



Timing

This chapter provides information about Cisco ONS 15600 timing. To provision timing, refer to the *Cisco ONS 15600 Procedure Guide*.

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6.1 Timing Parameters

SONET timing parameters must be set for each ONS 15600 node. Each ONS 15600 independently accepts its timing reference from one of three sources:

- The BITS (building integrated timing supply) pins on the Customer Access Panel (CAP).
- A port on an OC-N card installed in the ONS 15600. The timing is traceable to a node that receives timing through a BITS source.
- The internal Stratum 3E clock (ST3E) on the TSC card.

You can set ONS 15600 timing to one of three modes: external, line or mixed. If the timing comes from BITS, set ONS 15600 timing to external. If the timing comes from an OC-N port, set the timing to line. If the timing comes from both BITS and OC-N port, set ONS 15600 timing to mixed. In typical ONS 15600 networks:

- One node is set to external timing. The external node derives its timing from a BITS source wired to the BITS backplane pins. The BITS source, in turn, derives its timing from a Primary Reference Source (PRS), such as a Stratum 1 clock or GPS signal.
- Other nodes are set to line timing. The line nodes derive timing from the externally timed node through the OC-N trunk cards.

You can set three timing references for each ONS 15600. The first two references are typically two BITS-level sources, or two line-level sources optically traceable to a node with a BITS source. The third reference is the internal ST3E clock provided on every ONS 15600 TSC card. If an ONS 15600 becomes isolated, the TSC maintains timing at the ST3E level.

6.2 Network Timing

Figure 6-1 shows an ONS 15600 network timing example. Node 1 is set to external timing. Two timing references are Stratum 1 timing sources wired to the BITS input pins on the Node 1 backplane. The third reference is set to internal clock. The BITS output pins on the backplane of Node 3 are used to provide timing to outside equipment, such as a digital access line access multiplexer. In the event of a failure of one of the TSC modules, the redundant TSC module provides timing for BITS out. There are some restrictions on the provisioning of BITS out:

If the system is BITS timed:

- BITS-1 Out can have one reference if a 1+1 protected pair is chosen or two references can be selected if unprotected line sources are chosen.
- BITS-2 Out can have one reference if a 1+1 protected pair is chosen or two references can be selected if unprotected line sources are chosen.

If system is LINE timed:

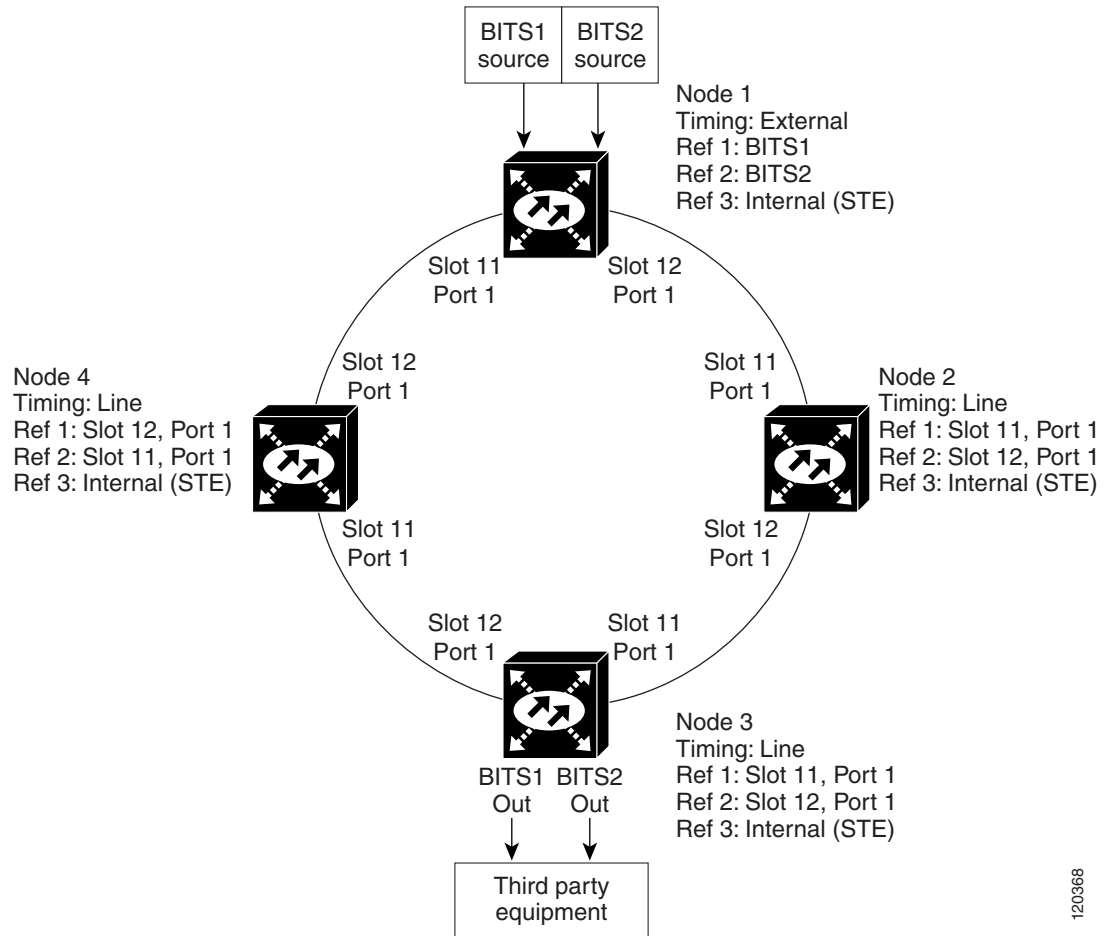
- BITS-1 Out can have one unprotected line source and either or both of the NE references.
- BITS-2 Out can have one unprotected line source and either or both of the NE references.

If the system is in mixed mode:

- BITS-1 Out can have one unprotected line source and any line source selected as NE reference Ref-1 or Ref-2.
- BITS-2 Out can have one unprotected line source and any line source selected as NE reference Ref-1 or Ref-2.

In the example, Slots 11 and 12 of Node 1 contain the trunk (span) cards. Timing at Nodes 2, 3, and 4 is set to line, and the timing references are set to the trunk cards according to the distance from the BITS source. Reference 1 is set to the trunk card closest to the BITS source. At Node 2, Reference 1 is Slot 11/Port 1 because it is connected to Node 1. At Node 4, Reference 1 is set to Slot 12/Port 1 because it is connected to Node 1. At Node 3, Reference 1 could be either trunk card because they are an equal distance from Node 1.

Figure 6-1 ONS 15600 Timing Example



6.3 Synchronization Status Messaging

Synchronization Status Messaging (SSM) is a SONET protocol that communicates information about the quality of the timing source. SSM messages are carried on the S1 byte of the SONET line layer. They enable SONET devices to automatically select the highest quality timing reference and to avoid timing loops.

SSM messages are either Generation 1 or Generation 2. Generation 1 is the first and most widely deployed SSM set. Generation 2 is a newer version. If you enable SSM for the ONS 15600, consult your timing reference documentation to determine which message set to use. [Table 6-1](#) lists the Generation 1 message set.

Table 6-1 SSM Generation 1 Message Set

Message	Quality	Description
PRS	1	Primary reference source—Stratum 1
STU	2	Synchronization traceability unknown

Table 6-1 SSM Generation 1 Message Set (continued)

Message	Quality	Description
ST2	3	Stratum 2
ST3	4	Stratum 3
SMC	5	SONET minimum clock
ST4	6	Stratum 4
DUS	7	Do not use for timing synchronization
RES	—	Reserved; quality level set by user

Table 6-2 lists the Generation 2 message set.

Table 6-2 SSM Generation 2 Message Set

Message	Quality	Description
PRS	1	Primary reference source—Stratum 1
STU	2	Synchronization traceability unknown
ST2	3	Stratum 2
TNC	4	Transit node clock
ST3E	5	Stratum 3E
ST3	6	Stratum 3
SMC	7	SONET minimum clock
ST4	8	Stratum 4
DUS	9	Do not use for timing synchronization
RES	—	Reserved; quality level set by user