Troubleshooting T3 Error Events

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Introduction

This document describes various T3 error events, and explains how to identify and troubleshoot them. The document also includes a section on Hard Plug Loopback Tests.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

This document is not restricted to specific software and hardware versions.

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

For more information on document conventions, refer to the Cisco Technical Tips Conventions.

Identify the Error Event

Based on the type of port adapter used, Cisco IOS® Software commands display T3 error events.

- PA−T3: **show controllers serial**

```
dodi#show controllers serial 5/0
  M1T−T3 pa: show controller:
  ...
  Data in current interval (798 seconds elapsed):
  0 Line Code Violations, 0 P−bit Coding Violation
  0 C−bit Coding Violation
  0 P−bit Err Secs, 0 P−bit Sev Err Secs
  0 Sev Err Framing Secs, 0 Unavailable Secs
  0 Line Errored Secs, 0 C−bit Errored Secs, 0 C−bit Sev Err Secs
```

- PA−MC−T3: **show controllers T3**

```
dodi#show controllers T3 4/0
  T3 4/0 is up.
  ...
  Data in current interval (81 seconds elapsed):
  0 Line Code Violations, 0 P−bit Coding Violation
  0 C−bit Coding Violation
  0 P−bit Err Secs, 0 P−bit Severely Err Secs
  0 Severely Err Framing Secs, 0 Unavailable Secs
  0 Line Errored Secs, 0 C−bit Errored Secs, 0 C−bit Severely Errored
  Total Data (last ... 15 minute intervals)
```

Error Event Definitions

Regardless of which port adapter is used, T3 error events are defined as follows:

- **Line Code Violations (LCV)**: The number of Bipolar Violations (BPV) received in the bipolar with three−zero substitution (B3ZS) line code.
- **P−bit Err Secs (PES)**: A second with one or more PCVs, one or more Out−of−Frame defects, or a detected incoming Alarm Indication Signal (AIS).
- **C−bit Coding Violation (CCV)**: The number of coding violations reported through the C−bits. For C−bit parity, it is the count of CP−bit parity errors that occur in the accumulation interval.
- **P−bit Severely Err Secs (PSES)**: A second with 44 or more PCVs, one or more Out−of−Frame defects, or a detected incoming AIS.
- **Severely Err Framing Secs**: The number of one−second intervals in which either a Remote Alarm Indication was received, or a Loss Of Frame condition occurred.
- **Unavailable Secs (UAS)**: The number of one−second intervals in which the controller was down.
- **Line Errored Secs**: The number of one−second intervals in which a Line Code Violation occurred.
- **C−bit Errored Secs**: Number of seconds with one or more CCV, one or more Out−of−Frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.
- **C−bit Severely Errored Secs**: Number of seconds with 44 or more CCVs, one or more Out−of−Frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.
- **Total Data (last ... 15 minute intervals)**: Summary statistics for T3 signal quality for 15−minute intervals. The counters in this data block are cleared every 24 hours (96 intervals).

Troubleshoot the Error Event

This section describes various error events that occur on T3 lines, and provides information on how to fix them.

Line Code Violations and an Increase in Line Errored Secs

To troubleshoot these error events:

1. Ensure that the equipment on the remote end of the 75 ohms coaxial cable sends a T3 signal with B3ZS line code.
2. Check the 75 ohms coaxial cable integrity by looking for breaks or other physical abnormalities in the cable. Replace the cable, if necessary.
3. Insert an external loopback cable into the port. For more information, refer to the Hard Plug Loopback Tests for T3 Lines section.

Severely Err Framing Secs and an Increase in Unavailable Secs

To troubleshoot these error events:

1. Ensure that the local interface port configuration corresponds with the far−end equipment configuration.
2. Try to identify the alarm on the local end, and execute the actions as suggested in T3 Alarm Troubleshooting.
3. Insert an external loopback cable into the port. For more information, refer to Hard Plug Loopback Tests for T3 Lines section.

Hard Plug Loopback Tests for T3 Lines

Hard plug loopback tests are used to determine whether or not the router hardware has any faults. If a router passes a hard plug loopback test, the problem lies elsewhere on the T3 line.

Set a Hard Cable Loopback on BNC

In order to set a hard plug loopback, you need a 75 ohms coaxial cable with male BNC connectors at each end. Use this coaxial cable to connect the Transmit (TX) port on the port adapter to its Receive (RX) port.

You also need to configure **clock source internal** on the T3 serial interface/controller, and all T1 controllers (PA−MC−T3 only).

Verify the Hard Plug Loopback

Based on the type of port adapter used, you must verify the hard loopback throuh extended pings (for PA−T3), or a T1 Bit Error Rate Test (BERT) (for PA−MC−T3).

PA−T3: Prepare for the Extended Ping Test

To prepare for the extended ping test, complete these steps:

1. Use the **write memory** command to save your router configuration.
2. Set the encapsulation for interface serial to High−Level Data Link Control (HDLC) in interface configuration mode.
3. Use the **show running−config** command to check whether the interface has a unique IP address. If the serial interface does not have an IP address, obtain a unique address, and assign it to the interface with a subnet mask of 255.255.255.0.
4. Clear the interface counters. To do so, use the **clear counters** command.

PA−T3: Perform Extended Ping Tests

To perform serial line ping tests, complete these steps:

1. Enter this information:

    - Type: ping ip
    - Target address = enter the IP address of the interface to which the IP address was just assigned.
    - Repeat count = 1000
    - Datagram size = 1500
    - Timeout = press ENTER
    - Extended commands = yes
    - Source Address = press ENTER
    - Set Df bit in ip header = press ENTER
    - Validate reply data = press ENTER
    - Data pattern = 0x0000
    - Press ENTER thrice

    Note: The ping packet size is 1500 bytes, and we perform an all−zeros ping (0x0000). Additionally, the ping count specification is set to 1000. Therefore, in this case, there are 1000 1500−byte ping packets sent out.
2. Examine the **show interfaces serial** command output, and determine whether input errors have increased. If input errors have not increased, the local hardware (cable, router interface card) is probably in good condition.
3. Perform additional extended pings with different data patterns. For example:

    - Repeat step 1, but use a Data Pattern of 0x1111.
    - Repeat step 1, but use a Data Pattern of 0xffff.
    - Repeat step 1, but use a Data Pattern of 0xaaaa.
4. Verify whether all the extended pings tests are 100 percent successful.
5. Enter the **show interfaces serial** command. Your T3 serial interface should have no cyclic redundancy check (CRC), frame, input, or other errors. Verify this by looking at the fifth and sixth lines from the bottom of the **show interfaces serial** command output.

    If all pings are 100 percent successful and there are no errors, the hardware must be good. The problem is either a cabling or telephone company issue.
6. Remove the loopback cable from the interface, and plug the T3 line back into the port.
7. On the router, enter the **copy startup−config running−config** EXEC command to erase any changes made to the running−config during the extended ping test. When prompted for a destination filename, press ENTER.

PA−MC−T3: Prepare for the BERT on a T1 Line

Bit error rate test (BERT) circuitry is built into the PA−MC−T3. You can configure any T1 line (not the T3 line) to connect to the onboard BERT circuitry.

There are two categories of test patterns that can be generated by the onboard BERT circuitry:

- pseudorandom
- repetitive

The pseudorandom test patterns are exponential numbers, and conform to ITU−T O.151 and O.153. The

repetitive test patterns are zeroes or ones, or alternating zeroes and ones.

To prepare for the BERT on a T1 line, clear the interface counters using the **clear counters** command.

PA−MC−T3: Perform a BERT on an T1 Line

To perform a BERT on a T1 line, complete these steps:

1. Send a BERT pattern on a T1 line with the **T1 <T1−line−number> bert pattern 2^23 interval 1** T3 controller configuration command, where the T1−line−number is 1−28.
2. After the BERT is completed, examine the **show controllers** T3 command output, and determine whether:

   - The number of bits received corresponds with the number of bits sent on the T1 line during the BERT interval.
   - Bit errors remained zero (0).

   If Bit Errors have not increased, the local hardware (cable, router interface card) is probably in good condition.

   ```
   T3 4/0 T1 2
      No alarms detected.
      Framing is crc4, Clock Source is line, National bits are 0x1F.
      BERT test result (done)
      Test Pattern : 2^23, Status : Not Sync, Sync Detected : 1
      Interval : 1 minute(s), Time Remain : 0 minute(s)
      Bit Errors(Since BERT Started): 0 bits,
      Bits Received(Since BERT start): 111 Mbits
      Bit Errors(Since last sync): 0 bits
      Bits Received(Since last sync): 111 Mbits
   ```
3. Perform additional BERTs on other T1 lines.

   If all BERTs are 100 percent successful, and there are no Bit Errors, the hardware must be good. In this case, the problem is either with the cabling or with the telephone company.
4. Remove the loopback cable from the interface, and plug the T3 line back into the port.

   If you open a Service Request, please provide the output of these commands to the Cisco TAC:

   - **show running**
   - **show controller**
   - **clear counters**
   - **show interfaces**
   - **ping with different pattern**

Related Information

- **T3 Alarm Troubleshooting**
- **Technical Support − Cisco Systems**

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