# Release Notes for Cisco ONS 15454 SDH Release 4.7

**September, 2004**

Release notes address closed (maintenance) issues, caveats, and new features for the Cisco ONS 15454 SDH multiplexer. For detailed information regarding features, capabilities, hardware, and software introduced with this release, refer to the "Release 4.7" version of the of the *Cisco ONS 15454 DWDM Installation and Operations Guide,* and *Cisco ONS 15454 SONET and DWDM Troubleshooting Guide.* For the most current version of the Release Notes for Cisco ONS 15454 SDH Release 4.7, visit the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/ong/15454sdh/sdhrelnt/index.htm

Cisco also provides Bug Toolkit, a web resource for tracking defects. To access Bug Toolkit, visit the following URL:

http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl

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# Changes to the Release Notes

This section documents supplemental changes that have been added to the *Release Notes for Cisco ONS 15454 SDH Release 4.7* since the production of the Cisco ONS 15454 SDH System Software CD for Release 4.7.

No changes have been added to the release notes for Release 4.7.

# Caveats

Review the notes listed below before deploying the ONS 15454 SDH. Caveats with DDTS tracking numbers are known system limitations that are scheduled to be addressed in a subsequent release. Caveats without DDTS tracking numbers are provided to point out procedural or situational considerations when deploying the product.

## Hardware

### DDTS # CSCed18803

Rarely, the Muxponder unit does not pass Jitter Tolerance test from Trunk port to client port as per ITU-T G.825, 2 Mb/s mask, at the 10 Hz specific setpoint. The Muxponder should be configured with G.709 Off, FEC Off and Trunk signal provided by external Jitter test box, and the unit client port output monitored for errors, to see this issue. This issue will be resolved in a future release. Note, however, that in normal network configurations the muxponder is operated with G.709 and FEC turned on, and the jitter tolerance tests pass.

### DDTS # CSCuk48503

Under specific conditions the MXPD does not pass the Telcordia GR-253/G.825 Jitter generation mask test on 10G TX Trunk port. The 2.5 G TX Client jitter generation is always within mask and does not exhibit this issue. This occurs only when, in SONET mode, there is no FEC, no G.709, and client interfaces are looped back, with non-synchronous clocking, and the jitter testbox TX connected to Trunk RX port, while the jitter testbox RX is connected to the Trunk TX port. The jitter testbox TX clock recovers from RX with an additional 5 ppm offset added. This issue will be resolved in a future release.

### DDTS # CSCea78210

The TXP_MR_2.5G and TXPP_MR_2.5G cards do not support TX Optical power performance monitoring on the trunk port. To see this, go to the Optics Performance Monitoring tab of the TXP_MR_2.5G or TXPP_MR_2.5G card, and select the trunk port. TX Optical Pwr is not shown.

# DWDM Cards

## DDTS # CSCef15415

RMON TCAs are not raised on the TXPP_MR_2.5G client port after a hardware reset. To see this issue, provision two nodes with TXPP_MR_2.5G (TXP-1 and TXP-2) as follows.

**Step 1** Connect the TXP-1 DWDM-A trunk to the TXP-2 DWDM-A trunk.

**Step 2** Connect the TXP-1 DWDM-B trunk to the TXP-2 DWDM-B trunk.

**Step 3** Create an external fiber loopback on the TXP-1 client.

**Step 4** Connect the TXP-2 client to a traffic generator.

**Step 5** Provision 1G FC payload on the TXP-1 and TXP-2.

**Step 6** Ensure that traffic is running smoothly.

**Step 7** Provision RMON thresholds using TL1 for all TXPP_MR_2.5G ports (client and trunks).

**Step 8** Apply a hardware reset to the TXPP_MR_2.5G.

After the card reboots, only DWDM-A and DWDM-B (trunk) port RMON TCAs are raised in the CTC History pane. RMON TCAs for port 1 (client) are not raised. This issue will not be resolved.

## DDTS # CSCef15452

RMON TCAs are not raised when the RMON history is cleared on TXPP_MR_2.5G card. To see this issue, provision two nodes with TXPP_MR_2.5G (TXP-1 and TXP-2) as follows.

**Step 1** Connect the TXP-1 DWDM-A trunk to the TXP-2 DWDM-A trunk.

**Step 2** Connect the TXP-1 DWDM-B trunk to the TXP-2 DWDM-B trunk.

**Step 3** Create an external fiber loopback on the TXP-1 client.

**Step 4** Connect the TXP-2 client to a traffic generator.

**Step 5** Provision 1G FC payload on the TXP-1 and TXP-2.

**Step 6** Ensure that traffic is running smoothly.

**Step 7** Provision RMON thresholds using TL1 for all TXPP_MR_2.5G ports (client and trunks).

**Step 8** While the traffic is running reset the RMON history by clicking the Clear button in the CTC Payload PM pane.

RMON TCAs are not raised for any port. This issue will not be resolved.

## DDTS # CSCef18649

LDCC and MS-DCC do not work at OC12/STM4 line rates (client and trunk side). Use SDCC or RS-DCC (D1..D3) at OC12/STM4 line rates. This issue will be resolved in a future release.

## DDTS # CSCef37516

Port LEDs remains red with no alarms reported in the following scenario.

**Step 1** For two nodes with TXP_MR_2.5G (TXP-1 and TXP-2):

**Step 2** Connect the TXP-1 trunk to the TXP-2 trunk.

**Step 3** Connect the TXP-1 and TXP-2 clients to a traffic generator.

**Step 4** Provision STM16 payload for TXP-1 and TXP-2.

**Step 5** Provision TXP-1 and TXP-2 in transparent mode with G.709 on.

**Step 6** Enable Manual ALS for TXP-1 and TXP-2.

**Step 7** Ensure that traffic is up and running.

**Step 8** For TXP_MR_2.5G TXP-1 and TXP-2 nodes remove the Pluggable Port Modules (PPMs) and replace them with GIGE/FC PPMs.

**Step 9** Connect a traffic generator to the TXP_MR_2.5G TXP-1 client and loop back the TXP_MR_2.5G TXP-2 client with an external fiber.

**Step 10** On the TXP_MR_2.5G TXP-1 node, set the client and trunk ports to OOS state.

**Step 11** Using CTC, delete the STM16 PPM and provision a GIGE PPM payload.

**Step 12** Set the client and trunk ports to IS state.

**Step 13** Repeat the same operation on the TXP_MR_2.5G in the TXP-2 node.

When you have completed these steps and traffic is up and running, CTC shows that there are no alarms or conditions, while the client and trunk LEDs are still red. To recover from this state, perform a hardware reset on the affected card. This issue will be resolved in a future release.

## DDTS # CSCef43317

For TXP-MR-2.5G cards, the LCD panel displays five wavelengths instead of four. The fifth wavelength is a duplicate of the fourth. This issue will be resolved in a future release.

## DDTS # CSCef53322

The MXP_2.5G_10G Client fails to indicate a bad signal, or LOS. To see this issue, complete the following steps.

**Step 1** Set up two ONS 15454 SDH nodes with STM16 SNCP (STM16-1 and STM16-2) (call the nodes STM16-1 and STM16-2).

**Step 2** Set up two ONS 15454 SDH nodes with MXP_MR_2.5G_10G (call the nodes MXP-1 and MXP-2).

**Step 3** Place MXP-1 and MXP-2 in Transperent Termination Mode.

**Step 4** Ensure that STM16-1 is connected to MXP-1 client 1.

**Step 5** Ensure that STM16-2 is connected to MXP-2 client 1.

**Step 6** Ensure that MXP-1 trunk is connected to MXP-2 trunk.

**Step 7** In MXP-1, change MXP-1 MXP_MR_2.5G_10G Client 1 and Trunk port states to

**Step 8** UNLOCKED-AUTOMATIC-IN-SERVICE. Set the Automatic in Service Timer to 15 min for

**Step 9** Client 1 and the Trunk port. CTC displays decrementing of the Automatic in Service Timer in node view > **Maintenance** > **AINS Soak** tab.

**Step 10** Remove the receive fiber of both the Client 1 and Trunk ports. The trunk port Automatic in Service Timer indicates a Bad Signal.

The client port Automatic in Service Timer continues to count and fails to indicate the Bad Signal even when not receiving any signal. After 15 minutes the client port changes its state to UNLOCKED. This issue will be resolved in a future release.

## DDTS # CSCuk47128

With low rate Signal Degrade on the main trunk port, you might see a constant switch oscillation on a splitter protected 2.5g multirate transponder card when the protection is set to revertive and FEC is off. This issue can be reproduced in the following way:with the following steps.

**Step 1** Set the splitter protection group to revertive, with revertive time set to 30 secs (less than 2 mins).

**Step 2** Enable G.709, but configure FEC to off. Payload is SONET/SDH.

**Step 3** Set the SD BER threshold to 1E-8 or lower.

**Step 4** Inject SD on the (active) main trunk port at a constant bit rate of 1E-8.

The splitter switches to the protect trunk port. This switch is due to SD but there is no corresponding alarm in CTC, since it clears immediately after the switch occurs. As a result of this switch, the error counts reset and begin accumulating again on both the trunk ports.

**Note** It can take around 2 mins for the error counts to accumulate enough to raise a Signal Degrade defect again on the main trunk port (for a rate of 1E-8).

After 30 seconds, the splitter switches back to the main trunk port because of the revertive time period provisioned.

When the error counts on the main trunk port accumulate enough, SD is declared and the switch cycle repeats itself continuously.

To work around this issue, set the revertive time to a time period longer than the time required to accumulate errors and raise SD, corresponding to the SD BER threshold provisioned. If you use the default SD BER threshold of 1E-7, you might avoid this issue. This issue will be resolved in a future release.

## DDTS # CSCuk52818

An unsupported state for the PPM module is reported when upgrading the software from Release 4.6.1 to 4.7. This can occur when you preprovision a TXP_MR_2.5G card using Release 4.6.1, insert in a different card in the preprovisioned slot, then activate to Release 4.7 from CTC. The PPM reports IS,AINS/OOS-AUMA,UAS&UEQ, which is not aa allowed state. The correct state should be IS,AINS/OOS-AUMA,UEQ.

To recover from this incorrect state reporting, manually delete the PPM and recreate it. This issue will be resolved in a future release.

## DDTS # CCSCef50726

Receive client fiber removal can cause a switch from the protect to the active in a TXPP_MR_2.5G. To see this issue, perform the following steps.

**Step 1** Set up two nodes with TXPP_MR_2.5G (call the nodes TXP-1 and TXP-2).

**Step 2** Ensure that TXP-1 DWDM-A trunk is connected to TXP-2 DWDM-A trunk with a 100 Km span.

**Step 3** Ensure that TXP-1 DWDM-B trunk is connected to TXP-2 DWDM-B trunk with a 0 Km span.

**Step 4** Ensure that TXP-1 client has an external fiber loopback.

**Step 5** Connect the TXP-2 client to a traffic generator.

**Step 6** Provision TXP-1 and TXP-2 with FICON 1G payload.

**Step 7** Ensure that traffic is running smoothly on the protected span.

**Step 8** Remove the receive client fiber at the near end.

This causes the far end trunk to switch from protect to working span. Similarly, removal of the receive Client fiber at far end causes the near end trunk to switch from the protect to the working span. (Note that the traffic is already lost due to the receive client fiber pull.) To work around this issue, manually switch via CTC from the working to the protect span. This issue will be resolved in a future release.

## DDTS # CCSCef13304

Incorrect ALS initiation causes a traffic outage on an FC payload. This issue can be seen by performing the following steps.

**Step 1** Set up two nodes with TXPP_MR_2.5G (call these nodes TXP-1 and TXP-2).

**Step 2** Connect the TXP-1 DWDM-A trunk to the TXP-2 DWDM-A trunk.

**Step 3** Connect the TXP-1 DWDM-B trunk to the TXP-2 DWDM-B trunk.

**Step 4** Provision the TXP-1 client with an external fiber loopback.

**Step 5** Connect the TXP-2 client to a traffic generator.

**Step 6** Ensure that TXP-1 and TXP-2 have 1G FC payload provisioned.

**Step 7** Enable ALS on TXP-1 trunk port and set it to "Manual Restart."

**Step 8** When traffic is running, remove the receive and transmit fibers on TXP1 port 1 (client). Traffic goes down and shutdown on TXP-1 port 2 (trunk) displays "No."

**Step 9** Reconnect the fibers for TXP-1 port 1 (client).

ALS is now initiated on TXP-1 port 2 (trunk) and the laser shuts down. Traffic never comes back.

**Note** This issue is restricted to the TXPP_MR_2.5G card.

To recover from this situation, perform a manual restart or disable the ALS in this configuration. This issue will not be resolved.

## DDTS # CSCef56765

On the TXP-MR-2.5G and TXPP-MR-2.5G a force switch is dropped when the working card soft resets. To see this issue, perform the following steps.

**Step 1** Starting with two nodes, set up Node 1 with two transponder cards: Txp1 and Txp2.

**Step 2** Set up Node 2 with two transponder cards: Txp3 and Txp4.

**Step 3** Provision Nodes 1 and 2 Y-Cable protection, revertive 0.5 min.

**Step 4** Provision Txp1 and Txp3 as working cards.

**Step 5** Provision two DWDM links, DWDM1 and DWDM2, connecting Node 1 with Node 2, where

**Step 6** DWDM1 is working, and DWDM2 is protect.

**Step 7** Place the transponder cards in transparent mode with OTN on.

**Step 8** Ensure that the payload type is 2G FICON.

**Step 9** On Node 1 apply a force switch to protect, ensuring that traffic switches. The client LED on TXP2 will be green and TXP1 LEDs will not glow.

**Step 10** Soft reset TXP1.

As a result, the force switch will clear. This issue will be resolved in a future release.

## DDTS # CSCef47092

If you preprovision two MXP_MR_25G cards such that client ports 1 and 2 of these two cards are configured with FC1G payload and have distance extension disabled, after creating a Y-Cable on port 1, it is impossible to enable distance extension on port 2. This issue will be resolved in a future release.

## DDTS # CSCuk51184

When downloading Release 4.7 nodes with Release 4.6 installed, The 15454-32MUX-O and 15454-32DMX-O report an AWG Temperature fail low alarm that subsequently clears. This also occurs when downgrading from Release 4.7 to Release 4.6, where the AWG Temperature alarm fail ishigh. This issue cannot be resolved.

## DDTS # CSCec22885

AS-MT is not enabled in Port 3 when a loopback is applied. To see this issue, on the TXPP card, make the following 3 changes before clicking Apply:

**Step 1** Change Port 2 to OOS-MT from IS.

**Step 2** Change Port 3 to OOS-MT from IS.

**Step 3** Change Port 2 to facility or terminal loopback.

Now, when you click Apply, CTC issues the error message: "Error applying changes to row2 peer trunk port must not be IS." Port 3 is still IS and the loopback changes are not applied. You must place Port 3 in the OOS-MT state, apply the changes, and then change the loopback to recover.

This error occurs only when all three of the above changes are attempted at the same time.

To avoid this issue, first change both the trunk ports to OOS-MT, click Apply, and then place port 2 in loopback and click Apply again. This issue will be resolved in a future release.

## DDTS # CSCed76821

With Y-cable provisioned for MXP-MR-2.5G cards, if you remove the client receive fiber on one side, the far end takes greater than 100 ms to switch away from the affected card. It is not known or has not been determined when or if this issue will be resolved.

## DDTS # CSCef44939

Under certain conditions you may be unable to provision an Express Order Wire (EOW) circuit using an MXP_2.5G_10G or TXP_MR_10G card trunk port. This can occurs as follows.

**Step 1** Provision an MXP_2.5G_10G or TXP_MR_10G card within a node.

**Step 2** Disable OTN.

**Step 3** Provision DCC on both client and trunk ports.

**Step 4** Go to the Network view **Provisioning > Overhead Circuits** tab.

During the EOW circuit provisioning only the MXP/TXP client ports are listed for the selection. This issue will not be resolved.

## DDTS # CSCuk51185

After a soft reset of an OSCM or OSC-CSM card, a CONTBUS-IO alarm is raised. This issue will not be resolved.

## DDTS # CSCuk50144

Neither E1 nor E2 circuits are available for EOW circuits on TXP_MR_2.5 TXT in Section and Line Termination mode. This issue will be resolved in a future release.

## DDTS # CSCee45443

When the FICON bridge does not receive the expected number of idle frames between data packets it will transition to SERV MODE. This issue will be resolved in a future release.

## DDTS # CCSCef18649

LDCC and MS-DCC do not work at OC12/STM4 line rate on the client or trunk side. Use SDCC or RS-DCC (D1..D3) at OC12/STM4 line rates. This issue will be resolved in a future release.

## DDTS # CCSCef22599

In Release 4.7 it is not possible to configure a Y-Cable protection group when DE is enabled. This issue will be resolved in a future release.

## DDTS # CSCec40684

After a database restore TXPP trunk ports might report SF, resulting in a traffic outage. The SF occurs when you restore the database and then put the port OOS for DWDM cards; then the operating mode in the database is different from the current operating mode. To avoid this issue, either put the DWDM port OOS before restore the database, or, after restoring the database, reset the DWDM cards. This issue will not be resolved.

## DDTS # CSCec51270

Far end traffic does not switch in line termination mode with .G709 off. This can occur with non-revertive Y-cable, and DCC enabled, under certain specific conditions. To avoid this issue, turn on .G709 when in line mode. This issue will not be resolved.

## DDTS # CSCuk42668

TXP-MR-2.5G F1-UDC may not be passed through in a line-terminated configuration with OTN off. This can occur with clean, OC-3/STM-1, line-terminated traffic, with OTN disabled, when you create a D1-D3 tunnel, a D4-D12 tunnel, and an F1-UDC from client to client. This issue will not be resolved.

## DDTS # CSCuk42752

If you go to the Overhead Circuits Tab in network view and select any User Data, F1 or User Data D4-D12 circuit type, no nXP cards are available for selection in the Endpoints. However, user Data type circuits can still be made end-to-end (where “end-to-end” refers to external cards, such as AIC to AIC) if the nXP cards are put in Transparent mode. It is not known when or if this issue will be resolved.

## DDTS # CSCeb49422

With TXPP cards, a traffic loss up to six seconds can occur during a DWDM protection switch. This behavior may be exhibited during protection switches by certain third-party fiber channel switches due to loss of buffer credits resulting in a reconvergence of the fiber channel link. This issue is under investigation.

## DDTS # CSCeb53044

The 2G Fiber Channel (FC) payload data type in the TXP_MR_2.5G and TXPP_MR_2.5G cards does not support any 8B/10B Payload PM monitoring.

## DDTS # CSCeb32065

Once engaged, the ALR will not restart on the trunk lines of a TXP or TXPP card. This occurs whenever ALR engages on the trunk lines of a TXP or TXPP card and the recover pulse width is provisioned to less than 40 seconds. This is a function of the trunk laser turn-on time, and the limiting recovery pulse width will vary by card. To avoid this issue, provision the pulse width to 40 seconds or more.

## DDTS # CSCeb37346

Near end and far end PMs might increment simultaneously on TXPP-2.5G cards. This can occur when two nodes have TXPP-2.5G cards and two nodes have STM16 cards in a four node network, where both TXPP-2.5G cards have STM16 SFPs on them, and are in MS (Line Termination) mode. By default, the TXPP-2.5G cards are in Splitter protection: the first DWDM port is working and the second is protect. If you remove the receive fiber of the first DWDM port on one TXPP-2.5G card, both near and far end counts begin to increment. The far end counts should not increment in this case. This issue is seen only when the Txpd cards have G709 and FEC on. If the cards have G709 and FEC off, only the near end counts will increment, as expected.

## DDTS # CSCeb26662 and CSCea88023

With TXP-MR-2.5G cards, when the current 1 day Optics PM rolls over, the information is inaccurate. This issue will not be resolved.

## DDTS # CSCuk42588

With ALS mode configured as “Auto Restart” or “Manual Restart,” it is possible the ALS Pulse Duration Recovery time can be set to values out of ITU-T recommendation G.664. You can use values out of the range defined in ITU-T recommendation G.664 only in order to interoperate with equipment that lasers cannot turn on or off within the required pulse time. To stay within the specification, you can set this value to 2 seconds and up to 2.25 seconds.

## DDTS # CSCea81219

On the TXPP, the default value for Tx Power High for TCAs & Alarms is too high for the trunk ports. Since Tx Power TCA and Alarm are not supported for trunk ports, this caveat is for informational purposes only.

## DDTS # CSCeb24815

With TXP-MR-2.5G cards, ratios are calculated incorrectly after clearing statistics. This is because after you clear statistics the entire time period becomes invalid. Once the time period rolls over again, values will be reliable for the new period.

## DDTS # CSCeb27187

During a Y-Cable protection switch, the client interface sends 200,000 to 300,000 8B/10B errors towards the attached Catalyst 3550 switch. The switch reacts to this large amount of 8B/10B errors by reinitializing the interface and spanning tree. The end result is that a protection switch can lead to a 30-45 second traffic hit if the switch is running spanning tree (default mode). This is expected behavior.

### DDTS # CSCea87290

In a Y-Cable protection group, if GCCs are defined on both cards, both cards' active LEDs will be green.

### DDTS # CSCeb12609

For the TXPP, attenuating Port 2 Rx signal, SD, and SF alarms are not declared before LOC is raised. This is due to the intrinsic design of the optical interface, which allows required BER performances with dispersion and OSNR penalties.

This can occur when Port 2 is in back to back or has low dispersions and high OSNR.

### DDTS # CSCea68773

The ACTV/STBY LED shows AMBER when a 2.5G transponder is first connected. The DWDM cards introduced a new design: When all the ports are OOS on a card, the card is considered to be in standby mode.

## Line Cards

### Ethernet Polarity Detection

The TCC2 does not support Ethernet polarity detection. The TCC+ and TCCI both support this feature. If your Ethernet connection has the incorrect polarity (this can only occur with cables that have the receive wire pairs flipped), the TCC+/I will work, but the TCC2 will not. In this event, a standing condition, “LAN Connection Polarity Reverse Detected” (COND-LAN-POL-REV), will be raised (a notification will appear on the LCD, and there will be an alarm raised). This issue will most likely be seen during an upgrade or initial node deployment. To correct the situation, ensure that your Ethernet cable has the correct mapping of the wire wrap pins. For Ethernet pin mappings, consult the “DLP-A 21 Install LAN Wires on the Backplane” procedure in the user documentation.

### Active TCC2 Card Removal

Active TCC2 cards should not be removed. If the active TCC2 card must be removed, to minimize network interruption you can first perform a lockout on all circuits that originate from the node whose active TCC2 will be removed (performing a lockout on all spans will also accomplish the same goal). No lockout is necessary for switches initiated through CTC.

**Caution** If you mistakenly remove an active TCC2 card and you subsequently lose traffic on some interface cards, you may need to physically reset these cards if they fail to regain traffic.

## Maintenance and Administration

**Caution** VxWorks is intended for qualified Cisco personnel only. Customer use of VxWorks is not recommended, nor is it supported by Cisco's Technical Assistance Center. Inappropriate use of VxWorks commands can have a negative and service affecting impact on your network. Please consult the troubleshooting guide

for your release and platform for appropriate troubleshooting procedures. To exit without logging in, enter a Control-D (hold down the Control and D keys at the same time) at the Username prompt. To exit after logging in, type “logout” at the VxWorks shell prompt.

**Note** Release 4.7 supports DWDM applications only. Upgrades to Release 4.7 are supported only for nodes running Release 4.5 or 4.6.x DWDM.

## DDTS # CSCef53317

A traffic hit can occur during a clock reference switch. To see this issue, complete the following steps.

**Step 1** Set up two ONS 15454 SDH nodes with STM16 SNCP (call the nodes STM16-1 and STM16-2).

**Step 2** Set up two ONS 15454 SDH nodes with MXP_MR_2.5G_10G (call the nodes MXP-1 and MXP-2).

**Step 3** Place MXP-1 and MXP-2 in Transperent Termination Mode.

**Step 4** Ensure that STM16-1 is connected to MXP-1 client 1.

**Step 5** Ensure that STM16-2 is connected to MXP-2 client 1.

**Step 6** Ensure that MXP-1 trunk is connected to MXP-2 trunk.

**Step 7** Connect a traffic generator to MXP_MR_2.5G_10G Port 3 (client) of MXP-1 and feed a PRC clock.

**Step 8** Set MXP-1 Clock Reference 1 to MXP_MR_2.5G_10G Port 3, leaving the other two clock references as INTERNAL.

**Step 9** Provision circuits such that a combination of VC4-4C, VC12, VC3 and VC4 traffic flows between STM16-1 and STM16-2 through MXP-1 and MXP-2.

**Step 10** Gradually inject increasingly negative frequency offset through the traffic generator, in steps of 3 ppm, where you perform the next decrement step only when the node returns to NORMAL state.

When the clock offset reaches around 17 ppm, Clock Reference 1 fails and MXP-1 switches to Clock Reference 2. During the clock switch a traffic hit might occur for less than one second. The same is behavior can occur when injecting positive frequency offset. This issue will be resolved in a future release.

## DDTS # CSCef53655

When importing an NE default file, errors are raised for the following defaults.

- FC-MR.config.port.distanceExtension.NumGFPBuffers
- MXP-MR-2_5G.config.fc.distanceExtension.NumGFPBuffers

This issue will be resolved in a future release.

## DDTS # CSCuk49106

The amplifier gain set point shown by CTC and the actual measured amplifier gain differ. The following steps illustrate this issue.

**Step 1** Reduce the insertion loss of the span just before the amplifier.

**Step 2** Execute the APC procedure.

The APC procedure does not check consistency between the gain set point and the real gain, but rather only verifies the amplifier total output power. As a workaround, manual setting can be performed to align these values, although the discrepancy does not impact the normal functioning of the amplifier. This issue will be resolved in a future release.

## DDTS # CSCuk52184

Rarely, after having completed an ONS 15454 MSTP network installation in which all nodes in the network are installed, and Automatic Node setup is provisioned and run, the Optical channel network connection provisioning operation does not go to a final state. OCHCH remains in OOS-AINS state. To recover from this issue, soft reset all nodes in the affected network. This issue will be solved in a future release.

## DDTS # CSCuk52850

In a fiber cut scenario on the LINE-RX, with OSC and channels provisioned, transient LOS-P or LOS-O alarms might be raised. This issue will be resolved in Release 5.0.

## DDTS # CSCuk52914

Reports of the ports regulated by APC contain some useless ports. The wrong ports are the Channel RX ports of MUX, WSS and AD-xC boards. The behavior is common to the CTC and TL1 interfaces. A MUX, WSS, or AD-xC board must be present in the system and a circuit be provisioned passing through them to see this issue. This issue will be resolved in Release 5.0.

## DDTS # CSCef56986

In a Y-Cable protection group, a force switch is incorrectly displayed when the node is powered down. To see this issue, perform the following steps.

**Step 1** Starting with two nodes, set up Node 1 with two transponder cards: Txp1 and Txp2.

**Step 2** Set up Node 2 with two transponder cards: Txp3 and Txp4.

**Step 3** Provision Nodes 1 and 2 Y-Cable protection, revertive 0.5 min.

**Step 4** Provision Txp1 and Txp3 as working cards.

**Step 5** Provision two DWDM links, DWDM1 and DWDM2, connecting Node 1 with Node 2, where

**Step 6** DWDM1 is working, and DWDM2 is protect.

**Step 7** Place the transponder cards in transparent mode with OTN on.

**Step 8** Ensure that the payload type is 2G FICON.

**Step 9** On Node 1, apply a force switch to protect, ensuring that traffic switches. The client LED on TXP2 will be green and TXP1 LEDs will not glow. The working card will be standby and the protect card will be active.

**Step 10** Power down the node.

**Case 1**: After the node comes up CTC displays the working card as active and protect card as standby. The force switch is still, however, in place.

**Case 2**: The force switch is cleared. This case is less frequent.

This issue will be resolved in a future release.

## DDTS # CSCuk53088

A splitter protect group might incur a double switch when the protect trunk port is placed in service. The double switch will occur if the working trunk port is already in service and is currently incurring alarms or defects. When the protect trunk is placed in service it will become active. If there are any defects on the trunk (for example, no receive signal) the splitter will immediately switch back to working.

**Note** The double switch will not occur if the working port is error-free.

Apply a FORCE-TO-WORKING or a LOCKOUT-OF-PROTECT switch command before placing the protect trunk in service to avoid this issue. This issue will be resolved in Release 5.0.

## DDTS # CSCef54670

The SQUELCHED condition is not raised when a card is in MS termination mode. To see this issue perform the following steps.

**Step 1** Set upone ONS 15454 SDH node with MXP_2.5G_10G (MXP-1).

**Step 2** Provision MXP-1 Port 1 (client) with any payload.

**Step 3** Set MXP-1 Port 1 (client) and Port 5 (trunk) to the UNLOCKED state.

LOS and LOS-P alarms are reported on MXP-1 Port 1 (client). The SQUELCHED condition is not reported on MXP-1 Port 1 (client). This issue will be resolved in a future release.

## DDTS # CSCef57989

Invalid idles are transmitted in a splitter switch. To see this issue perform the following steps.

**Step 1** Set up two MXPP cards connected to each other.

**Step 2** Provision the client port as FICON ISL 1G with DE on and Auto detect credit on.

**Step 3** Connect the client port to an MDS switch.

**Step 4** Provsion a manual switch.

NOS is transmitted by both MXPPs and OLS is recieved by these cards from the MDS at both ends. However, then the MXPP sends some invalid idles. It is not known or has not been determined when or if this issue will be resolved.

## DDTS # CSCef05162

Clearing the displayed statistics for a port will also clear the displayed history for that port. Clearing the displayed statistics for all ports will also clear the displayed history for all ports. There is no warning message from the TCC2. If History information is to be retained, do not clear displayed statistics for any port without first documenting the displayed history information for the associated port. This issue will not be resolved.

## DDTS # CSCef29516

The ALS pulse recovery min value is 60 instead of 100. If this occurs, increase the value to 100. This issue will not be resolved.

## DDTS # CSCef47990

Certain PM values are not displayed in CTC. In particular, if you perform an FC link down and up and observe FC LinkRecovery counts, the count will not appear to increase. This issue will be resolved in a future release.

## DDTS # CSCeb36749

In a Y-Cable configuration, if you remove the client standby RX fiber; a non-service affecting LOS is raised, as expected. However, if you then remove the trunk active RX fiber; a non-service affecting LOC is raised, but the previously non-service affecting LOS on the client port is now escalated to a service affecting alarm, in spite of no traffic having been affected. It is not known when or if this issue will be resolved.

## DDTS # CSCee82052

After setting the node time (either manually or via NTP) you must wait for the endpoint of the interval to be reached before the end time will reflect the recently-set node time. Until this has occurred, the date time stamp for the end of the retrieved interval remains 12/31/69. This issue has been closed and will not be resolved.

## DDTS # CSCdy10030

CVs are not positively adjusted after exiting a UAS state. When a transition has been made from counting UAS, at least 10 seconds of non-SES must be counted to exit UAS. There are no plans to resolve this issue at this time.

## DDTS # CSCdx35561

CTC is unable to communicate with an ONS 15454 SDH that is connected via an Ethernet craft port. CTC does, however, communicate over an RS-DCC link with an ONS 15454 SDH that is Ethernet connected, yielding a slow connection. This situation occurs when multiple nodes are on a single Ethernet segment and the nodes have different values for any of the following features:

- Enable OSPF on the LAN
- Enable Firewall
- Craft Access Only

When any of these features are enabled, the proxy ARP service on the node is also disabled. The ONS 15454 SDH proxy ARP service assumes that all nodes are participating in the service.

This situation can also occur immediately after the aforementioned features are enabled. Other hosts on the Ethernet segment (for example, the subnet router) may retain incorrect ARP settings for the ONS 15454 SDHs.

To avoid this issue, all nodes on the same Ethernet segment must have the same values for Enable OSPF on the LAN, Enable Firewall, and Craft Access Only. If any of these values have changed recently, it may be necessary to allow connected hosts (such as the subnet router) to expire their ARP entries.

You can avoid waiting for the ARP entries to expire on their own by removing the RS-DCC links from the affected ONS 15454 SDH nodes. This will disconnect them for the purposes of the proxy ARP service and the nodes should become directly accessible over the Ethernet. Network settings on the nodes can then be provisioned as desired, after which the RS-DCC can be restored.

This issue will not be resolved.

## DDTS # CSCdy11012

When the topology host is connected to multiple OSPF areas, but CTC is launched on a node that is connected to fewer areas, the topology host appears in CTC, and all nodes appear in the network view, but some nodes remain disconnected. This can occur when the CTC host does not have routing information to connect to the disconnected nodes. (This can happen, for example, if automatic host detection was used to connect the CTC workstation to the initial node.)

CTC will be able to contact the topology host to learn about all the nodes in all the OSPF areas, but will be unable to contact any nodes that are not in the OSPF areas used by the launch node. Therefore, some nodes will remain disconnected in the CTC network view.

To work around this issue, if no firewall enabled, then the network configuration of the CTC host can be changed to allow CTC to see all nodes in the network. The launch node must be on its own subnet to prevent network partitioning, and craft access must not be enabled. The CTC host must be provisioned with an address on the same subnet as the initial node (but this address must not conflict with any other node in the network), and with the default gateway of the initial node. CTC will now be able to contact all nodes in the network.

If a firewall is enabled on any node in the network, then CTC will be unable to contact nodes outside of the initial OSPF areas. This issue will not be resolved.

### DDTS # CSCdw38283

If a node has one good BITS reference and is running in a normal state, and you configure a second BITS reference, then reconfigure the second reference within 30 seconds of applying the first configuration, the node will enter FAST START SYNC mode. To avoid this problem, wait a minute before configuring the second reference a second time. This issue is a hardware limitation, and there are no current plans to resolve it.

### DDTS # CSCdv10824: Netscape Plugins Directory

If you use CTC, JRE, and the Netscape browser with a Microsoft Windows platform, you must ensure that any new installation of Netscape uses the same Netscape directory as the previous installation did, if such an installation existed. If you install Netscape using a different path for the plugins directory, you will need to reinstall JRE so that it can detect the new directory.

### "Are you sure" Prompts

Whenever a proposed change occurs, the "Are you sure" dialog box appears to warn the user that the action can change existing provisioning states or can cause traffic disruptions.

## Performance Monitoring

### DDTS # CSCef28522

When you inject errors on a splitter protection card in the node's working port, CVL and ESL are incremented for the working and portect far end ports. This issue will not be resolved.

### DDTS # CSCef40281

UAS-SM increments incorrectly on the TXPP_MR_2.5G card. To see this issue, complete the following steps.

**Step 1** Set up one ONS 15454 SDH node with TXPP_MR_2.5G (TXP-1).

**Step 2** Ensure that the TXP-1 DWDM-A trunk has receive connected to transmit via an external fiber.

**Step 3** Ensure that the TXP-1 client is provisioned as STM16 payload.

**Step 4** Ensure that the TXP-1 client is connected to a traffic generator.

**Step 5** Provision the card in Transparent mode with G.709 on.

**Step 6** Set TXPP_MR_2.5G Port 1 (client) and Port 2 (DWDM-A) In Service (IS), leaving Port 3 Out Of Service (OOS).

**Step 7** Inject LOS in client port using the traffic generator, or simply remove the receive fiber.

In the CTC card view > **Performance** > **Payload PM** tab, RS-ES and RS-SES begin incrementing, continuing up to 9, when RS-UAS begins also incrementing.

After this, all three counters increment simultaneously. This issue will be resolved in a future release.

### DDTS # CSCef40518

ES-SM fails to reset when UAS begins incrementing. To see this issue, complete the following steps.

**Step 1** Set up one ONS 15454 SDH node with TXPP_MR_2.5G (TXP-1).

**Step 2** Ensure that the TXP-1 DWDM-A trunk has receive connected to transmit via an external fiber.

**Step 3** Ensure that the TXP-1 client is provisioned as STM16 payload.

**Step 4** Ensure that the TXP-1 client is connected to a traffic generator.

**Step 5** Provision the card in Transparent mode with G.709 on.

**Step 6** From the traffic generator inject OTU BIP8 errors at 1e-5 rate on the TXPP_MR_2.5G client port.

In the **Performance** > **OTN** tab, ES-SM and SES-SM begin to increment. After 9 seconds, ES-SM and SES-SM stop incrementing and the UAS-SM counter begins incrementing from 10. At this point, SES-SM returns to 0 but ES-SM stays at 9. This issue will be resolved in a future release.

# Resolved Caveats for Release 4.7

This section highlights resolved caveats for Release 4.7.

## DWDM Cards

### DDTS # CSCed05006

In the Defaults pane, when you change the default ALS mode for the TXP/TXPP_2.5G_10G cards to "Manual Restart for Test," CTC issues an error message. The mode can be successfully changed but you must click Reset to proceed with further changes to defaults. Changes to other defaults on that pane may have to be reapplied. To prevent the error, change the default pulse width at the same time as changing the default ALS mode to "Manual Restart for Test." The default pulse width must be in the appropriate range for this mode (80-100). This issue is resolved in Release 4.7.

### DDTS # CSCec78443

You cannot provision an end-to-end circuit through a TXP regen group (a pair of transponders connected back to back via the client interface that provide for regeneration for DWDM) with G.709 on, and in line termination on the TXP cards, which are feeding traffic to the regen group. To avoid this issue turn G709 off for all TXPs. This issue is resolved in Release 4.7.

### DDTS # CSCeb25490

Occasionally CTC displays a LO-TXPOWER alarm when SMT4 and STM1 SFP is installed at the client port of a TXP or TXPP card. The LO-TXPOWER alarm is displayed when the alarm threshold is set to the default value in the TX POWER LOW field of the Optical Threshold in the CTC provisioning window. To work around this issue, lower the alarm threshold value (TX POWER LOW (dBm)) of Optical Threshold in the CTC provisioning window. This issue is resolved in Release 4.7.

# New Features and Functionality

This section highlights new features and functionality for Release 4.7. For detailed documentation of each of these features, consult the user documentation.

## New Hardware

### DWDM Cards

#### 32-Channel Demultiplexer Card

The 32-Channel Demultiplexer card (32DMX) is a single-slot optical demultiplexer. The card receives an aggregate optical signal on its COM RX port and demultiplexes it into 32 100-GHz-spaced channels. The 32DMX card can be installed in Slots 1 to 6 and in Slots 12 to 17.

The 32DMX card is designed specifically for use in ONS 15454 MSTP nodes. The 32DMX card operates in conjunction with the 32WSS card to create a software-controlled node with ROADM functionality. ROADM functionality requires two 32DMX single-slot cards and two 32WSS double-slot cards (six slots in the ONS 15454 chassis).

Both the 32DMX card and 32WSS card use Planar Lightwave Circuit (PLC) technology to perform wavelength-level processing.

The 32DMX has the following two types of ports.

**Note** For port type descriptions and uses, consult the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

- Common Receive (COM RX) port
- Drop ports (1-32)

#### 32-Channel Wavelength Selective Switch Card

The 32-Channel Wavelength Selective Switch (32WSS) card performs channel add/drop processing within the ONS 15454 MSTP node. The 32WSS operates in conjunction with the 32DMX to implement Reconfigurable OADM (ROADM) functionality. Equipped with ROADM functionality, the ONS 15454 MSTP can be configured to add or drop individual optical channels using CTC, Cisco MetroPlanner, and CTM.

A ROADM node uses two 32WSS cards (two slots each) and two 32DMX cards (one slot each), for a total of six slots in the chassis. The 32WSS card can be installed in slots 1-2, 3-4, 5-6, or in slots 12-13, 14-15, or 16-17. A terminal site can be configured using only a 32WSS card and a 32DMX card plugged into the east or west side of the shelf. The 32WSS has the following six types of ports.

**Note** For port type descriptions and uses, consult the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

- ADD ports (1-32)
- EXP RX port

- EXP TX port
- COM TX port
- COM RX port
- DROP TX port

## Client Cards

### MXP_MR_2.5G and MXPP_MR_2.5G Muxponder Cards

Two new 2.5 Gbps 100 GHz datamux cards, the MXP_MR_2.5G and MXPP_MR_2.5G, are available for the ONS 15454. These cards can be used for data and SAN applications in a DWDM network. The cards are capable of translating the client input GE and FC optical signal into an optical signal with an optical frequency on the 100 GHz spacing frequency grid, as defined in ITU-T G.692. The cards are available in card protected and unprotected versions.

Long transmission distances are achieved through the use of flat gain optical amplifiers.

The 2.5-Gbps Multirate Muxponder-100 GHz-Tunable 15xx.xx-15yy.yy (MXP_MR_2.5G) card aggregates a mix and match of client Storage Area Network (SAN) service client inputs (GE, FICON, and Fibre Channel) into one 2.5 Gbps STM-16/OC-48 DWDM signal on the trunk side. It provides one long-reach STM-16/OC-48 port per card and is compliant with Telcordia GR-253-CORE.

The 2.5-Gbps Multirate Muxponder–Protected–100 GHz–Tunable 15xx.xx-15yy.yy (MXPP_MR_2.5G) card aggregates various client SAN service client inputs (GE, FICON, and Fibre Channel) into one 2.5 Gbps STM-16/OC-48 DWDM signal on the trunk side. It provides two long-reach STM-16/OC-48 ports per card and is compliant with ITU-T G.957 and Telcordia GR-253-CORE.

Because the cards are tunable to one of four adjacent grid channels on a 100 GHz spacing, each card is available in eight versions, with 15xx.xx representing the first wavelength and 15yy.yy representing the last wavelength of the four available on the board. In total, 32 DWDM wavelengths are covered in accordance with the ITU-T 100GHz grid standard, G.692, and Telcordia GR-2918-CORE, Issue 2. Card versions and their corresponding wavelengths are documented in the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

#### Client Interface

The client interface supports the following payload types.

- GE
- 1G FC
- 2G FC
- 1G FICON
- 2G FICON

**Note** ESCON is not supported for Release 4.7, and FICON support is limited (see the caveat for DDTS # CSCee45443 for applicable Release 4.7 FICON limitations). The changes required to support ESCON and to eliminate the FICON limitations will be made available in a future release with a software upgrade.

Because the client payload cannot oversubscribe the trunk, a mix of client signals can be accepted, up to a maximum limit of 2.5 Gbps. Client interface data rates and encapsulation methods are documented in the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

All of the client interfaces supported use the Transparent Generic Framing Procedure (GFP-T) encapsulation method. (For data rates, see the *Cisco ONS 15454 DWDM Installation and Operations Guide*.) The current version of the GFP-T, G.7041, supports transparent mapping of 8B/10B block-coded protocols, including Gigabit Ethernet, Fibre Channel, and FICON.

In addition to the GFP mapping, 1 Gbps traffic on port 1 or port 2 of the high-speed SERDES is mapped to an STS-24c channel. If two 1 Gbps client signals are present at port 1 and port 2 of the high-speed SERDES, the port 1 signal is mapped into the first STS-24c channel and the port 2 signal into the second STS-24c channel. The two channels are then mapped into an OC-48 trunk channel.

GFP-T performance monitoring is available via remote monitoring (RMON), and trunk PM is managed according to Telcordia GR-253 and ITU G.783/826. Client PM is achieved through RMON for FC and GE.

#### Client to STS Mapping

Only Contiguous concatenation is supported for the MXP_MR_2.5G and MXPP_MR_2.5G (no VCAT).

Port one supports:

- 1GE and 1G-FC mapped over first STS-24c payload
- 2G-FC mapped over STS-48c

Port two supports:

- 1GE and 1G-FC mapped over second STS-24c payload

#### Muxponder Protection

MXP_MR_2.5G card protection is accomplished using Y-cable protection. Two MXP_MR_2.5G cards can be joined in a Y-cable protection group, which provides protection against failures both on the fiber and in the muxponders. MXPP_MR_2.5G card protection is accomplished using splitter protection, which provides protection against failures due to fiber cuts or unacceptable signal degradation on the trunk side. Switching is performed only if the protect line is error free.

#### Buffer-to-Buffer Credit Management

A buffer-to-buffer credit management scheme provides FC flow control. With this feature enabled, a port indicates the number of frames that can be sent to it (its buffer credit) before the sender is required to stop transmitting and wait for the receipt of a “ready” indication. The MXP_MR_2.5G and MXPP_MR_2.5 cards support FC credit based flow control with a buffer-to-buffer credit extension of up to 1600 km for 1G FC and up to 800 km for 2G FC. The feature may be enabled or disabled.

#### Buffer-to-Buffer Distance Extension

Release 4.7 can examine the B2B client credit and allow the client equipment to run at full rate even with hundreds of Km adopting proprietary exchange of memory information between the two cards.

This does not involve termination of the FC link. Only protocol error monitoring and flow control are terminated.

End systems interoperate through this solution transparently. The number of frames in transit cannot exceed the far end buffer capacity. “Ready” indicators (called R_RDYs) are terminated locally and not part of flow control, so they do not waste WAN bandwidth. Release 4.7 supports maximum FC throughput independent of attached FC Switch BB Credit Allocation. IDLE frames are terminated locally and regenerated at the far end.

#### DWDM Laser Features

The MXP_MR_2.5G and MXPP_MR_2.5G support the following DWDM laser features.

- 2.5 Gb/s operation; tunable over four separate channels at 100 GHz spacing
- Integrated wavelength-locker
- Entire C band ITU wavelengths available (1528 to 1563 nm)
- 14 pin butterfly package with optical isolator
- Internal TEC with precision NTC thermistor
- Extended reach performances up to 360 Km with 2 dB dispersion power penalty

## MXP_2.5G_10E Card

The 2.5-Gbps–10-Gbps Muxponder–100 GHz–Tunable xx.xx-xx.xx (MXP_2.5G_10E) card is a DWDM muxponder for the ONS 15454 platform that supports full optical transparency on the client side. The card multiplexes four 2.5 Gbps client signals (4 x OC48/STM-16 SFP) into a single 10-Gbps DWDM optical signal on the trunk side. The MXP_2.5G_10E provides wavelength transmission service for the four incoming 2.5 Gbps client interfaces. The MXP_2.5G_10E muxponder passes all SONET/SDH overhead bytes transparently.

The digital wrapper function (ITU-T G.709 compliant) formats the DWDM wavelength so that it can be used to set up general communication channels (GCC) for data communications, enable forward error correction, or facilitate performance monitoring.

The MXP_2.5G_10E works with Optical Transparent Network (OTN) devices defined in ITU-T G.709. The card supports Optical Data Channel Unit 1 (ODU1) to Optical Channel Transport Unit (OTU2) multiplexing, an industry standard method for asynchronously mapping a SONET/SDH payload into a digitally wrapped envelope.

**Note** The MXP_2.5G_10E card is not compatible with the MXP_2.5G_10G card, which does not supports full optical transparency.

The MXP_2.5G_10E features a 1550-nm laser on the trunk port and four 1310-nm lasers on the client ports and contains five transmit and receive connector pairs (labeled) on the card faceplate. The card uses a dual LC connector on the trunk side and uses SFP modules on the client side for optical cable termination. The SFP pluggable modules are short reach (SR) or intermediate reach (IR) and support an LC fiber connector.

### Key Features

The MXP_2.5G_10E card has the following high level features:

Four 2.5 Gbps client interfaces (OC-48/STM-16) and one 10 Gbps trunk. The four OC-48 signals are mapped into a ITU-T G.709 OTU2 signal using standard ITU-T G.709 multiplexing.

**Onboard Enhanced Forward Error Correction (E-FEC) processor**: The processor supports both standard RS (specified in ITU-T G.709) and E-FEC, which allows an improved gain on trunk interfaces with a resultant extension of the transmission range on these interfaces. The E-FEC functionality increases the correction capability of the transponder to improve performance, allowing operation at a lower OSNR compared to the standard RS (237,255) correction algorithm. A new BCH algorithm implemented in E-FEC allows recovery of an input BER up to 1E-3.

**Pluggable client interface optic modules**: The MXP_MP_10E card has modular interfaces. Two types of optics modules can be plugged into the card: an OC-48/STM 16 SR-1 interface with a 7 km nominal range (for short range and intra-office applications) and an IR-1 interface with a range up to 40 km.

**High level provisioning support**: The MXP_MP_10E card is initially provisioned using Cisco MetroPlanner software. Subsequently, the card may be monitored and provisioned using CTC software.

**Link monitoring and management**: The MXP_MP_10E card uses standard OC-48 OH (overhead) bytes to monitor and manage incoming interfaces. The card passes the incoming SDH/SONET data stream and its overhead bytes transparently.

**Control of layered SONET/SDH transport overhead**: The card is provisionable to terminate regenerator section overhead. This is used to eliminate forwarding of unneeded layer overhead. It can help reduce the number of alarms and help isolate faults in the network.

**Automatic timing source synchronization**: The MXP_MP_10E normally synchronizes from the TCC2 card. If for some reason, such as maintenance or upgrade activity, the TCC2 is not available, the MXP_MP_10E automatically synchronizes to one of the input client interface clocks.

**Configurable squelching policy**: The card can be configured to squelch the client interface output if there is LOS at the DWDM receiver or if there is a remote fault. In the event of a remote fault, the card manages multiplex section alarm indication signal (MS-AIS) insertion.

#### Client Interfaces

The MXP_2.5G_10E provides four intermediate- or short-range OC-48/STM-16 ports per card on the client side. Both SR-1 or IR-1 optics can be supported and the ports utilize SFP connectors. The client interfaces use four wavelengths in the 1310-nm, ITU 100-MHz spaced channel grid.

#### DWDM Interface

The MXP_MP_10E serves as an OTN multiplexer, transparently mapping four OC-48 channels asynchronously to ODU1 into one 10-Gbps trunk. The DWDM trunk is tunable for transmission over four wavelengths in the 1550-nm, ITU 100-GHz spaced channel grid.

#### Multiplexing Function

The muxponder is an integral part of the optically transparent ROADM network in which data payload channels and wavelengths are processed exclusively at the optical level without electrical to optical (E-O) conversion. The key function of MXP_MP_10E is to multiplex 4 OC-48/STM16 signals onto one ITU-T G.709 OTU2 optical signal (DWDM transmission). The multiplexing mechanism allows the signal to be terminated at a far-end node by another MXP_2.5G_10E card.

The MXP_2.5G_10E card performs ODU to OTU multiplexing as defined in ITU-T G.709.

The output of the muxponder is a single 10-Gbps DWDM trunk interface defined using OTU2. It is within the OTU2 framing structure that FEC or E-FEC information is appended to enable error checking and correction.

The MXP_2.5G_10E card is synchronized to the TCC2 clock during normal conditions and transmits the ITU-T G.709 frame using this clock.

The MXP_2.5G_10E card supports Y-cable protection. Two MXP_2.5G_10E cards can be joined in a Y-cable protection group with one card assigned as the working card and the other defined as the protection card. This protection mechanism provides redundant bidirectional paths.

You can configure the Forward Error correction for the MXP_2.5G_10E in three modes: NO FEC, FEC, and E-FEC. So, as client side traffic passes through the MXP_2.5G_10E card, it can be digitally wrapped using FEC mode error correction or E-FEC mode error correction (or no error correction at all).

For further card details, specifications, and functionality, see the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

## TXP_MR_10E Card

The 10-Gbps Transponder–100-GHz–Tunable xx.xx-xx.xx (TXP_MR_10E) card is a multirate transponder for the ONS 15454 platform. The card is fully backward compatible with the TXT_MR_10G card. It processes one 10-Gbps signal (client side) into one 10-Gbps, 100-GHz DWDM signal (trunk side) that is tunable on four wavelength channels (ITU-T 100-GHz grid).

The TXP_MR_10E card can be used in any of the twelve I/O slots in the ONS 15454, including both high-speed and multirate ports (Slots 1 to 6 and Slots 12 to 17 can be used). Two TCC2 cards must be present in the system for the board to function. TCC2 fault replacement can be performed without impacting the traffic.

The TXP_MR_10E port features a 1550-nm laser for the trunk port and a ONS-XC-10G-S1 XFP module for the client port and contains two transmit and receive connector pairs (labeled) on the card faceplate.

### Key Features

The key features of the TXP_MR_10G card are:

- A tri-rate XFP client interface
- OC-192 (SR1)
- 10GE (10GBASE-LR)
- 10G-FC (1200-SM-LL-L)
- OC-192 to G.709 OTU2 provisionable synchronous and asynchronous mapping

### Client Interface

The client interface is implemented by an on-board XFP module, a tri-rate transponder that provides a single port that can be configured in the field to support STM-64/OC-192 (with an SR-1 optics module that plugs into the XFP module), 10GE (10GBASE-LR), or 10G FC protocols. The XFP module supports 10 GE LAN PHY, 10 GE WAN PHY, STM-64, and OC-192 client signals.

Two types of pluggable client-side optics modules are available for the XFP module on the TXP_MR_10E card: an OC-192 SR-1/I-64.2 interface (ITU-T G.691) or an S-64.2 optical interface (ITU-T G.691). The SR-1 is a 1310-nm optical interface that uses LC connectors. SR-1 is typically used in short-reach intra-office applications with ranges typically up to 7 km.

### DWDM Trunk Interface

On the trunk side, the TXP_MR_10E card provides a 10 Gbps STM-64/OC-192 interface. Four tunable channels are available in the 1550-nm band on the 100-GHz ITU grid for the DWDM interface. The TXP_MR_10E card provides 3R transponder functionality for this 10 Gbps trunk interface, so, the card is suited for use in long range amplified systems. The DWDM interface is complaint with ITU-T G.707, ITU-T G.709, and Telcordia GR-253-CORE standards.

The TXP_MR_10E card supports Y-cable protection, which provides transponder equipment protection without client terminal equipment interface protection. A single client interface can be split between two transponder cards using a Y-protection device.

You can configure the Forward Error correction for the TXP_MR_10E in three modes: NO FEC, FEC, and E-FEC. So, as client side traffic passes through the TXP_MR_10E card, it can be digitally wrapped using FEC mode error correction or E-FEC mode error correction (or no error correction at all).

**Note** Because the transponder has no visibility into the data payload and detect circuits, a TXP_MR_10E card does not display circuits under the card view.

#### Client-to-Trunk Mapping

The TXP_MR_10E card can perform ODU2-to-OCh mapping, which allows operators to provision data payloads in a standard way across 10-Gbps optical links. For further card details, specifications, and functionality, see the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

## Small Form-Factor Pluggables

The following small form-factor pluggables (SFPs and XFPs) are new for Release 4.7. For SFP and XFP installation or removal consult the document, *Installing GBIC, SFP and XFP Optical Modules in Cisco ONS 15454, 15327, 15600, and 15310 Platforms*.

### XFP

The 10 Gbps 1310 nm XFP transceiver is an integrated fiber optic transceiver that provides a high-speed serial link at the following signaling rates: 9.95 Gbps, 10.31 Gbps, 10.51 Gbps, and 10.66/10.71/11.10 Gbps which apply to 10GBASE-LR (fibre channel and Ethernet) as well as OC-192 STM-64 SONET-SDH. The XFP integrates the receiver and transmit path. The transmit side recovers and re-times the 10 Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310 nm DFB (distributed feed-back) laser, enabling data transmission over SMF through an LC connector. The receive side recovers and re-times the 10 Gbps optical data stream from a PIN photo detector, transimpedance amplifier and passes it to an output driver.

### SFP

Small Form-factor Pluggables (SFPs) are integrated fiber optic transceivers that provide high speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFP modules. There is no correlation between the type of latch to the model type (such as SX or LX/LH) and technology type (such as Gigabit Ethernet). See the label on the SFP for technology type and model.

# New Software Features and Functionality

## ROADM

ROADM allows you to add and drop wavelengths without changing the physical fiber connections. ROADM technology is useful in network applications that require the ability to optically pass DWDM wavelengths without a physical fiber jumper. Release 4.7 ROADM also provides channel equalization allowing all 32 wavelengths to be optically balanced. Release 4.7 ROADM offers significant insertion loss reduction over previous back-to-back multiplexing or demultiplexing solutions. Configurations using ROADM support up to 16 node rings.

ROADM technology in Release 4.7 also supports any-to-any connection capability, spans from 1 dB to 15 dB, and SONET, data, or video multirate traffic.

### Any-to-Any Rings

The any-to-any ring topology contains only ROADM nodes. Optical service channel (OSC) regeneration or amplifier nodes can be installed between ROADM nodes, if required. This topology potentially allows you to route every wavelength from any source to any destination node inside the network.

For optical performance information for ROADM rings and linear networks refer to the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

## New Node Types

Release 4.7 provides support for the following new node types.

### ROADM Node

ROADM nodes are equipped with at least one 32-Channel Wavelength Selective Switch (32WSS). A 32DMX or 32DMX-O demultiplexer can be installed, but is not required. For ROADM node installation options, management, and turnup, consult the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

#### ROADM Power Equalization Monitoring

Reconfigurable OADM (ROADM) nodes allow you to monitor the 32WSS card equalization functions on the **Maintenance > DWDM > Power Monitoring** subtab. The tab compares the input channel power Add (Padd) and express or pass-through (Ppt) with the power level at output (Pout).

### OSC Regeneration Line Site

A Release 4.7 OSC Regeneration line site can be built using two OSC-CSMs for the single purpose of providing an electrical regeneration of the OSC channel.

Metroplanner plans an OSC regeneration site every time there is a link longer than 37 db on which payload amplification or add and drop capabilities are not required.

NDT splits this link into n sublinks of maximum length 31 dB, then places an OSC regeneration site between each sublink and the next, as needed.

Although it is not commonly the case (due to the span length), in a limited set of cases the OSC Regeneration site can be crossed by pass through traffic (for example single channel 2.5 Gbs).

The OSC Regeneration Site feature also supports hybrid configurations.

### HUB or Terminal Nodes with 32WSS and 32DMX

The 32WSS and 32DMX are normally installed in ROADM nodes, but they can be installed in hub and terminal nodes, as well. If the cards are installed in a hub node, the 32WSS express (EXP RX and EXP TX) ports are not cabled.

## Provisioning Parameters for Terminal and HUB Sites

On Hub and Terminal sites, ANS algorithms require setting a value for VOA Target Channel Power (TPVOACh(i)) on all demultiplex and multiplex paths. Specifically, Hub and Terminal Site setup requires the use of the following parameters.

- West/East Side Add and Drop Stage Output Power [WestPoutad; EastPoutad]
- West/East Side Add and Drop Stage Input Power [WestPinad; EastPinad]
- West/East Side Add and Drop Stage By-Pass Power [WestPby-passad; EastPby-passad]
- West/East Side Add and Drop Stage Channel (i) Drop Power (for i = 1..32) [WestPDropCh(i); EastPDropCh(i)]
- West/East Side Add and Drop Stage Drop Power [WestPDrop; EastPDrop]

WestPdrop and EastPdrop are used when the 32-DMX West or East is equipped. WestPDropCh(i) and EastPDropCh(i) are used when the 32DMX-O West or East is equipped.

For a terminal site only one set (East or West) of these parameters is used according to the node line direction:

- East side parameters in the case of terminal site West
- West side parameters in the case of terminal site East

For further details on these and other Hub and Terminal site parameters, consult the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

## Y-Cable Protection

Y-cable protection is available for the following ONS 15454 transponder and muxponder cards:

- TXP_MR_10G
- TXP_MR_2.5G
- MXP_MR_2.5G
- MXP_2.5G_10G

In Y-cable protection, the client ports of the two cards are joined by Y-cables. A single receive client signal is injected into the receive Y-cable and is split between the working and protect cards in the protection group. The transmit client signals from the two protection group cards are connected via the transmit Y-cable with only the active card signal passing through as the single transmit client signal. The other card must have its laser turned off to avoid signal degradation where the Y-cable joins. To create Y-cable protection, first create a Y-cable protection group for two TXP or MXP cards using CTC, then connect the client ports of the two cards physically with a Y-cable. The single client signal is then sent into the receive Y-cable and is split between the two TXP or MXP cards.

## Automatic Laser Shutdown

With Release 4.7 Automatic Laser Shutdown (ALS) is supported on both the client and trunk interfaces. On the client interface, ALS is compliant with ITU-T G.664 (6/99). On the data application and trunk interface, the switch on and off pulse duration is greater than 60 seconds. The “on” and “off” pulse duration is user-configurable.

## MSTP Fiber Support

Release 4.7 provides qualification of MSTP over the following fibers in addition to SMF-28.

- FiberSupported ConfigurationsNode typology
- SMF-28RingHub
- E-LeafLinearActive OADM
- TW-RSLinear w/o OADMPassive OADM

For further information on use of these fibers with Release 4.7 consult the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

## OC3/STM1 Performance Monitoring for OSCM and OSC-CSM Cards

The following new PMs are supported in Release 4.7 for OC3/STM1 facility equipped on OSCM and OSC-CSM cards.

### SONET

Number of Coding violations (CV).

- CV-S: section
- CV-L-NE: line near end
- CV-L-FE: line far end

Number of Error seconds (ES).

- ES-S: section
- ES-L-NE: line near end
- ES-L-FE: line far end

Number of Severely Error Seconds (SES).

- SES-S: section
- SES-L-NE: line near end
- SES-L-FE: line far end

Number of Severely Error Framing Seconds (SEF).

- SEF-S: section

Unavailable Seconds (UAS).

- UAS-L-NE: line near end
- UAS-L-FE: line far end

Failure Counts (FC).

- UAS-L-NE: line near end
- UAS-L-FE: line far end

### SDH

Error Blocks (EB). A block in which one or more bits are in error.

- EB-RS: regeneration section
- EB-MS-NE: multiplex section, near end
- EB-MS-FE: multiplex section, far end

Background Block Errors (BBE). An error block not occurring as part of an SES.

- BBE-RS: regeneration section
- BBE-MS-NE: multiplex section, near end
- BBE-MS-FE: multiplex section, far end

Errored Seconds (ES). A one second period with one or more errored blocks or at least one defect.

- ES-RS: regeneration section
- ES-MS-NE: multiplex section, near end
- ES-MS-FE: multiplex section, far end

Number of Severely Error Seconds (SES).

- SES-RS: regeneration section

- SES-MS-NE: multiplex section, near end
- SES-MS-FE: multiplex section, far end

Unavailable Seconds (UAS).

- UAS-MS-NE: multiplex section, near end
- UAS-MS-FE: multiplex section, far end

## System Type Removal

Release 4.7 removes the System Type parameters, System Type West and System Type East. These parameters are replaced in Release 4.7 and forward with the following four pairs of parameters:

- West Side Tx Amplifier Working Mode ([dwdm.tx.amp.WkgModeW]) and West Side Tx Amplifier Ch Power ([dwdm.tx.amp.ChPwrW]), applicable for all OPT-BST facing west.
- West Side Rx Amplifier Working Mode ([dwdm.rx.amp.WkgModeW]) and West Side Rx Amplifier Ch Power ([dwdm.rx.amp.ChPwrW]), applicable for all OPT-PRE facing west.
- East Side Tx Amplifier Working Mode ([dwdm.tx.amp.WkgModeE]) and East Side Tx Amplifier Ch Power ([dwdm.tx.amp.ChPwrE]), applicable for all OPT-BST facing east.
- East Side Rx Amplifier Working Mode ([dwdm.rx.amp.WkgModeE]) and East Side Rx Amplifier Ch Power ([dwdm.rx.amp.ChPwrE]), applicable for all OPT-PRE facing east.

For further details on these new parameters and their uses, consult the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

## LOS-P Threshold Configuration on OPT-BST/OSC-CS/OPT-PRE COM-RX Port

Release 4.7 LOS-P Threshold configuration provides the following ANS provisioning parameters:

- West Side Fiber Stage Input Threshold [WestFSInTh]
- East Side Fiber Stage Input Threshold [EastFSInTh]
- West Side Rx Amplifier Input Power Fail Threshold [WestRxAmpInPwrFailTh]
- East Side Rx Amplifier Input Power Fail Threshold [EastRxAmpInPwrFailTh]
- Release 4.7 ANS sets:
- LOS-P Threshold on West OPT-BST LINE-1-RX port, or West OSC-CSM LINE-1-RX to WestFSInTh
- LOS-P Threshold on East OPT-BST LINE-1-RX port, or East OSC-CSM LINE-1-RX port to EastFSInTh
- LOS-P Threshold on West OPT-PRE LINE-1-RX port to WestRxAmpInPwrFailTh
- LOS-P Threshold on East OPT-PRE LINE-1-RX port to EastRxAmpInPwrFailTh

## Circuit Size Label Removed from OCHNC Circuits

The circuit size specification or modification option is no longer supported for any of the interfaces, as follows.

- CTC Circuit Creation wizard
- CTC Edit Circuit function
- TL1 commands for OCHNC x-connection creation

- TL1 commands for OCHNC x-connection editing

## Wavelength Path Provisioning Changes

The following changes have been made for Wavelength Path Provisioning (WPP). Consult the*Cisco ONS 15454 DWDM Installation and Operations Guide* for details.

- Warning message for last OSC deletion
- Conditions when last OSC cannot be deleted are listed

## Calibration Value by Port Service State

As of Release 4.7 you can modify calibration values independently by port service state, with the exception of amplifier Offset (former power calibration), when the OPT-BST LINE-3-TX LINE-1-RX or OPT-PRE LINE-1-TX is in IS-NR service state.

The following table summarizes the calibration functions that can be performed in the different service states.

***Table 1 Calibration Functions***

| Function | IS-NR | OOS-AU,AINS | OOS-MA,DSLBD | OOS-MA,MT |
|---|---|---|---|---|
| Offset | No | Yes | Yes | Yes |
| VOA Attenuation Calib | Yes | Yes | Yes | Yes |
| VOA Power Calib | Yes | Yes | Yes | Yes |

## New Alarms and Conditions

The following alarms and conditions are new for Release 4.7. For details consult the *Cisco ONS 15454 SONET and DWDM Troubleshooting Guide*.

- New LOS-P, LOS-O alarms
- New PARAM_MISM condition
- OSRI ON raises conditions in specific instances
- ALS standing condition is revised

## New CTC Functionality

### ANS Provisioning Tab

In Release 4.7 CTC, ANS NE Update and Provisioning tabs have been removed and merged in a new pane having a tree format. Parameters in tree view are organized according to four main layout sectors: West RX, West TX, East RX and West TX. In each sector parameters are grouped according to their type category: amplifier, thresholds, power.

**Note** The System type has been removed. See the "System Type Removal" section on page 29.

Only parameters applicable for the node type are presented in the tree view. By using the Import button can load a Metroplanner provisioning file. Provisioning information can be exported in two formats: for a future import (by Export button), for node commissioning (csv/tsv/html) by selecting from the **File > Export** menu. All settings will become effective only after having launched the ANS application.

## ANS Results Report

For every MSTP port for which a regulation is required, ANS provides details about parameters set or unset.

Possible results values are:

- "Success - Changed" when a calculated set-point differs from the old one
- "Success - Unchanged" when a calculated set-point is equal to the old one
- "Fail - Out of Range" when a calculated set-point is outside of the acceptable range
- "Fail - Port in IS state" when the set-point cannot be applied because port is in service
- "Not Applicable" when the set-point is not calculable for that particular node layout

## OCHNC Bidirectional Circuits

In release 4.6.x OCHNC bidirectional circuit support existed in the creation wizard only. Creation of a bidirectional circuit in the wizard resulted in the actual creation of two unidirectional circuits with no link between them. Release 4.7 adds full support for bidirectional circuits both in CTC and in the TL1 interface. OCHNC bidirectional circuit forward and reverse components always use the same wavelength and always cross the same optical path. Support for unidirectional circuits remains unchanged.

## Changes to Automatic Power Control

### APC Interface

Release 4.7 enables you to manually launch, enable, or disable APC. These functions can be performed upon any network node, by CTC or TL1.

**Note** The APC interface is a maintenance function for use by maintenance personnel. Improper use of this function can have undesirable effects at the network level.

### APC States

An "APC State" flag indicates the APC working condition for all nodes in a given network. The APC state flag can be any of the following values.

- "Disable - Internal"—Displayed when APC has been automatically disabled for an internal cause.
- "Disable - User"—Displayed when APC has been disabled by the user.
- "Not Applicable - Network Type"—Displayed when the Network Type is set to "Not DWDM" or "Metro Access," types that do not support the APC application.
- "Enable"—Displayed when APC is enabled.

### APC Outputs

CTC and TL1 users can retrieve "Last monitored time" and "Last modified time" for every parameter whose set point is monitored by APC. APC updates the last check time value every time it checks a parameter set point for correctness. APC updates the last modification time value every time it modifies

the parameter set point. Last check time and Last modification time will then be displayed on the CTC and TL1 interfaces only for those parameters effectively checked by APC. This implies that parameters associated to ports that are not in IS-NR service state will not be reported (since they are not carrying traffic).

### Span Loss Check

The Release 4.7 Network Design Tool guarantees optical performance on a given span if its length is included between two values:

- Start of Life (SoL)—A span loss value provided by the user
- End of Life (EoL)—A span loss value given by the SoL plus aging margins

Release 4.7 also provides a measurement of actual span loss in field, comparing the far end OSC power with the near end OSC power. This measurement can be performed in every MSTP node because for each such node OSC channel is regenerated.

From a network management point of view, span loss measurement can be useful when equipment is installed, or anytime a fiber is repaired after a cut. The NE will raise the Span Loss Out of Range Transient Condition on CTC, TL1 and SNMP interfaces when the measured span loss is higher than the maximum expected span loss, or when it is lower than the minimum expected span loss, and the difference between the MaxExpSpanLoss and MinExpSpanLoss is greater that 1 dB. The condition is not raised in case of a software release upgrade. The maximum and minimum expected span loss data is provided by Metroplanner and provisioned via the CTC or TL1 interface. Expected and Measured span loss are displayed in the tool-tip associated with the particular link in the Network View.

### Optical Channel Graphical Equalizer

In an ROADM node you can monitor the 32-WSS equalization functions comparing channel power level at the input ports (ADD(i) and EXP-RX) with channel power level at the output port (COM-TX). You can access this feature every time a 32-WSS is equipped or provisioned; however, the feature's use in Hub and Terminal site configurations is not warranted, since these nodes do not allow provisioning of pass-trough traffic.

Line direction is identified by a double notation:

- Functional (W->E and E->W)
- Physical (slot/port on which both incoming and outgoing signals are associated)

### New Provisioning Interface for Amplifiers

The CTC interface for the OPT-PRE and OPT-BST amplified port in the card view > **Provisioning** tab is modified in Release 4.7 for thoroughness and readability as follows.

- Working Mode—Control Power or Control Gain. This is set by ANS.
- Signal Output Power—ASE compensated power value.
- Total Output Power—Sum of ASE and signal power.
- Total Output Power Set-Point—Power set point, applicable only if the working mode is control power.
- Gain—Applicable only when the working mode is control gain.
- Gain Set Point—Gain set-point calculated by APC or user-provided via the ANS interface.
- Offset—This is the former “Power Calibration,” applicable for both amplifier working modes.
- Per Channel Power Reference—Set by ANS.

- Tilt Reference—Set by ANS.
- Tilt Calibration—Read and write parameter used to modify the amplifier tilt.

### Pluggable Port Module Support

Release 4.7 CTC provides a new "PPM" subtab in the Provisioning tab of the card view for the transponder, and muxponder cards. This tab enables you to provision the pluggable port modules (PPMs) for SFPs (with a muxponder) and XFPs (with a transponder). When you create a PPM you can choose the slot number for the SFP or XFP, and then choose the appropriate PPM type for that card, selecting as many ports as you wish within the range of supported ports for the card. For specific instructions on provisioning PPMs, consult the *Cisco ONS 15454 DWDM Installation and Operations Guide*.

### Buffer-to-Buffer in CTC

Release 4.7 CTC supports the following features related to buffer-to-buffer technology.

- CTC enables distance extension (B2B).
- CTC allows Autodetect, or manual setting of the client buffer credit.

## Metroplanner 2.5

Release 4.7 integrates the ability to use Cisco Metroplanner 2.5. The primary purpose of MetroPlanner is to assist sales engineers (SEs) in the design and validation of optical networking deployment using Cisco Optical Networking System (ONS) platforms. Metroplanner provides a means to construct and test optical networks in a modelled graphical environment, enabling you to efficiently model multiple network design options for customers across a wide range of Cisco optical network products. You can enter specific configurations, or site distances alone, and from them build the desired network type. You can enter topology and service requirement specifications, then choose the type of platform or equipment for the network design. Several solutions can correspond to one type of equipment or platform. The MetroPlanner graphical user interface (GUI) models general specifications and produces detailed BOMs to provision optimized networks. Using Metroplanner you can verify multiple constraints such as optical budget limitations and platform architecture. Metroplanner automatically models and tests both simple and complex optical network designs. Optical networks designed using Metroplanner can take advantage of the availability of dark fiber to build a common infrastructure that supports data, storage area network (SAN), and time-division multiplexing (TDM) traffic.

### Topology Support

MetroPlanner supports the following network topologies.

- Bus (single span, point-to-point, and linear)
- Open (or hubbed) ring
- Closed (or meshed) ring

### Protection Scheme Support

MetroPlanner designs support the following protection schemes.

- Client-based 1+1 protection
- Fiber switched protection
- Y-cable protection

- Unprotected

### Service Support

Depending on the platform selected, MetroPlanner can support any subset of the following services.

- 2R Any Rate
- Gigabit Ethernet
- 10 Gigabit Ethernet
- Enterprise System Connection (ESCON)
- Fibre Channel
- Fibre Channel 2G
- Fast Ethernet
- FDDI
- STM-1
- STM-4
- STM-16
- STM-64
- OC-3
- OC-12
- OC-48
- OC-192
- Inter-System Channel (ISC)
- Sysplex Control Link Oscillator (CLO)
- Sysplex External Throughput Rate (ETR)
- D1 Video
- Serial Data Input (SDI)
- Fiber Connection (FICON)
- FICON 2G
- HDTV
- Reserved

## TL1

In Release 4.5 only TL1 test access was available for the ONS 15454 SDH platform. As of Release 4.7 the full range of TL1 DWDM commands is available. For specific commands, syntax, and their uses, consult the *Cisco ONS 15454 SONET and SDH TL1 Quick Reference Guide*.

# Related Documentation

## Release-Specific Documents

- *Release Notes for Cisco ONS 15454 SDH Release 4.5*
- *Release Notes for Cisco ONS 15454 Release 4.7*
- *Cisco ONS 15454 SDH Software Upgrade Guide, Release 4.7*

## Platform-Specific Documents

- *Cisco ONS 15454 DWDM Installation and Operations Guide, Release 4.7*
- *Cisco ONS 15454 SONET and DWDM Troubleshooting Guide, Release 4.7*
- *Cisco ONS 15454 SONET and SDH TL1 Quick Reference Guide, Release 4.7*

# Obtaining Documentation

The following sections provide sources for obtaining documentation from Cisco Systems.

## World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following sites:

- http://www.cisco.com
- http://www-china.cisco.com
- http://www-europe.cisco.com

## Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or as an annual subscription.

## Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco Direct Customers can order Cisco Product documentation from the Networking Products MarketPlace:

  http://www.cisco.com/cgi-bin/order/order_root.pl

- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

  http://www.cisco.com/go/subscription

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, in North America, by calling 800 553-NETS(6387).

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170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

# Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools. For Cisco.com registered users, additional troubleshooting tools are available from the TAC website.

## Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information and resources at anytime, from anywhere in the world. This highly integrated Internet application is a powerful, easy-to-use tool for doing business with Cisco.

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To access Cisco.com, go to the following website:

http://www.cisco.com

## Technical Assistance Center

The Cisco TAC website is available to all customers who need technical assistance with a Cisco product or technology that is under warranty or covered by a maintenance contract.

## Contacting TAC by Using the Cisco TAC Website

If you have a priority level 3 (P3) or priority level 4 (P4) problem, contact TAC by going to the TAC website:

http://www.cisco.com/tac

P3 and P4 level problems are defined as follows:

- P3—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

In each of the above cases, use the Cisco TAC website to quickly find answers to your questions.

To register for Cisco.com, go to the following website:

http://www.cisco.com/register/

If you cannot resolve your technical issue by using the TAC online resources, Cisco.com registered users can open a case online by using the TAC Case Open tool at the following website:

http://www.cisco.com/tac/caseopen

## Contacting TAC by Telephone

If you have a priority level 1 (P1) or priority level 2 (P2) problem, contact TAC by telephone and immediately open a case. To obtain a directory of toll-free numbers for your country, go to the following website:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not restored quickly. No workaround is available.
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.

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This document is to be used in conjunction with the documents listed in the "Related Documentation" section.