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Introduction

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Introduction

This document describes how you can provision timing on ONS 15454 through Cisco Transport Controller (CTC). CTC provides two methods for you to provision timing and modify the settings:

- At the node level, you can configure timing from the **Provisioning/Timing** tab. Here, you can provision different timing modes and references for the entire node.
- At each optical port, you can change the default Synchronous Status Message (SSM) settings.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Cisco ONS 15454

Components Used

The information in this document is based on these software and hardware versions:

- Cisco ONS 15454

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Configure Timing at the Node Level

The node level comprises three configuration sections:

- General Timing
- Building Integrated Timing Supply (BITS) Facilities
- Reference Lists

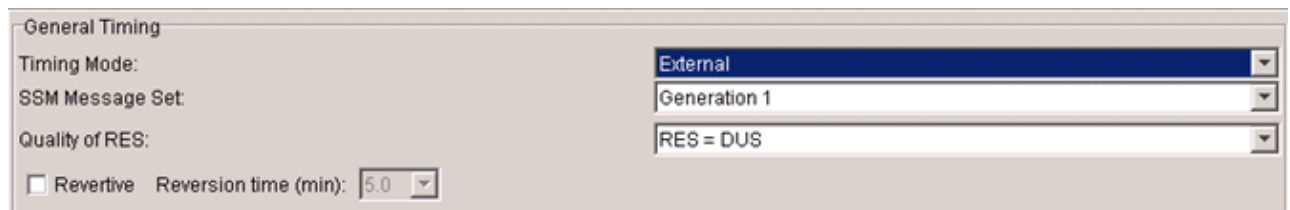
General Timing

The General Timing section defines:

- The Timing Mode for the NE.
- The SSM message set.
- The quality of RES.
- Whether Revertive timing is used.

Some options in other sections depend on the timing mode you select in this section. Figure 1 shows the default settings.

Figure 1 Provision General Timing



The screenshot shows a configuration window titled "General Timing". It contains the following fields and controls:

- Timing Mode:** A dropdown menu with "External" selected.
- SSM Message Set:** A dropdown menu with "Generation 1" selected.
- Quality of RES:** A dropdown menu with "RES = DUS" selected.
- Revertive:** An unchecked checkbox.
- Reversion time (min):** A text input field containing "5.0" with a dropdown arrow on the right.

The Timing Control Card (TCC) always acts as an SSM Generation 2 (Gen2)–capable device for incoming SSM regardless of the settings here. Through provisioning, TCC can translate Gen2 messages into Generation 1 (Gen1) messages. TCC or outputs use the translated messages. For example, assume that SSM Message Set is provisioned to be Gen1, and a Gen2 message comes in. TCC displays the Gen2 message for the inbound interface in the **Conditions** tab. However, TCC translates the message into a Gen1 equivalent message for the NE–SYNC and outputs. During Gen2 to Gen1 translation, TCC always uses a nearest lower quality message for a higher quality message. For example, TCC translates ST3E (quality level 5) into ST3 (quality level 4).

Revertive timing means that the TCC reverts to the highest priority reference with the best SSM quality level. Non–revertive timing means that the TCC chooses the best quality reference available, and does not change with regard to priority. You can define Priority in the Reference Lists section.

BITS Facilities

Use the BITS Facilities section to provision two BITS In and two BITS Out ports. In order to enable a BITS port, change the state from OOS (out of service) to IS (in service). Figure 2 shows the default settings.

Figure 2 Provision BITS Facilities for SONET

BITS Facilities		
	BITS-1	BITS-2
BITS In State:	OOS	OOS
BITS Out State:	OOS	OOS
Coding:	B8ZS	B8ZS
Framing:	ESF	ESF
Sync. Messaging:	<input checked="" type="checkbox"/> Enabled	<input checked="" type="checkbox"/> Enabled
AIS Threshold:	SMC	SMC
LBO:	0-133 ft	0-133 ft

Cisco recommends two external timing devices for redundancy. The incoming BITS signal is a 1.544 MHz DS-1 (for SONET systems) formatted as Superframe (SF) or Extended Superframe (ESF). SSM requires ESF. BITS coding and framing are applicable to both In and Out ports in releases earlier than version 5.0.

For SDH systems, BITS Facilities can be E1, 2.048 MHz, or 64 kHz. You must provision appropriate coding and framing to match the source.

Ensure that the BITS In source is Primary Reference Source (PRS) or Primary Reference Clock (PRC). Additionally, ensure that a metallic timing source, for example, a Global Positioning System (GPS) clock or a timing T1, directly delivers the BITS In source. Cisco does not recommend a regular data T1 because the 1s density cannot be guaranteed. A timing T1 is a T1 with all 1s.

When you check the **Enabled** check box for Sync. Messaging, TCC expects to receive SSM from BITS In ports. Here, the BITS source provides SSM. If a BITS source does not provide SSM capability, do not check the **Enabled** check box. When you do not enable SSM, a Sync Traceability Unknown (STU) message appears for BITS In when the clock signal is within bounds. Otherwise the Do Not Use (DUS) message appears. In release 5.0 and later, Admin SSM option is available when the clock source does not support SSM. Instead of the default STU, you can set other messages, for example, PRS.

When you do not enable BITS In SSM, the AIS Threshold option is available to alert external devices timed from BITS Out for timing failures. When the line clock quality is below the selected threshold, AIS is sent on BITS Out. The default threshold is SMC (S1 = 1100) for DS1 and G812L (S1 = 1000) for 2 MHz. Cisco recommends Synchronous Equipment Timing Supply (SETS) so that any signal with quality above or equal to SETS does not result in an absence of signal. AIS is unframed all 1s signal for DS1 and no signal for 2 MHz.

BITS Out SSM derives from the SSM of the active line, and always sends SSM if the facility supports SSM. If the SSM values of the lines are DUS, BITS Out sends DUS. If you disable SSM for the active line (at the port level), BITS Out sends STU.

Reference Lists

The Reference Lists section enables you to configure timing references and BITS Out source. You can configure the priority of each reference. The priority can range from Ref-1, also called Primary Reference, with the highest priority, to Ref-3, or Third Reference, with the lowest priority (see Figure 3).

Figure 3 Provision Reference Lists

Reference Lists			
	NE Reference	BITS-1 Out	BITS-2 Out
Ref-1:	BITS-1	slot 6 (OC48), port 1	slot 6 (OC48), port 1
Ref-2:	BITS-2	slot 12 (OC48), port 1	slot 12 (OC48), port 1
Ref-3:	Internal Clock	None	None

This table indicates that the available options in the references depend on the Timing Mode selected earlier:

Timing Mode	Reference Options
External	BITS1, BITS2, Internal clock
Line	Any synchronous IO port(s), Internal clock
Mixed	BITS1, BITS2, any synchronous IO port(s), Internal clock

Note: When you provision 1+1 protection between two optical ports, you can provision only the working port as a timing reference. The protect port is automatically selected during a switch.

When a port is selected for timing, EnableSyncMsg is checked on that IO port (see the Configure Timing at the Optical IO Card Level section). Also note that to delete a card from the chassis, you cannot provision the ports on that card as a reference.

For BITS Out references, select the synchronous IO ports as the source. Options for BITS Out are IO ports, NE Reference, or None.

Use the **Maintenance/Timing** tab to monitor the status and conditions of references. Figure 4 shows a sample output.

Figure 4 Reference Status Report

Timing Report								
Timing Status Report for Node AS206 10/21/04 15:44:47 CDT Timing Mode: Line								
Clock: NE		Status: HOLDOVER_STATE		Status Changed At: 10/21/04 15:30:01 CDT			Switch Type: AUTOMATIC	
Reference	Selected	Facility	State	Condition	Condition Changed	SSM	SSM Quality	SSM Changed
1		slot 12 (OC48), port 1	IS	OKAY	10/21/04 15:25:03 CDT	Enabled	DUS	10/21/04 15:44:07 CDT
2	X	Internal Clock	IS	OKAY	10/20/04 16:12:42 CDT	Disabled	ST3	10/21/04 15:44:47 CDT

The report displays the Timing Mode of Line at the top. The NE clock section indicates that the current clock status is Holdover. The reference section contains an X in the Selected column to indicate the current NE reference. The Condition column displays the current reference quality as OKAY. If the reference quality is not OKAY, this column displays OOB (Out of Bounds). The SSM column shows the SSM processing status, and the SSM Quality column indicates the message type. The internal clock does not process incoming SSM. Therefore, the SSM column displays the value 'disabled'.

You can also perform manual reference switching in the **Maintenance/Timing** tab. User-initiated protection request commands can be of two types:

- **Forced Switch** A Forced Switch request against the active reference switches to a valid reference, even if the new reference has a worse SSM value.
- **Manual Switch** A Manual Switch request against the active (or selected) reference causes a reference switch to the standby reference. However, the switch occurs only if the standby reference is healthy and has the same quality level as the active reference.

Configure Timing at the Optical IO Card Level

Each optical IO card has four settings relevant to synchronization for each port (see Figure 5):

- **ProvidesSync:** The ProvidesSync check box is automatically checked if you configure that port as one of the line timed references. If so, you cannot uncheck this option in the Port Provisioning window (display only).
- **EnableSyncMsg:** The EnableSyncMsg check box is checked by default. You can uncheck this option to turn off SSM. Incoming SSM is processed by default. This setting does not affect outgoing SSM (always enabled).
- **Send DoNotUse:** The Send DoNotUse check box is not checked by default. You can check this option to always send DUS.
- **State:** The State column indicates whether a port is IS or OOS. If a port is OOS, the port is not used for line timing reference.

Figure 5 Provision Port Level Timing

Port #	Port Name	SF BER	SD BER	ProvidesSync	EnableSyncMsg	Send DoNotUse	PJSTSMon#	State	AINS Soak	Type
1		1E-4	1E-7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Off	IS	08:00 (H:M)	SONET

If you uncheck EnableSyncMsg, an SSM-OFF condition occurs for the port. You can observe the change in the **Maintenance/Timing** tab. The SSM-STU condition occurs if the reference is good. DUS occurs if the reference fails. When you disable SSM, timing loops can occur. If the remote port is to send DUS, the receiving port continues to consider the remote port as a potential reference when you disable SSM. Cisco strongly recommends that you retain the default setting (SSM enabled) unless there are specific reasons that require SSM to be disabled.

If two optical ports are in a 1+1 protection group, you can change card-level timing settings only on the working port. The protect port automatically reflects any changes you make on the working port.

Whenever you select a port as the active timing reference for a node, reference is always sent back to the upstream node automatically. This is part of the SSM mechanism, and requires no configuration.

A downstream node can report DUS when Send DoNotUse is enabled on the sending port of an upstream node, and EnableSyncMsg is enabled on the receiving port. If you enable Send DoNotUse, the port is never used as a timing source for the downstream node. Therefore, do not enable Send DoNotUse, unless you use a lab setup, or some special setup where you need to cross network boundaries. For example, Cisco recommends that you transmit DUS between two carriers and from customers to carriers.

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Related Information

- **Technical Support & Documentation – Cisco Systems**

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