CE-100T-8 Ethernet Operation

This chapter describes the operation of the CE-100T-8 (Carrier Ethernet) card supported on the ONS 15454 and ONS 15454 SDH. A CE-100T-8 card installed in an ONS 15454 SONET is restricted to SONET operation, and a CE-100T-8 card installed in an ONS 15454 SDH is restricted to SDH operation. Another version of the CE-100T-8 card is supported on the ONS 15310-CL.

Provisioning is done through Cisco Transport Controller (CTC) or Transaction Language One (TL1). Cisco IOS is not supported on the CE-100T-8 card.

For Ethernet card specifications, refer to the *Cisco ONS 15454 Reference Manual* or the *Cisco ONS 15454 SDH Reference Manual*. For step-by-step Ethernet card circuit configuration procedures, refer to the *Cisco ONS 15454 Procedure Guide* or the *Cisco ONS 15454 SDH Procedure Guide*. Refer to the *Cisco ONS SONET TL1 Command Guide* or the *Cisco ONS SDH Command Guide* for TL1 provisioning commands.

Chapter topics include:

- CE-100T-8 Overview, page 22-1
- CE-100T-8 Ethernet Features, page 22-2
- CE-100T-8 SONET/SDH Circuits and Features, page 22-7

CE-100T-8 Overview

The CE-100T-8 is a Layer 1 mapper card with eight 10/100 Ethernet ports. It maps each port to a unique SONET/SDH circuit in a point-to-point configuration. Figure 22-1 illustrates a sample CE-100T-8 application. In this example, data traffic from the Fast Ethernet port of a switch travels across the point-to-point circuit to the Fast Ethernet port of another switch.

Figure 22-1 CE-100T-8 Point-to-Point Circuit
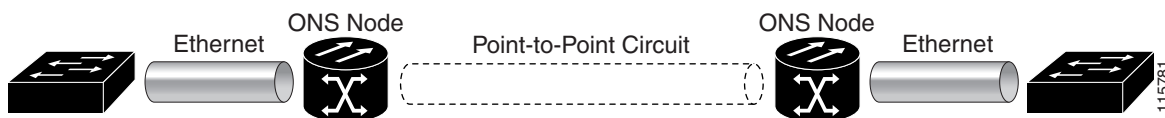
The CE-100T-8 cards allow you to provision and manage an Ethernet private line service like a traditional SONET/SDH line. CE-100T-8 card applications include providing carrier-grade Ethernet private line services and high-availability transport.

The CE-100T-8 card carries any Layer 3 protocol that can be encapsulated and transported over Ethernet, such as IP or IPX. The Ethernet frame from the data network is transmitted on the Ethernet cable into the standard RJ-45 port on a CE-100T-8 card. The CE-100T-8 card transparently maps Ethernet frames into the SONET/SDH payload using packet-over-SONET/SDH (POS) encapsulation. The POS circuit with its encapsulated Ethernet inside is then multiplexed onto an optical card like any other SONET synchronous transport signal (STS) or SDH synchronous transport mode (STM). When the payload reaches the destination node, the process is reversed and the data is transmitted from the standard RJ-45 port in the destination CE-100T-8 card onto the Ethernet cable and data network. The POS process is covered in detail in Chapter 19, "POS on ONS Ethernet Cards."

The CE-100T-8 card supports ITU-T G.707 and Telcordia GR-253 based standards. It allows a soft reset, which is errorless in most cases. During the soft reset if there is a provisioning change, or if the firmware is replaced during the software upgrade process, the reset is equivalent to a hard reset. For more information on a soft reset of a CE-100T-8 card using CTC, refer to the *Cisco ONS 15454 Procedure Guide* or the *Cisco ONS 15454 SDH Procedure Guide*.

CE-100T-8 Ethernet Features

The CE-100T-8 card has eight front-end Ethernet ports which use standard RJ-45 connectors for 10BASE-T Ethernet/100BASE-TX Ethernet media. Ethernet Ports 1 through 8 each map to a POS port with a corresponding number. The console port on the CE-100T-8 card is not functional.

The CE-100T-8 cards forward valid Ethernet frames unmodified over the SONET/SDH network. Information in the headers is not affected by the encapsulation and transport. For example, included IEEE 802.1Q information will travel through the process unaffected.

The ONS 15454 SONET/SDH CE-100T-8 and the ONS 15310-CL CE-100T-8 support maximum Ethernet frame sizes of 1548 bytes including the Cyclic Redundancy Check (CRC). The Maximum Transmission Unit (MTU) size is not configurable and is set at a 1500 byte maximum (standard Ethernet MTU). Baby giant frames in which the standard Ethernet frame is augmented by IEEE 802.1 Q-tags or Multiprotocol Label Switching (MPLS) tags are also supported. Full Jumbo frames are not supported.

The CE-100T-8 cards discard certain types of erroneous Ethernet frames rather than transport them over SONET/SDH. Erroneous Ethernet frames include corrupted frames with CRC errors and undersized frames that do not conform to the minimum 64-byte length Ethernet standard.

Note   Many Ethernet attributes are also available through the network element (NE) defaults feature. For more information on NE defaults, refer to the "Network Element Defaults" appendix in the *Cisco ONS 15454 Reference Manual* or the *Cisco ONS 15454 SDH Reference Manual*.

Autonegotiation, Flow Control, and Frame Buffering

On the CE-100T-8, Ethernet link autonegotiation is on by default and when the port's duplex or speed is set to auto. The user can also set the link speed, duplex, and flow control manually under the card-level Provisioning tab of CTC.

The CE-100T-8 supports IEEE 802.3x flow control and frame buffering to reduce data traffic congestion. Flow control is on by default.

To prevent over-subscription, buffer memory is available for each port. When the buffer memory on the Ethernet port nears capacity, the CE-100T-8 uses IEEE 802.3x flow control to transmit a pause frame to the attached Ethernet device. Flow control and autonegotiation frames are local to the Fast Ethernet interfaces and the attached Ethernet devices. These frames do not continue through the POS ports.

The CE-100T-8 card has symmetric flow control and proposes symmetric flow control when autonegotiating flow control with attached Ethernet devices. Symmetric flow control allows the CE-100T-8 cards to respond to pause frames sent from external devices and to send pause frames to external devices.

The pause frame instructs the source to stop sending packets for a specific period of time. The sending station waits the requested amount of time before sending more data. Figure 22-2 illustrates pause frames being sent and received by CE-100T-8 cards and attached switches.

Figure 22-2   Flow Control
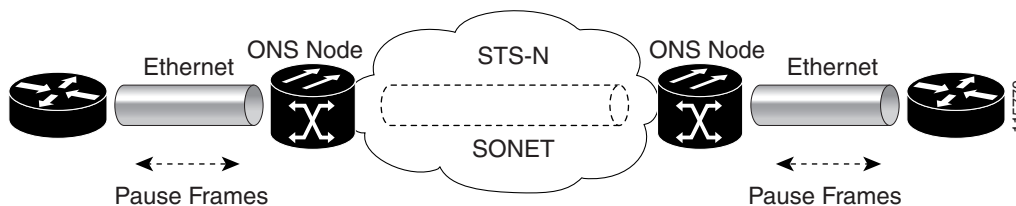
This flow-control mechanism matches the sending and receiving device throughput to that of the bandwidth of the STS circuit. For example, a router might transmit to the Ethernet port on the CE-100T-8 card. This particular data rate might occasionally exceed 51.84 Mbps, but the SONET circuit assigned to the CE-100T-8 port might be only STS-1 (51.84 Mbps). In this example, the CE-100T-8 sends out a pause frame and requests that the router delay its transmission for a certain period of time. With flow control and a substantial per-port buffering capability, a private line service provisioned at less than full line rate capacity (STS-1) is efficient because frame loss can be controlled to a large extent.

Ethernet Link Integrity Support

The CE-100T-8 supports end-to-end Ethernet link integrity (Figure 22-3). This capability is integral to providing an Ethernet private line service and correct operation of Layer 2 and Layer 3 protocols on the attached Ethernet devices.

End-to-end Ethernet link integrity means that if any part of the end-to-end path fails, the entire path fails. It disables the Ethernet port on the CE-100T-8 card if the remote Ethernet port is unable to transmit over the SONET/SDH network or if the remote Ethernet port is disabled.

Failure of the entire path is ensured by turning off the transmit pair at each end of the path. The attached Ethernet devices recognize the disabled transmit pair as a loss of carrier and consequently an inactive link or link fail.

Figure 22-3   End-to-End Ethernet Link Integrity Support
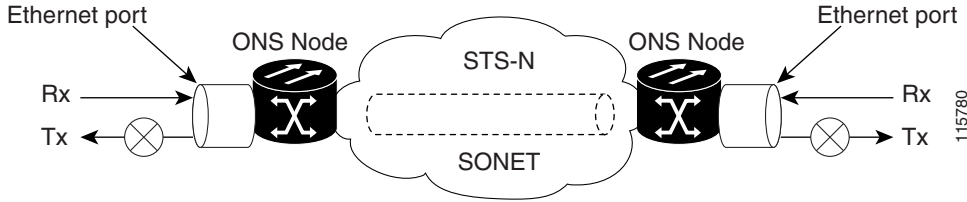
Note Some network devices can be configured to ignore a loss of carrier condition. If a device configured to ignore a loss of carrier condition attaches to a CE-100T-8 card at one end, alternative techniques (such as use of Layer 2 or Layer 3 keep-alive messages) are required to route traffic around failures. The response time of such alternate techniques is typically much longer than techniques that use link state as indications of an error condition.

Enhanced State Model for Ethernet and SONET/SDH Ports

The CE-100T-8 supports the Enhanced State Model (ESM) for the Ethernet ports, as well as for the SONET/SDH circuit. For more information about the ESM, see the "Enhanced State Model" appendix in the *ONS 15454 SONET Reference Manual* or the *ONS 15454 SDH Reference Manual*.

The Ethernet ports can be set to the ESM service states including the In-Service, Automatic In-Service (IS,AINS) administrative state. IS,AINS initially puts the port in the Out-of-Service and Autonomous, Automatic In-Service (OOS-AU,AINS) state. In this service state, alarm reporting is suppressed, but traffic is carried and loopbacks are allowed. After the soak period passes, the port changes to In-Service and Normal (IS-NR). Raised fault conditions, whether their alarms are reported or not, can be retrieved on the CTC Conditions tab or by using the TL1 RTRV-COND command.

Two Ethernet port alarms/conditions, CARLOSS and TPTFAIL, can prevent the port from going into service. This occurs even though alarms are suppressed when a CE-100T-8 circuit is provisioned with the Ethernet ports set to the IS,AINS state, because the CE-100T-8 link integrity function is active and ensures that the links at both ends are not enabled until all SONET and Ethernet errors along the path are cleared. As long as the link integrity function keeps the end-to-end path down, both ports will have at least one of the two conditions needed to suppress the AINS-to-IS transition. Therefore, the ports will remain in the AINS state with alarms suppressed.

ESM also applies to the SONET/SDH circuits of the CE-100T-8 card. If the SONET/SDH circuit is set up in IS,AINS state and the Ethernet error occurs before the circuit transitions to IS, then link integrity will also prevent the circuit transition to the IS state until the Ethernet port errors are cleared at both ends. The service state will be OOS-AU,AINS as long as the administrative state is IS,AINS. When there are no Ethernet or SONET errors, link integrity enables the Ethernet port at each end. Simultaneously, the AINS countdown begins as normal. If no additional conditions occur during the time period, each port transitions to the IS-NR state. During the AINS countdown, the soak time remaining is available in CTC and TL1. The AINS soaking logic restarts from the beginning if a condition appears again during the soak period.

A SONET/SDH circuit provisioned in the IS,AINS state remains in the initial Out-of-Service (OOS) state until the Ethernet ports on each end of the circuit transition to the IS-NR state. The SONET/SDH circuit transports Ethernet traffic and counts statistics when link integrity turns on the Ethernet port, regardless of whether this AINS-to-IS transition is complete.

IEEE 802.1Q CoS and IP ToS Queuing

The CE-100T-8 references IEEE 802.1Q class of service (CoS) thresholds and IP type of service (ToS) (IP Differentiated Services Code Point [DSCP]) thresholds for priority queueing. CoS and ToS thresholds for the CE-100T-8 are provisioned on a per port level. This allows the user to provide priority treatment based on open standard quality of service (QoS) schemes already existing in the data network attached to the CE-100T-8. The QoS treatment is applied to both Ethernet and POS ports.

Any packet or frame with a priority greater than the set threshold is treated as priority traffic. This priority traffic is sent to the priority queue instead of the normal queue. When buffering occurs, packets on the priority queue preempt packets on the normal queue. This results in lower latency for the priority traffic, which is often latency-sensitive traffic such as voice-over-IP (VoIP).

Because these priorities are placed on separate queues, the priority queuing feature should not be used to separate rate-based CIR/EIR marked traffic (sometimes done at a Metro Ethernet service provider edge). This could result in out-of-order packet delivery for packets of the same application, which would cause performance issues with some applications.

For an IP ToS-tagged packet, the CE-100T-8 can map any of the 256 priorities specified in IP ToS to priority or best effort. The user can configure a different ToS in CTC at the card-level view under the **Provisioning > Ether Ports** tabs. Any ToS class higher than the class specified in CTC is mapped to the priority queue, which is the queue geared towards low latency. By default, the ToS is set to 255, which is the highest ToS value. This results in all traffic being treated with equal priority by default.

Table 22-3 shows which values are mapped to the priority queue for sample IP ToS settings. (ToS settings span the full 0 to 255 range, but only selected settings are shown.)

Table 22-1   IP ToS Priority Queue Mappings

ToS Setting in CTC	ToS Values Sent to Priority Queue
255 (default)	None
250	251–255
150	151–255
100	101–255
50	51–255
0	1–255

For a CoS-tagged frame, the CE-100T-8 can map the eight priorities specified in CoS to priority or best effort. The user can configure a different CoS in CTC at the card-level view under the **Provisioning > Ether Ports** tabs. Any CoS class higher than the class specified in CTC is mapped to the priority queue, which is the queue geared towards low latency. By default, the CoS is set to 7, which is the highest CoS value. This results in all traffic being treated with equal priority by default.

Table 22-3 shows which values are mapped to the priority queue for CoS settings.

Table 22-2   CoS Priority Queue Mappings

CoS Setting in CTC	CoS Values Sent to Priority Queue
7 (default)	None
6	7
5	6, 7

Table 22-2   CoS Priority Queue Mappings (continued)

CoS Setting in CTC	CoS Values Sent to Priority Queue
4	5, 6, 7
3	4, 5, 6, 7
2	3, 4, 5, 6, 7
1	2, 3, 4, 5, 6, 7
0	1, 2, 3, 4, 5, 6, 7

Ethernet frames without VLAN tagging use ToS-based priority queueing if both ToS and CoS priority queueing is active on the card. The CE-100T-8 card's ToS setting must be lower than 255 (default) and the CoS setting lower than 7 (default) for CoS and ToS priority queueing to be active. A ToS setting of 255 (default) disables ToS priority queueing, so in this case the CoS setting would be used.

Ethernet frames with VLAN tagging use CoS-based priority queueing if both ToS and CoS are active on the card. The ToS setting is ignored. CoS based priority queueing is disabled if the CoS setting is 7 (default), so in this case the ToS setting would be used.

If the CE-100T-8 card's ToS setting is 255 (default) and the CoS setting is 7 (default), priority queueing is not active on the card, and data gets sent to the default normal traffic queue. If data is not tagged with a ToS value or a CoS value before it enters the CE-100T-8 card, it also gets sent to the default normal traffic queue.

Note   Priority queuing has no effect when flow control is enabled (default) on the CE-100T-8. When flow control is enabled, a 6-kilobyte, single-priority, first-in first-out (FIFO) buffer fills, then a PAUSE frame is sent. This results in the packet ordering priority becoming the responsibility of the external device, which is buffering as a result of receiving the PAUSE flow-control frames.

Note   Priority queuing has no effect when the CE-100T-8 is provisioned with STS-3C circuits. The STS-3c circuit has more data capacity than Fast Ethernet, so CE-100T-8 buffering is not needed. Priority queuing only takes effect during buffering.

RMON and SNMP Support

The CE-100T-8 card features remote monitoring (RMON) that allows network operators to monitor the health of the network with a network management system (NMS). The CE-100T-8 uses the ONG RMON. The ONG RMON contains the statistics, history, alarms, and events MIB groups from the standard RMON MIB. A user can access RMON threshold provisioning through TL1 or CTC. For RMON threshold provisioning with CTC, see the *Cisco ONS 15454 Procedure Guide* (NTP-A279) and the *Cisco ONS 15454 Troubleshooting Guide*, or the *Cisco ONS 15454 SDH Procedure Guide* and the *Cisco ONS 15454 SDH Troubleshooting Guide*.

Statistics and Counters

The CE-100T-8 has a full range of Ethernet and POS statistics information under **Performance > Ether Ports** or **Performance > POS Ports**.

CE-100T-8 SONET/SDH Circuits and Features

The CE-100T-8 has eight POS ports, numbered one through eight, which can be managed with CTC or TL1. Each POS port is statically mapped to a matching Ethernet port. By clicking the card-level **Provisioning > POS Ports** tab, the user can configure the Administrative State, Framing Type, and Encapsulation Type. By clicking the card-level **Performance > POS Ports** tab, the user can view the statistics, utilization, and history for the POS ports.

Available Circuit Sizes and Combinations

Each POS port terminates an independent contiguous concatenation (CCAT) or virtual concatenation (VCAT) circuit. The SONET/SDH circuit is created for these ports through CTC or TL1 in the same manner as a SONET/SDH circuit for a non-Ethernet line card. Table 22-3 and Table 22-4 show the circuit sizes available for the CE-100T-8.

Table 22-3   Supported SONET Circuit Sizes of CE-100T-8 on ONS 15454

CCAT	VCAT High Order	VCAT Low Order
STS-1	STS-1-1v	VT1.5-nV (n= 1 to 64)
STS-3c	STS-1-2v	
	STS-1-3v	

Table 22-4   CE-100T-8 Supported SDH Circuit Sizes of CE-100T-8 on ONS 15454 SDH

CCAT	VC-3 VCAT	VC-12 VCAT
VC-3	VC-3-1v	VC-12-nV (n= 1 to 63)
VC-4	VC-3-2v	
	VC-3-3v	

A single circuit provides a maximum of 100 Mbps of throughput, even when a larger STS-3c or VC-4 circuit, which has a bandwidth equivalent of 155 Mbps, is provisioned. This is due to the hardware restriction of the Fast Ethernet port. A VCAT circuit is also restricted in this manner. Table 22-5 shows the minimum SONET circuit sizes required for wire speed service delivery.

Table 22-5   Minimum SONET Circuit Sizes for Ethernet Speeds

Ethernet Wire Speed	CCAT High Order	VCAT High Order	VCAT Low Order
Line Rate 100BASE-T	STS-3c	STS-1-3v, STS-1-2v[1]	VT1.5-xv (x=56-64)
Sub Rate 100BASE-T	STS-1	STS-1-1v	VT1.5-xv (x=1-55)
Line Rate 10BASE-T	STS-1	Not applicable	VT1.5-7v
Sub Rate 10BASE-T	Not applicable	Not applicable	VT1.5-xv (x=1-6)

1. STS-1-2v provides a total transport capacity of 98 Mbps.

Table 22-6 shows the minimum SDH circuit sizes required for 10 Mbps and 100 Mbps wire speed service.

Table 22-6   SDH CIrcuit Sizes and Ethernet Services

Ethernet Wire Speed	CCAT	VC-3 VCAT	VC-12 VCAT
Line Rate 100BASE-T	VC-4	VC-3-3v, VC-3-2v[1]	VC-12-*xv* (x=50-63)
Sub Rate 100BASE-T	VC-3	VC-3-1v	VC-12-*xv* (x=1-49)
Line Rate 10BBASE-T	VC-3	VC-3-1v	VC-12-*5v*
Sub Rate 10BASE-T	Not applicable	Not applicable	VC-12-x*v* (x=1-4)

1. VC-3-2v provides a total transport capacity of 98 Mbps.

The number of available circuits and total combined bandwidth for the CE-100T-8 depends on the combination of circuit sizes configured. Table 22-7 shows the CCAT high-order circuit size combinations available for the CE-100T-8 on the ONS 15454.

Table 22-7   CCAT High-Order Circuit Size Combinations for SONET

Number of STS-3c Circuits	Maximum Number of STS-1 Circuits
None	8
1	7
2	6
3	3
4	None

Table 22-8 shows the CCAT high-order circuit size combinations available for the CE-100T-8 on the ONS 15454 SDH.

Table 22-8   CCAT High-Order Circuit Size Combinations for SDH

Number of VC-4 Circuits	Maximum Number of VC-3 Circuits
None	8
1	7
2	6
3	3
4	None

Table 22-9 shows the VCAT high-order circuit size combinations available for the CE-100T-8 on the ONS 15454.

Table 22-9   VCAT High-Order Circuit Combinations for STS-1-3v and STS-1-2v SONET

Number of STS-1-3v Circuits	Maximum Number of STS-1-2v Circuits
None	4
1	3
2	2

Table 22-9   VCAT High-Order Circuit Combinations for STS-1-3v and STS-1-2v SONET (continued)

Number of STS-1-3v Circuits	Maximum Number of STS-1-2v Circuits
3	1
4	None

Table 22-10 shows VC-3-3v and VC-3-2v circuit size combinations available for the CE-100T-8 on the ONS 15454 SDH.

Table 22-10   VCAT Circuit Combinations for VC-3-3v and VC-3-2v for SDH

Number of VC-3-3v Circuits	Maximum Number of VC-3-2v Circuits
None	4
1	3
2	2
3	1
4	None

A user can combine CCAT high-order, VCAT high-order and VCAT low-order circuits. The CE-100T-8 supports up to eight low-order VCAT circuits.

The available SONET circuit sizes are VT1.5-Xv, where X is the range from 1 to 64. A maximum of four circuits are available at the largest low-order VCAT SONET circuit size, VT1.5-64v. Table 22-11 details the maximum density service combinations for SONET.

The available SDH circuit sizes are VC-12-Xv, where X is the range from 1 to 63. A maximum of four circuits are available at the largest low-order VCAT SDH circuit size, VC-12-63v. Table 22-12 details the maximum density service combinations for SDH.

Table 22-11   CE-100T-8 Illustrative Service Densities for SONET

Service Combination	STS-3c or STS-1-3v	STS-1-2v	STS-1	VT1.5-xV	Number of Active Service
1	4	0	0	0	4
2	3	1	1	0	5
3	3	0	3	0	6
4	3	0	0	4 (x=1–21)[1]	7[1]
5	2	2	2	0	6
6	2	1	4	0	7
7	2	1	1	4 (x=1–21)[1]	8[1]
8	2	0	6	0	8
9	2	0	3	3 (x=1–28)	8
10	2	0	0	6 (x=1–28)	8
11	1	3	3	0	7
12	1	2	5	0	8
13	1	2	2	3 (x=1–28)	8

Table 22-11   CE-100T-8 Illustrative Service Densities for SONET (continued)

Service Combination	STS-3c or STS-1-3v	STS-1-2v	STS-1	VT1.5-xV	Number of Active Service
14	1	1	1	5 (x=1–28)	8
15	1	0	7	0	8
16	1	0	3	4 (x=1–42)	8
17	1	0	0	7 (x=1–42)	8
18	0	4	4	0	8
19	0	3	3	2 (x=1–42)	8
20	0	0	8	0	8
21	0	0	4	4 (x=1–42)	8
22	0	0	0	8 (x=1–42)	8

1. This low-order VCAT circuit combination is achievable if one of the first two circuits created on the card is a low-order VCAT circuit. If the first two circuits created on the card are high-order VCAT or CCAT circuits, then a maximum of three low-order VCAT circuits can be created on the card.

Table 22-12   CE-100T-8 Sample Service Densities for SDH

Service Combination	VC-4 or VC-3-3v	VC-3-2v	VC-3	VC-12-xv	Number of Active Service
1	4	0	0	0	4
2	3	1	1	0	5
3	3	0	3	0	6
4	3	0	0	3 (x=1–21)	6
5	2	2	2	0	6
6	2	1	4	0	7
7	2	1	1	3 (x=1–21)	7[2]
8	2	0	6	0	8
9	2	0	3	3 (x=1–21)	8
10	2	0	0	6 (x=1–21)	8
11	1	3	3	0	7
12	1	2	5	0	8
13	1	2	2	3 (x=1–21)	8[2]
14	1	1	1	5 (x=1–21)	8[2]
15	1	0	7	0	8
16	1	0	3	2 (x=1–32) plus 2 (x=1–31)	8
17	1	0	0	7 (x=1–28)	8
18	0	4	4	0	8

Table 22-12   CE-100T-8 Sample Service Densities for SDH (continued)

Service Combination	VC-4 or VC-3-3v	VC-3-2v	VC-3	VC-12-xv	Number of Active Service
19	0	3	3	1 (x=1–32) plus 1 (x=1–31)	8
20	0	0	8	0	8
21	0	0	4	2 (x=1–32) plus 2 (x=1–31)	8
22	0	0	0	4 (x=1–32) plus 4 (x=1–31)	8

2   These service combinations require creating the VC-12-xv circuit before you create the VC-3 circuits.

CE-100T-8 Pools

The CE-100T-8 total circuit capacity is divided among four pools. Each pool has a maximum capacity of three STS-1s with SONET or three VC-3s with SDH.

Displaying CE-100T-8 Pool Information with the STS/VT Allocation or VC4/VC LO Allocation Tab

At the CTC card-level view under the Maintenance tab, the STS/VT Allocation tab on the ONS 15454 SONET and the VC4/VC LO Allocation tab on the ONS 15454 SDH display how the provisioned circuits populate the four pools. On both screens, the POS Port table has a row for each port with three columns. They show the port number, the circuit size and type, and the pool it is drawn from. The Pool Utilization table has four columns and shows the pool number, the type of circuits in that pool, how much of the pool's capacity is being used, and whether additional capacity is available.

Figure 22-4 displays an SDH version of the tab, and Figure 22-5 displays the SONET version of the tab.

Figure 22-4   CE-100T-8 Allocation Tab for SDH

Figure 22-5   CE-100T-8 STS/VT Allocation Tab
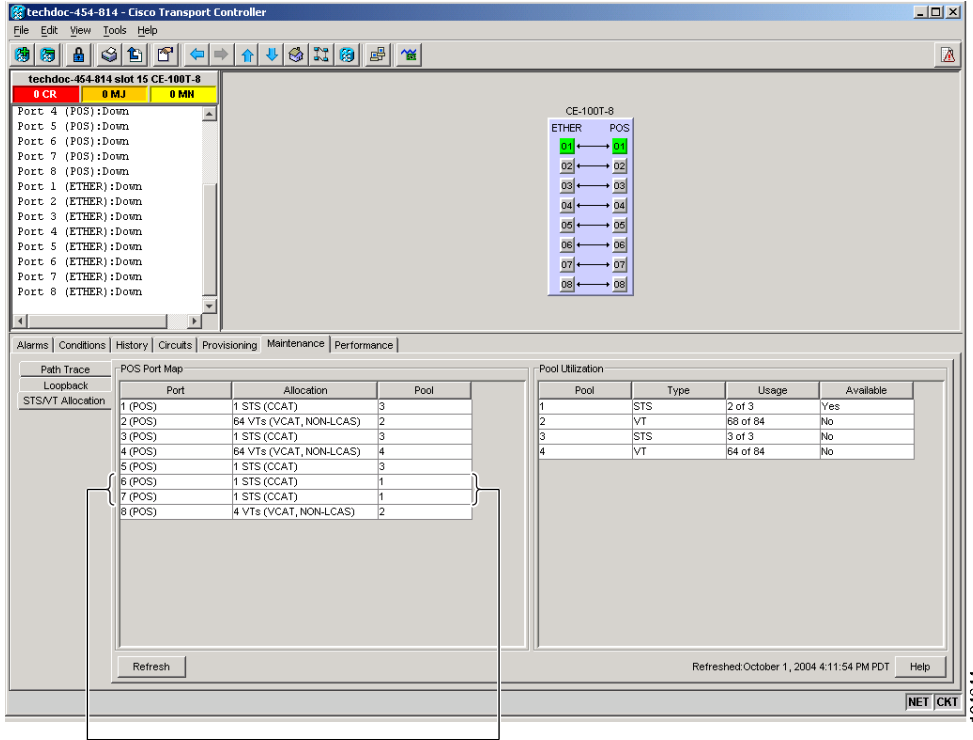
Both Port 6 and Port 7
belong to Pool 1

CE-100T-8 Pool Allocation Example

This information can be useful in freeing up the bandwidth required for provisioning a circuit if there is not enough existing capacity in any one pool for provisioning the desired circuit. The user can look at the distribution of the existing circuits among the four pools and decide which circuits to delete in order to free space for the desired circuit.

For example if a user needs to provision an STS-3c or STS-1-3v on the SONET CE-100T-8 card shown in Figure 22-5, an STS-3c or STS-1-3v worth of bandwidth is not available from any of the four pools. The user needs to delete circuits from the same pool to free bandwidth. If the bandwidth is available but scattered among the pools, the circuit cannot be provisioned. Looking at the POS Port Map table, the user can determine which circuits belong to which pools. The Pool and Port columns in Figure 22-5 show that Port 6 and Port 7 are both drawn from Pool 1, and that no other circuits are drawn from Pool 1. Deleting these two STS-1 circuits will free an STS-3c or STS-1-3v worth of bandwidth from a single pool.

If the user did not determine what circuits to delete from the table information, he might delete the STS-1 circuits on Port 3, Port 5 and Port 6. This frees an STS-3c or STS-1-3v worth of bandwidth, but the required bandwidth is not available from a single pool and the STS-3c or STS-1-3v circuit is not provisionable.

CE-100T-8 Pool Provisioning Rules

All VCAT circuit members must be from the same pool. One of the four memory pools is reserved for the low-order VCAT circuits if sufficient bandwidth exists to support the high-order circuits in the remaining three pools. The high-order CCAT circuits use all the available capacity from a single memory pool before beginning to use the capacity of a new pool. The memory pools are allocated alternatively for the first three high-order VCAT circuits if the pools have the sufficient bandwidth to support the requested circuit size. To help prevent stranding bandwidth, provision your high-order VCAT circuits first to distribute them evenly.

CE-100T-8 VCAT Characteristics

The ML-100T-8 card and the CE-100T-8 card (both the ONS 15310-CL version and the ONS 15454 SONET/SDH version) have hardware-based support for the ITU-T G.7042 standard Link Capacity Adjustment Scheme (LCAS). This allows the user to dynamically resize a high order or low order VCAT circuit through CTC or TL1 without affecting other members of the VCG (errorless).

The ONS 15454 SONET/SDH ML-Series card has a software-based LCAS (SW-LCAS) scheme. This scheme is also supported by both the ML-100T-8 card and the CE-100T-8 (both the ONS 15310-CL version and the ONS 15454 SONET/SDH version), but only for circuits with the other end terminating on a ONS 15454 SONET/SDH ML-Series card.

The CE-100T-8 card allows independent routing and protection preferences for each member of a VCAT circuit. The user can also control the amount of VCAT circuit capacity that is fully protected, unprotected, or uses Protection Channel Access (PCA) (when PCA is available). Alarms are supported on a per-member as well as per virtual concatenation group (VCG) basis.

Note The maximum tolerable VCAT differential delay for the CE-100T-8 is 48 milliseconds. The VCAT differential delay is the relative arrival-time measurement between members of a VCG.

CE-100T-8 POS Encapsulation, Framing, and CRC

The CE-100T-8 uses Cisco EoS LEX (LEX). LEX is the primary encapsulation of ONS Ethernet cards. In this encapsulation, the protocol field is set to the values specified in Internet Engineering Task Force (IETF) Request For Comments (RFC) 1841. The user can provision frame-mapped generic framing procedure (GFP-F) framing (default) or high-level data link control (HDLC) framing. With GFP-F framing, the user can also configure a 32-bit CRC (the default) or no CRC (none). When LEX is used over GFP-F it is standard Mapped Ethernet over GFP-F according to ITU-T G.7041. HDLC framing provides a set 32-bit CRC. From CTC go to CE card view and click the Provisioning >pos ports tab, to see the various parameters that can be configured on the POS ports, see "CTC Display of POS Port Provisioning Status". Various parameters like, admin state, service state, framing type, CRC , MTU and soak time for a port can be configured here. More details about the interoperability of ONS Ethernet cards, including information on encapsulation, framing, and CRC, see the "POS on ONS Ethernet Cards" chapter.

The CE-100T-8 card supports GFP-F null mode. GFP-F CMFs are counted and discarded.

CE-100T-8 Loopback, J1 Path Trace, and SONET/SDH Alarms

The CE-100T-8 card supports terminal and facility loopbacks. It also reports SONET/SDH alarms and transmits and monitors the J1 Path Trace byte in the same manner as OC-N cards. Support for path termination functions includes:

- H1 and H2 concatenation indication

- C2 signal label

- Bit interleaved parity 3 (BIP-3) generation

- G1 path status indication

- C2 path signal label read/write

- Path level alarms and conditions, including loss of pointer (LOP), unequipped, payload mismatch, alarm indication signal (AIS) detection, and remote defect indication (RDI)

- J1 path trace for high-order CCAT paths

- J2 path trace for high-order VCAT circuits at the member level

- J2 path trace for low-order VCAT circuits at the member level

- Extended signal label for the low-order paths