Integrated Services Digital Network (ISDN).

The submodules extends the power and flexibility of LAN switching over greater geographic distances using either a Frame Relay network, ISDN network or leased line connection, such as T1. In a Frame Relay network configuration, the submodule provides a cost-effective link that is capable of supporting multiple virtual circuits. In a leased line configuration, the submodule provides dedicated bandwidth to a single remote site. In an ISDN line configuration, the submodule supports both inbound and outbound call circuits for interconnection to remote submodules or other devices that support standard PPP over ISDN. In addition, an ISDN configuration supports bandwidth on demand and backup of failed lines.

In and OmniAccess 512, each "submodule" WAN expansion daughtercard with a single port. Different port types provide a range of access rates from 9.6 kbps to 2 Mbps. Management, data handling, compression, and multi-protocol encapsulation are compatible with the current Frame Relay and PPP standards.

VLAN architectures are preserved and consistent on both sides of a WAN link. The submodules support Alcatel Frame Relay trunking. As a result, VLAN groups on one side of a Frame Relay link are compatible with those on the other side. In addition, the submodule is capable of both Frame Relay and PPP transparent bridging, and IP and IPX routing.

The WAN submodule supports standard RFC 1490 multiprotocol encapsulation over Frame Relay and synchronous PPP for bridging and routing interoperability with numerous other WAN networking devices. In addition, the submodule supports Alcatel Frame Relay trunking, so multiple VLAN groups on one side of a Frame Relay link can be transported across the WAN.

♦ Note ♦

The OmniAccess 512's front panel is divided into several areas labeled S1, S2, S3, etc. These areas relate to the conceptual division of the switch into several modules. (For specific information on slot designations, see Chapter 1, titled "OmniAccess 512 Switches.")

As a result, WAN uplink ports, when they exist, will always be in slot 3 in an OmniAccess 512 switch.

Supported Physical Interfaces

The OmniAccess family of products support numerous physical interface (port) types. The port types available with the submodule family are described below.

Universal Serial Port

The Universal Serial Port (USP) provides connectivity to legacy synchronous serial port devices. With the addition of an adapter cable, it supports RS-232, RS-449, RS-530, V.35 and X.21 Data Terminal Equipment (DTE) and Data Communication Equipment (DCE) interfaces at speeds up to 2.048 Mbps. USPs support access via Frame Relay or synchronous PPP. The submodule automatically detects the cable type connected and will configure the correct physical interface to use.

ISDN Basic Rate Interface Port

The ISDN Basic Rate Interface (BRI) port supports either a U or S/T interface (jumper selectable) for interfacing to public or private ISDN networks. Synchronous PPP is supported on the two bearer (B) channels. Multiple ISDN switch protocol variations are supported on the delta (D) channel (used for signaling). Each B channel runs at 64 kbps, and the D channel runs at 16 kbps.

Fractional T1 Port

The fractional T1 port connects directly to North American and Japanese circuit switch digital data public or private networks without requiring an external Digital Service Unit/Channel Service Unit (DSU/CSU).

Note

For public digital networks, check with your service provider. They may allow only connections that use a configured short-haul interface via a network-provided Channel Service Unit (CSU).

The port provides an integral DSU/CSU function with both short-haul (i.e,. short distance) and long-haul (i.e,. long distance) capabilities. The port allows the user to configure a range of time slots from 1 to 24 to allow for full T1 (all 24 time slots used) or a fractional T1 (less than 24 time slots) service. The fractional T1 port can support access via Frame Relay or synchronous PPP.

Fractional E1 Port

The fractional E1 port connects directly to ITU-T standard circuit switch digital data public or private networks without requiring an external DSU/CSU.

Note

For public digital networks, check with your service provider. They may allow only connections that use a configured short-haul interface via a network-provided Channel Service Unit (CSU).

The port provides an integral DSU/CSU function with both short-haul (i.e., short distance) and long-haul (i.e., long distance) capabilities. The port allows you to configure for full E1 (all 30 or 31 time slots used) or fractional E1 (1-29 time slots) service. The fractional E1 port supports access via either Frame Relay or synchronous PPP.

Supported Protocols

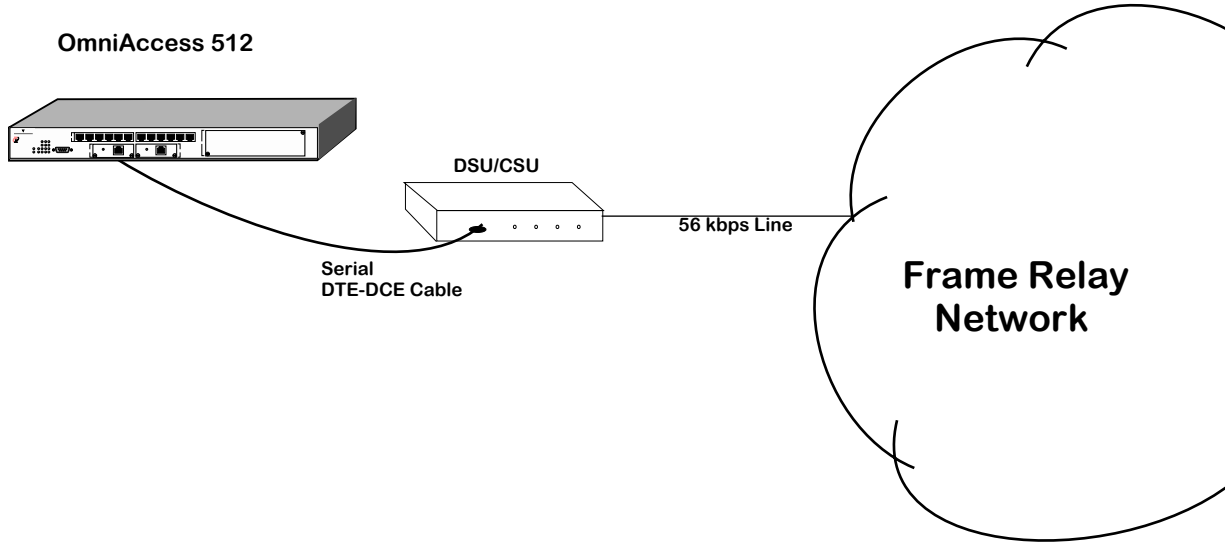
The WAN switching submodules support both Frame Relay and synchronous Point-To-Point Protocol (PPP). For details on implementing these protocols, see Chapter 26, “Managing Frame Relay,” and Chapter 20, “Point-to-Point Protocol.” For ISDN signalling protocols, the submodules support D-channel signalling (see Chapter 29, “Managing ISDN Ports”).

Application Examples

This section provides several examples of WAN networking configurations using WAN switching submodules.

Frame Relay Using Serial Ports

In a typical configuration, the serial port is a submodule in an OmniAccess 512. Because it is compatible with OmniAccess 512 any-to-any switching and VLAN architecture, you can switch other topologies in the LAN to Frame Relay or PPP. The submodule connects to a DSU/CSU or T1 multiplexer through a serial cable. The following diagram shows a typical setup using a 56 kbps Frame Relay line (up to 2 Mbps access rates are supported).



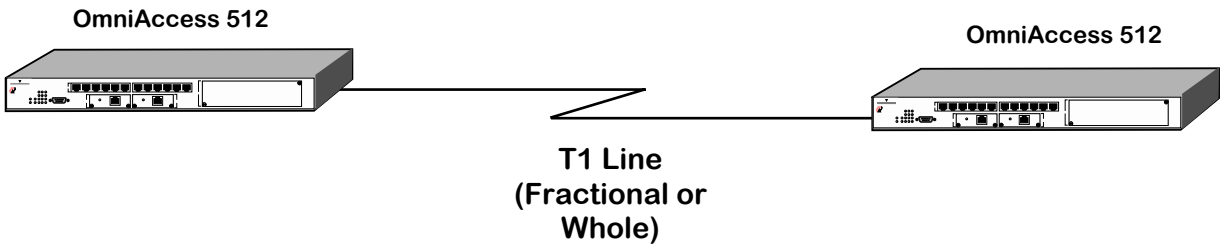
Frame Relay Configuration Using Serial Ports

For serial ports, the submodule supports automatic detection of cable types. It also supports internal, external, and split clocking.

Software in the switch allows you to configure access rate, clocking and protocol-related parameters. Additional software commands allow you to view status at the board, port, or protocol level. Extensive statistics are provided at each level, including a breakdown of traffic by frame type (Ethernet, IP, IPX, or BPDU) at the virtual circuit or PPP connection level.

Back-to-Back Using T1 Ports

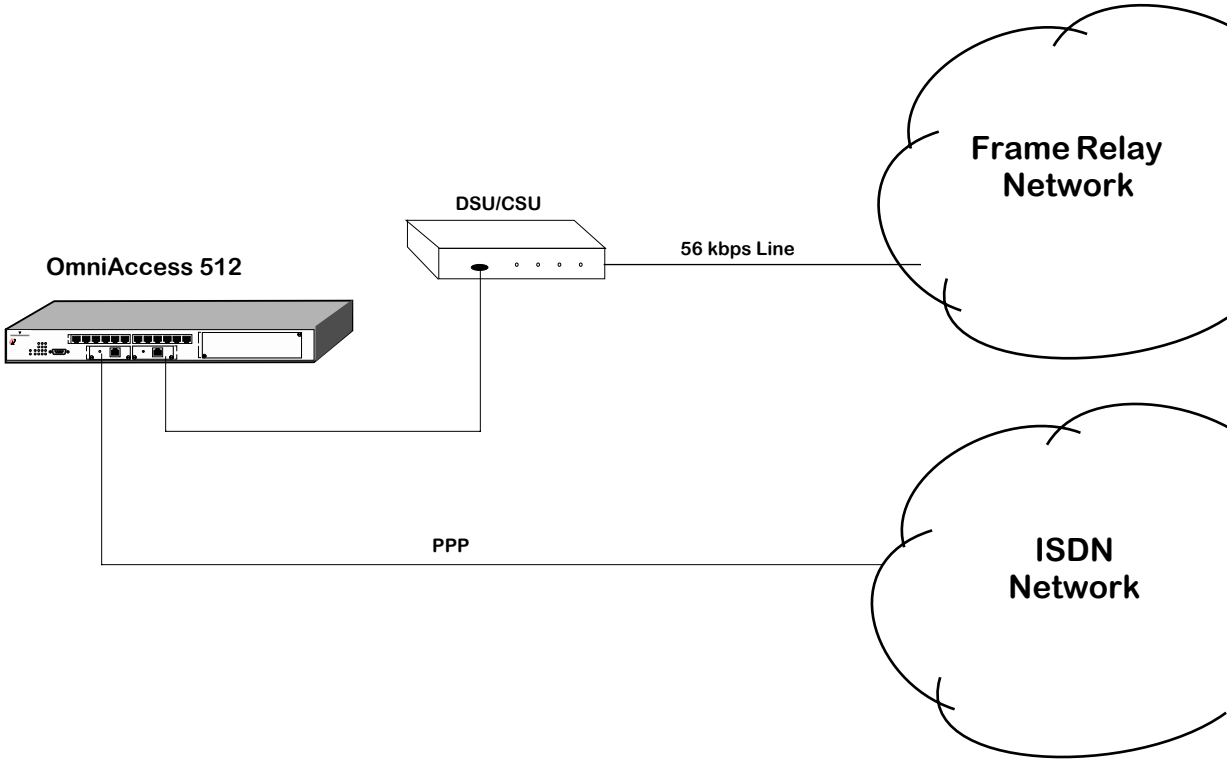
WAN switching submodules may be connected "back-to-back" without an intervening Frame Relay network or switch. Because the T1 port internally provides a DSU/CSU function, an external DSU/CSU is not required. Such connections are made by using private leased lines, such as T1 lines, instead of public Frame Relay networks, usually over large geographic distances.



Back-to-Back Configuration Using Fractional T1 Ports

Combined Frame Relay with ISDN Backup

This example shows an BRI submodule backing up its serial port via its ISDN port. The serial port connects to a DSU/CSU through a serial cable; this serial connection supports Frame Relay, but it could also support PPP. The other port, the ISDN port, connects to the ISDN network through a PPP connection. The services configured on the ISDN port exactly match those configured on the Frame Relay serial port so that if a failure does occur the ISDN port can transparently support the same services as the serial port. Refer to Chapter 31, "Backup Services," for details on how to implement this configuration.



ISDN Port Backs Up Frame Relay Connection

WAN Submodules

The OmniAccess 512 currently supports four (4) Wide Area Network submodules, which are as follows:

- FT1/E1 — Provides one T1/E1 port that supports Frame Relay or PPP.
- BRI-U — Provides one ISDN-BRI port for North American use. The ISDN-BRI port supports only PPP.
- BRI-S/T — Provides one ISDN-BRI port for European use. The ISDN-BRI port supports only PPP.
- S — Provides one Universal Serial Ports (USPs) that supports Frame Relay or PPP.

These submodules are illustrated and described in Chapter 1 titled “OmniAccess 512 Switches.”

Data Compression

Data compression allows you to get more data through the Frame Relay pipeline, further enhancing cost benefits. A typical data compression ratio on the board at the hardware level is from 2:1 to 4:1. In addition, the compression processor (HIFN 7711) has its own memory (DRAM) that can store up to 100 compression histories without degrading performance.

The submodules will only compress data if you enable compression through software and the bridge/router on the other end of the connection supports standard Frame Relay (FRF.9) or PPP (STAC-LZS) compression. (An OmniAccess 512-to-OmniAccess 512 connection could support compression.) Negotiation is necessary because if compressed data is sent to a bridge/router that does not support compression, this bridge/router will not recognize the data and will automatically drop the unrecognizable frames. By default, compression is on for Frame Relay and off for PPP.

If you enable compression, the submodule will query the Frame Relay or PPP device on the other end of the circuit to determine whether it supports compression. If it does, the submodule will compress all data except frame DLCMI (management) data and PPP control messages. If it does not support compression, data on that connection will be sent uncompressed. Refer to either Chapter 26, “Managing Frame Relay,” or Chapter 27, “Point-To-Point Protocol,” for information on enabling compression.

Loopback Detection

Loopback Detection is a common method for Carrier Service Providers to test clients’ circuits in the event of suspected line transmission problems. For both Frame Relay and PPP, loopback detection involves periodically transmitting a message and looking for that message to be received. When implementing Loopback Detection, it is important to keep two issues in mind: the message must not violate any standards; the message must be unique in such a way that it can be differentiated from a message sent by a remote node.

The messages are transmitted in one of two fixed intervals. When the port is in normal mode, the message is transmitted once every second. When two consecutive messages are received that match the transmitted message, the port is considered to be in loopback. Once in loopback mode, the message is transmitted once every 100 milliseconds. After ten consecutive messages are transmitted without receiving a match, the port is returned to normal mode. Consequently, it takes up to 2 seconds to detect the loopback condition and an additional second to exit it.

The message sent on a Frame Relay port uses standard 1490 encapsulation with a SNAP header. The OUI (Organizationally Unique Identifier) of the SNAP header is the Alcatel OUI, so encapsulation is standard, but the message is proprietary. The message is transmitted using the lowest available DLCI, or 32 if there are no DLCI's operating on the port. Because the message is merely attempting to determine the state of the physical port, the state of the DLCI, whether active, inactive or non-existent, is not important; the Frame Relay switch will discard any data for non-existent or inactive DLCIs.

The message sent on a PPP port uses the standard LCP Echo message.

Uniqueness of messages is accomplished by including a word in the message that is based upon the configuration of the port and a free-running timer. For PPP, uniqueness is enhanced by negotiating the LCP magic number option.

The WAN Port Software Menu

User interface commands for the submodule board are on a separate menu that is accessed through the **wan** command. The WAN Port menu is a submenu of the Interface menu. Typing **wan** at any system prompt displays the following menu:

```
Command     Wide Area Networking Menu
----------- ------------------------------------------------
wpmodify    Modify a given WAN port's parameters
wpdelete    Delete a given port's parameters, and restore defaults
wpview      View WAN port parameters for a given slot and port
wpstatus    View WAN port status of entire chassis, slot, or individual port
fr          Enter the Frame Relay submenu
ppp         Enter the PPP submenu
isdn        Enter the ISDN-specific submenu
link        Enter the link-specific submenu

Main        File        Summary     VLAN        Networking
Interface   Security    System      Services    Help
```

Note

The ISDN menu will only appear on systems with a BRI submodule installed.

You can start most of the commands by typing the first three (3) letters of the command name. For example, to use the **wpview** command, type **wpv**.

The following sections describe the use of commands on the WAN Port menu.

Setting Configuration Parameters

When you plug in a submodule board, it is automatically configured to the default settings. By default, the submodule uses the Frame Relay protocol. In addition, the access rate for serial ports defaults to 64 kbps for RS-232 cables. The access rate for other cable types defaults to 2 Mbps. You can change these settings, as well as several other settings, such as clocking and protocol type, with the **wpmodify** command.

♦ Important Note ♦

The front panel of an OA-512 switch is divided into several areas labeled **S1, S2, S3**, etc. Conceptually, think of these areas as a division of the switch into several modules, or slots. For more information on slot designation, see Chapter 1 titled "OmniAccess 512 Switches."

Modifying a Port

Use the **wpmodify** command to modify an submodule port, as shown below:

```
wpmodify 3/<port>
```

in which **3** is the slot number for WAN uplink modules, and **<port>** is the port number on the board that you want to modify (either **1** or 2). When this command is entered, the system automatically senses what type of port is being configured, and displays the appropriate screen for that type of port.

Make changes by entering the line number for the option you want to change, an equal sign (=), and the value for the new parameter. When you have finished entering the new values, type **save** at the prompt to save the new parameters. The following sections describe the options you can alter through this menu. The following three examples show a typical setup screen for a serial port, an ISDN-BRI port, and a fractional T1 port, respectively.

Serial Port Example

In this example, port 1 on slot 3 is a serial port. To modify serial port 2/1, enter:

```
wpm 3/1
```

A screen similar to following displays:

```
1)  Admin Status ..................................... UP
    {(U)p, (D)own}
2)  Speed in BPS ..................................... 2048000
    {9600, 19200, 56000, 64000, 128000, 256000, 512000, 768000}
    {1024000, 1544000, 2048000}
3)  Clocking ......................................... Split
    {(I)nternal, (E)xternal, (S)plit}
4)  Protocol Type .................................... Point to Point
    {(F)rame Relay, (P)PP(Point to Point)
(save/quit/cancel)
:
```

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to **DN**, the port will not pass data even, if its physical connection is good.

Speed in BPS

This option specifies the access rate for the Frame Relay or PPP line to the service provider. This parameter is the speed of the entire connection, not an individual virtual circuit. For example, if you have a 56 kbps line to your service provider, this field should be set to 56000. A full T1 line would have an access rate of 1,544,000 bps, and a full E1 line would have an access rate of 2,048,000 bps. For either T1 or E1, you can also have a fractional service with an access rate that is a multiple of 64 kbps.

Enter a value that is the same as one of the values displayed below this field.

Note

If the port you are configuring is a physical DCE port (i.e., DCE cable plugged into the submodule port) that can control the access rate and clocking, always enter a value for this field. This value will be used in computing congestion control parameters, such as the Committed Information Rate (CIR). If the port is a DTE, this setting will have no effect, except for informational purposes.

Clocking

This field sets the type of clocking used to clock transmit and receive data on the serial port. If the clock goes out-of-phase, you will receive errors.

Note

The clocking value is only relevant if the port is a physical DCE port (i.e., DCE cable plugged into the submodule port). If the submodule port is a physical DTE port, clocking will default to External.

External Clocking

If you set this value to External, clocking will be controlled by the external DCE (a DSU or other DCE device on the other end of the cable from the submodule port). External clocking is the default option when the submodule is a physical DTE device (i.e., controlled by an external DCE device).

When the submodule is acting as a physical DTE and

- the speed is greater than 256 kbps, or
- excessive FCS errors or Aborts are being detected coming from the submodule at the remote port or line monitor

then it is recommended that the external DCE (usually a CSU/DSU) be set to take a transmit data clock from the external DTE transmit clock (TXCE).

You can set up the external DCE this way by configuring its DTE, or dataport, configuration options. Set the "Transmit Clock Source" to "External." In this mode of operation, the transmit clock is output by the DCE device and the submodule turns it around on the external transmit clock back to the DCE, eliminating any phase misalignment between transmit clock and transmit data.

If the external DCE does not provide a DTE configuration option for the transmit clock source, then try setting the "Transmit Clock *Polarity*" to "Invert." Note that Invert is the clock polarity for Transmit (not Receive) and should only be used when excessive FCS errors or Aborts are detected.

Internal Clocking

If you set this value to Internal, clocking is controlled by the internal DCE (the submodule). Internal clocking should only be selected if the submodule is a physical DCE device and you are using an RS-232 cable. Internal clocking is the default setting when the submodule is a physical DCE device and an RS-232 DCE cable is connected to this port.

Split Clocking

Split clocking, which is also known as "loop timing," uses an additional control signal (TXCE) to keep the submodule and external DTE clocking synchronized. In split clocking, the external DTE takes the incoming transmit clock from the submodule and loops it back to TXCE. The submodule then uses this signal to clock in data from the external DTE device. Split clocking should only be used if the submodule is a physical DCE device and you are using a non-RS-232 cable, such as V.35.

♦ Important Note ♦

Split clocking is required if the access rate of the submodule port is greater than 256 kbps and it is acting as a DCE device. If split clocking is not used at these data rates, data out-of-phase errors, aborts, or CRC errors may occur.

Split clocking is the default when the submodule port is a physical DCE device and a non-RS-232 DCE cable is connected to the port.

Protocol Type

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP). The default setting is Frame Relay.

♦ Important Note ♦

A port must be set to either Frame Relay or PPP before any other protocol-related parameters can be set.

ISDN-BRI Port Example

In this example: port 2 on slot 3 is an ISDN-BRI port. To modify ISDN-BRI port 2/2, enter:

```
wpm 3/2
```

A screen similar to following displays:

```
1)  Admin Status ..........................................................UP
    {(U)p, (D)own}
    (save/quit/cancel)
:
```

Note that the only parameter you can set for an ISDN port from this screen is the Admin Status. All other parameters must be set from the ISDN, PPP, peer or WAN link menus. For more details on ISDN ports, see Chapter 29, "Managing ISDN Ports." For more details on managing PPP ports, see Chapter 27, "Point-to-Point Protocol." For more information on managing WAN links, see Chapter 28, "WAN Links."

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to **DN**, the port will not pass data even if its physical connection is good.

Fractional T1 Port Example

In this example: port 1 on slot 3 is a fractional T1 port. To modify fractional T1 port 2/1, enter:

```
wpm 3/1
```

A screen similar to following displays:

```
1)  Admin Status.....................................Enabled
    (E)nable, (D)isable}
    Speed in BPS.....................................1544000
    Clocking.........................................Local
2)  Protocol Type....................................Frame Relay
    {(F)rame Relay, (P)PP(Point to Point)
3)  T1 Starting Time Slot ...........................1
    { T1 (1..24)
4)  T1 Number of Time Slots .........................24
    { T1 (1..24)
(save/quit/cancel)
  :
```

Admin Status

The options for the Admin Status are **Enable** and **Disable**. If **Enable**, the port has been enabled and can transmit data as long as its Operational Status is also enabled. If set to **Disable**, the port will not pass data, even if its physical connection is good.

Speed in BPS

This field shows the speed for the T1/E1 port. This field is for reference only.

Clocking

This field shows the type of clocking set for the T1 port. This field is for reference only.

Protocol Type

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP).

♦ Important Note ♦

A port must be set to either Frame Relay or PPP before any other protocol-related parameters can be set.

T1/E1 Starting Time Slot

This field specifies the first time slot number to use on a T1 or E1 port. For a full T1 or E1 connection, specify time slot 1. For a fractional T1 or E1 connection, set this field to the starting time slot number as specified by your service provider.

T1/E1 Number of Time Slots

This field specifies the total number of 64 kbps time slots to use on the T1 or E1 connection. For a full T1, set this number to 24. For a full E1 connection, set this number to 30 if you are running multiframe; otherwise, set to 31. For fractional T1 or E1, you must set the number of time slots to the value specified by your service provider. For example, a 256 kbps service uses four time slots (4 x 64 = 256).

Viewing Configuration Parameters for the Submodule

You can view all current parameters for an submodule port or an individual virtual circuit using the **wpview** command. These parameters will be either the default parameters or parameters you modified using the **wpmodify** command or network management software.

You have a choice of viewing parameters at the chassis, slot or port level. You receive different configuration choices depending upon which level you choose. The sections below describe both ways to use the **wpview** command.

♦ Important Note ♦

The front panel of an OA-512 switch is divided into several areas labeled **S1, S2, S3**, etc. Conceptually, think of these areas as a division of the switch into several modules, or slots. For more information on slot designation, see Chapter 1 titled "OmniAccess 512 Switches."

Viewing Parameters for all Submodules in the Chassis

To view port parameters for all submodule boards in a chassis, enter the following command

```
wpview
```

or

```
wpv
```

A screen similar to following displays. In this example, the port parameters being displayed are for a system that contains a 2-port BRI submodule in slot 3.

```
                                  Admin/
                                  Oper/                 Speed
Slot/Port  Port Type  Intf. Type  State   Protocol      BPS       Clocking
=========  ========   =========   =====   ========      =======   ========
3/1          Serial    *NONE*     UP/DN   FR            0          External
3/2          ISDN      ISDN-ST    UP/UP   PPP           N/A        External
```

This screen lists the current values for the listed parameters.

For **Port Type**, **Intf. Type** and **Oper/State**, these parameters are the same as those set through the **wpmodify** command. For detailed information on these values, see *Modifying a Port* on page 25-9. For **Protocol**, **Speed BPS** and **Clocking**, these parameters are the same as those set through the **wpstatus** command. See *Obtaining Status and Statistical Information* on page 25-20.

Viewing Parameters for all Ports in a Single Submodule

To view port parameters for all ports on a particular submodule, enter the **wpview** command, followed by the number of the slot. In the following three examples, the port parameters are displayed for an ISDN-BRI board, a serial board, and a T1 board.

ISDN-BRI Board Example

To display the parameters for all ports on the ISDN-BRI board (in slot 3), enter:

```
wpview 3
```

or

```
wpv 3
```

A screen similar to following displays:

```
                                  Admin/
                                  Oper/                    Speed
Port  PortType   Intf. Type       State    Protocol        BPS        Clocking
====  ======     ==========       ======   ========        =======    ========
1     ISDN       ISDN-ST          UP/UP    PPP             N/A        N/A
```

Serial Board Example

To display the parameters for all ports on the serial board (in slot 3), enter:

```
wpview 3
```

or

```
wpv 3
```

A screen similar to following displays:

```
                                  Admin/
                                  Oper/                    Speed
Port  PortType   Intf. Type       State    Protocol        BPS        Clocking
====  ======     ========         ======   ========        =======    ========
1     Serial     V35DCE           UP/UP    PPP             2048000    Split
```

T1 Board Example

To display the parameters for all ports on the T1 board (in slot 3), enter:

```
wpview 3
```

or

```
wpv 3
```

A screen similar to following displays:

```
                                  Admin/
                                  Oper/                    Speed
Slot/Port  PortType  Intf. Type    State    Protocol        BPS        Clocking
=========  ========  ==========    ======   ========        =======    ========
 3/1       T1        T1            UP/UP    FR              1544000    Loop
```

Note

E1 boards provide a similar display, except the port type and interface type display as **E1** and speed displays as **2048000**.

Viewing Port Parameters

To view port parameters, enter the following command:

wpview 3/<port>

where **3** is the slot number for WAN uplinks, and **<port>** is the port number for which you want to view information (either **1** or **2**). The following three examples show the configuration setup screens for a fractional T1 port, a universal serial port, and an ISDN-BRI port.

Fractional T1 Port Example

The following example displays the configuration view screen for a fractional T1 port (port 1). To view 3/1, enter:

wpview 3/1

or

wpv 3/1

A screen similar to following displays:

```
Configuration View for Slot 3, Port 1.
1)  Admin Status.....UP
2)  Protocol Type.....Frame Relay
3)  T1/E1 Starting Time Slot.....1
4)  T1/E1 Number of Time Slots .....24
```

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to is **DN**, the port will not pass data even if its physical connection is good.

Protocol Type

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP). The default setting is Frame Relay.

T1/E1 Starting Time Slot

This field specifies the first time slot number to use on a T1 or E1 port. For a full T1 or E1 connection, specify time slot 1. For a fractional T1 or E1 connection, set this field to the starting time slot number as specified by your service provider.

T1/E1 Number of Time Slot

This field specifies the total number of 64 kbps time slots to use on the T1 or E1 connection. For a full T1, set this number to 24. For a full E1 connection, set this number to 30 if you are running multiframe, or 31 if you are not. For fractional T1 or E1, you must set the number of time slots to the value specified by your service provider. For example, a 256 kpbs service uses four time slots (4 x 64 = 256).

Universal Serial Port Example

The following example displays the configuration view screen for a universal serial port (port 2). To view 3/2, enter:

```
wpview 3/2
```

or

```
wpv 3/2
```

A screen similar to following displays:

```
Configuration View for Slot 3, Port 2.
1) Admin Status.....UP
2) Speed in BPS .....2048000
3) Clocking.....Split
4) Protocol Type.....Frame Relay
```

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to **DN**, the port will not pass data even if its physical connection is good.

Speed in BPS

This field displays the access rate for the Frame Relay line to the service provider. This parameter is the speed of the entire connection, not an individual virtual circuit. For example, if you have a 56 kbps line to your service provider, this field should be set to 56000. A full T1 line would have an access rate of 1,544,000 bps, and a full E1 line would have an access rate of 2,048,000 bps. For either T1 or E1, you can also have a fractional service with an access rate that is a multiple of 64 kbps.

Clocking

This field displays either **External**, **Internal**, or **Split**. For a more detailed discussion of clocking, see *Clocking* under *Modifying a Port* on page 25-9.

Protocol Type

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP). The default setting is Frame Relay.

ISDN-BRI Port Example

The following example displays the configuration view screen for an ISDN-BRI port (port 2). To view 3/2, enter:

```
wpview 3/2
```

or

```
wpv 3/2
```

A screen similar to following displays:

```
Configuration View for Slot 3, Port 2.
1)  Admin Status..................................................... UP
```

Admin Status

The options for the Admin Status are **UP** and **DN**. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If set to **DN**, the port will not pass data even if its physical connection is good.

Deleting Ports

The **wpdelete** command allows you to delete configuration information for a port. When you delete a this information, all WAN configuration parameters for the selected port revert back to default settings.

To delete a port configuration, enter the following command:

wpdelete 3/<port>

in which **3** is the slot number for WAN uplink modules and **<port>** is the port number that you want to delete. For example, to delete port 1, enter:

wpdelete 3/1

or

wpd 3/1

This system returns the following prompt to confirm the deletion:

This will delete Slot 3, Port 1. Continue? {(Y)es, (N)o} (N)

Enter a **Y** to confirm the deletion or press **Enter** to cancel the deletion.

Note

The **wpdelete** command requires that you indicate a slot and port number. For example,

wpdelete

would be an incorrect usage, whereas,

wpdelete 3/2

would be correct.

Obtaining Status and Statistical Information

You can obtain general and detailed WAN port statistical information on all submodules in the switch, a single board, individual ports, and Frame Relay and PPP protocols. The **wpstatus** command is used to provide this information. This information includes types of physical interface, access rate of the Frame Relay line, and errors. In addition, the **wpstatus** command can display the number of frames received and transmitted.

Obtaining Information on All Boards in a Switch

To obtain status information on all boards in a switch, you enter the **wpstatus** command without any parameters as follows:

wpstatus

or

wps

This command displays a screen similar to the following. In this example, the port parameters being displayed are for a 2-port submodule in slot 3.

Slot/Port	PortType	Intf. Type	Admin/ Oper/ State	Protocol	BPS	Speed Clocking
3/1	T1	T1	UP/UP	FR	1544000	External
3/2	Serial	530DCE	UP/UP	FR	2048000	Split

Each row in the table corresponds to a physical port on a board in the switch. The following sections describe the columns shown in this table:

Slot/Port

The first number in this column is the slot in the switch where this submodule is installed. The second number is the port number on the submodule.

Port Type

This column shows **Serial, ISDN, T1**, or **E1**.

Intf Type

This column indicates the physical cable type connected to this port. This cable type is automatically sensed by the submodule hardware. This column indicates the cable type and whether it is DCE or DTE. The following values may appear in this column:

- **V35DTE** (V.35 DTE cable)
- **V35DCE** (V.35 DCE cable)
- **232DTE** (RS-232 DTE cable)
- **232DCE** (RS-232 DCE cable)
- **X21DTE** (X.21 DTE cable)
- **X21DCE** (X.21 DCE cable)
- **530DTE** (RS-530 or RS-449 EIA DTE cable)
- **530DCE** (RS-530 or RS-449 EIA DCE cable)
- **T1**
- **E1**

- **ISDN-ST**
- **ISDN-U**

The submodule sees RS-530 and RS-449 cables the same because they are electrically identical. However, this does not affect the operation of either cable type. Both RS-530 and RS-449 cables are supported.

If no cable is connected to a universal serial port, then this column will display:

NONE

If an error has been detected on the port (e.g., cable type could not be detected), the following value displays:

ERROR!

Admin/Oper State

This column shows the Administrative and Operational State of this port. The value before the slash refers to the Admin Status. If **UP**, the port has been enabled and can transmit data as long as its Operational State is also **UP**. If the Admin Status is **DN**, the port will not pass data even if its physical connection is good.

The value after the slash refers to the Operational State. If **UP**, the port is capable of passing data as long as it has been logically enabled at the Administrative level. If **DN**, the port cannot pass data due to a problem in the physical connection (e.g., cable disconnected, 2-port submodule T1 board could not detect cable type) or because the port is administratively down. If the Operational State displays **LB**, the port is currently in Loopback (test) mode.

Protocol

The protocol type can be set to either Frame Relay or Point to Point Protocol (PPP).

Speed BPS

This column indicates the speed, or access rate, between the submodule serial port and DSU or other physical DTE device. The speed is expressed in bits per second (bps). This speed is the total bandwidth available on the line connected to this port. Virtual circuits on this port share this bandwidth.

Usually, the submodule port will be a physical DTE device and the speed will be determined by the DSU. In this case, this value will read **EXT CLK**, which means the submodule port gets its clocking from an externally attached DCE device (i.e., DTE cable plugged into submodule port) or no cable is attached. If the submodule port is a physical DCE device (i.e., DCE cable plugged into submodule port), then this value will be the actual clock rate used by the port.

Clocking

Indicates the type of clocking used on this port. The three types of clocking are described in *Clocking* on page 25-10.

Utilization

Indicates the amount of port usage, expressed in bandwidth percentage, over three durations: the previous ten seconds (**10s**), the previous minute (**1m**), and the previous five minutes (**5m**).

Obtaining Information on the Ports for a Single Submodule Board

To obtain status information on a single submodule, enter the **wpstatus** command and the slot number (**3**), as follows:

```
wpstatus 3
```

where **3** is the slot number for WAN uplink modules. In the following three examples, the port parameters are displayed for an ISDN-BRI board, a serial board, and a T1 board.

ISDN-BRI Board Example

In this example, the board in slot 3 is an ISDN-BRI board. To view the status of slot 3, enter:

```
wpstatus 3
```

or

```
wps 3
```

This command displays a screen similar to the following:

```
WAN Port Status for slot: 3

     Admin/
     Oper    Intf      Speed     Frames     Frames     Octets     Octets
PT   Status  Type      BPS       In         Out        In         Out
==   ======= ========  ========  ========== ========== ========== ==========
1    UP/DN   *NONE*    EXT CLK          0          0          0          0
2    UP/DN   ISDN-ST   N/A              0          0          0          0
```

Each row in the table corresponds to a port on the submodule you requested information on.

Serial Board Example

In this example, the board is a serial board. To view the status of slot 3, enter:

```
wpstatus 3
```

or

```
wps 3
```

This command displays a screen similar to the following:

```
WAN Port Status for slot: 3

   Admin/
    Oper    Intf      Speed      Frames     Frames    Octets      Octets
PT  Status  Type      BPS        In         Out       In          Out
==  ======  ======    =========  =======    ========  ========    ==========
1   UP/UP   V35DCE    2048000          3         17         36          276
2   UP/UP   V35DCE    2048000        175        926       2034        25617
```

2-Port Fractional T1 Board Example

In this example, the board is a Fractional T1 board. To view the status of slot 3, enter:

```
wpstatus 3
```

or

```
wps 3
```

This command displays a screen similar to the following:

```
WAN Port Status for slot: 3

     Admin/
     Oper    Intf      Speed    Frames      Frames      Octets      Octets
PT   Status  Type      BPS      In          Out         In          Out
==   ======  ========  ======== ========== ========== ========== ==========
1    UP/DN   T1        1544000         0           0           0          0
2    UP/UP   530DCE    2048000     45695       47761    10596229    2560992
```

PT

The port number on the board for which statistics are displayed.

Admin/Oper Status, Int Type, Speed Bps

These columns are described in the section, *Obtaining Information on All Boards in a Switch* on page 25-20. Please refer to this section for detailed information.

Frames In

The total number of frames received on this port since the last time the switch was initialized. The switch can only be initialized by rebooting.

Frames Out

The total number of frames sent on this port since the last time the switch was initialized.

Octets In

The total number of octets, or bytes, received on this port since the last time the switch was initialized. This statistic includes the data and Frame Relay or PPP header fields, but does not include CRC or flag characters.

Octets Out

The total number of octets, or bytes, sent on this port since the last time the switch was initialized. This statistic includes the data and Frame Relay or PPP header fields, but does not include CRC or flag characters.

Viewing Information on a Single Port

To obtain status information on a single port, enter the **wpstatus** command, followed by a 3, and the port number for which you want to receive information, as follows:

wpstatus 3/<port>

or

wps 3/<port>

where **3** is the slot number for WAN uplink submodules and **<port>** is the port number on the board (either 1 or 2).

Frame Relay Example

In the following example, port 1 on slot 3 is configured for Frame Relay. To obtain status information for this port, enter:

```
wpstatus 3/1
```

A screen similar to the following will be displayed:

```
Frame Relay Status for slot 3, port 1:

Administrative/Operational Status ..... Up/Up
Port Type ..... Universal Serial Port
Protocol ..... Frame Relay

Speed    Intf.    Receive      Receive      Receive      Transmit     Signal
BPS      Type     CRC Errors   Aborts       Overruns     Overruns     Errors
======== ======== ========== ========== ========== ========== ========
2048000  V35DCE            0          0          0          0        0

Control  DTR  RTS  DSR  CTS  DCD
Signal   ON   ON   ON   ON   OFF

Frame Relay Information:
UniCast      Discarded  Error
Octets       Frames     Frames    Count
========== ========== ========= ==========
IN             941079         0          0
Out             21334         0          0
IN+OUT         962413         0          0

Administrative/Operational Phase .... Up/Up

Last Error Type ..... No Error Since Reset
Last Error Time ..... 0 days, 00:00:00:00
Interface failures ..... 0
Last interface failure time ..... 0 days, 00:00:00:00

DLCI Information:
          Admin/
DLCI Num  Oper Status  DLCI Type    Frames In  Frames Out  Octets In  Octets Out
========  ===========  ==========  ==========  ==========  =========  =========
0         UP/UP        Configured        1021        1021      16044       1494
31        UP/UP        Learned          17716         136    2746651      12663
32        UP/DN        Learned              0           0          0          0
```

Applicable to all port types.

Physical Level Information.

Displays for serial ports only

Logical (Frame Relay) Information

Virtual Circuit Level Information

This command displays three (3) layers of information. The top section provides information on the physical interface. The middle section provides information on the logical, or Frame Relay, interface. The bottom section provides information on the virtual circuits associated with this physical port.

For detailed descriptions of the fields, refer to Chapter 26, “Managing Frame Relay.”

PPP Example

In the following example, port 1 on slot 3 is configured for Point-To-Point Protocol (PPP). To obtain status information for this port, enter:

```
wpstatus 3/1
```

A screen similar to the following will display:

```
WAN Port Status for slot 3, port 1:
Administrative/Operation Status: ..... UP/UP
Port Type ..... Universal Serial Port
Protocol ..... PPP

Speed    Intf.     Receive      Receive      Receive      Transmit     Signal
BPS      Type      CRC Errors   Aborts       Overruns     Underruns    Errors
=======  ========  ===========  =========    ===========  =========    ======

2048000  V35DCE              0            0            0            0         0

Control    DTR   RTS   DSR   CTS   DCD
Signals    ON    ON    ON    ON    ON

PPP Management Statistics:

                          IP      IPX     BCP     CCP
Admin                     Oper    Oper    Oper    Oper
Status   Mode             state   state   state   state
======   =======          ======  ======  =====   =====
UP       Normal           Open    Close   Open    Open

LCP Pkts    IPCP Pkts    IPX Pkts    BCP Pkts    CCP Pkt
IN/OUT      IN/OUT       IN/OUT      IN/OUT      IN/OUT
=========   ==========   =======     =========   =======
3/4         2/2          4/0         2/2         3/3

            Packets      Packets     Packets     Octets      Octets
            In           Out         In+Out      In          Out          %In    %Out
            ========     =========   =========   ========    =======      ====   =====
Total            284         5809        6093      100333      344187
Ethernet           0         1337        1337           0      157846       0      45
8025               0            0           0           0           0       0       0
FDDI               0            0           0           0           0       0       0
IP               281          282         563      100216       22931      99       6
IPX                0            0           0           0           0       0       0
BPDU               3         4190        4193         117      163410       0      47

STAC-LZS     Compressed     Compressed     Uncompressed     Compression
Compression: Frames         Octets         Octets           Ratio
             ===========    ===========    ===============  ============
In                   284           8635             100333        11.6:1
Out                 5809          96794             449230         4.6:1
In+Out              6093         105429             549563         5.2:1
```

Note

The section devoted to compressed data traffic statistics will be displayed only if the port has been configured for STAC-LZS compression and the optional compression module is installed

For detailed descriptions of the fields, refer to Chapter 27, “Point-to-Point Protocol.”

Configuring 31 Timeslots on a WAN E1 Port

On WSM E1 ports, the unframed format is not supported since WSMs only support standard E1 framing for PPP or Frame Relay (the "unframed" format is only supported for unstructured Circuit Emulation T1 or E1 ports).WSM E1 ports *must* be set to one of the standard E1 Framing types (E1, E1-CRC, E1-MF, E1-MF-CRC) with the **temod** command. (See Chapter 30, "Managing T1 and E1 Ports," for more information on the **temod** command.)

Most E1 services only allow a maximum of 30 usable timeslots since timeslot 0 is always used for Frame Synchronization (which is why you cannot use unframed for Frame Relay or PPP ports since you *must* specify how timeslot 0 is used) and timeslot 16 is usually used for multiframe sequencing.

The WSM can support 31 timeslots for cases where timeslot 16 is not used for multiframe control. When you configure the timeslots for a WSM E1 port, you specify a starting timeslot followed by a number of timeslots by using the **wpmodify** command. (See *Modifying a Port* on page 25-9 for more information on the **wpmodify** command.)

Normally, the WSM will use a default configuration that skips timeslot 16 automatically. In this way, it will select the E1 frame to generate E1 timeslot 0 (the "synchronization" timeslot), but leave timeslot 16 (the "multiframe control" timeslot) free. The WAN port configuration software when configured for 31 timeslots will then use all timeslots from 1 to 31 to give you a full E1 where timeslot 16 is also used for data. Again, this should only be done for facilities that do not require E1 Multi-Frame. For those types of E1 lines, they can support a maximum of 30 timeslots. Only those E1 lines that do not require E1 multiframe can be configured in the method described below.

To configure a WAN E1 port for 31 timeslots, follow the steps below:

1. Enter **temod 3/<port>** at the system prompt, where **3** is the slot number of the submodule with the E1 port and **<port>** is the port number of the E1 port. For example, to configure WSM E1 port 3/1, enter **temod 3/1**.

2. Enter **2=4** at the prompt to set the frame type to E1 or enter **2=5** at the prompt to set the frame type to E1-CRC.

3. Enter **save** at the prompt to save your settings.

4. Enter **wpmodify 3/<port>** or **wpm 3/<port>** at the system prompt, where **3** is the slot number of the submodule with the E1 port and **<port>** is the port number of the E1 port. For example, to configure WSM E1 port 3/1, enter **wpm 3/1**. (Note: **wpm** is the abbreviated for of **wpmodify**.)

5. Enter **3=1** to set the starting timeslot to 1.

6. Enter **4=31** to set the number of timeslots to 31.

7. Enter **save** at the prompt to save your settings.