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Tech Notes

CCITT Network Alarms



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Introduction

This tech note explains alarms associated with circuit lines and packet lines for a Consultative Committee for International Telegraph and Telephone (CCITT) network (G.703, G.704, G.732).

Note: The ITU-T carries out the functions of the former CCITT.

Line and Trunk Alarms and Explanations

The alarms reported by the IPX depend on the particular framing of the line or trunk. For example:

- If a circuit line is CCS, the multiframe alarms do not apply.
- If a packet line is EI/32 or subrate, the frame-level alarms do not apply.
- Packet errors are applicable only to packet lines.

Some alarms are applicable (but not counted) because there is limited space on the display. For example:

- Multiframe alarms for EI/30 packet lines.
- Statistical and hardware alarms.

It is important to distinguish between statistical alarms and hardware alarms. The Network Trunk Card (NTC) and Channel Interface Processor (CIP) keep counters for all statistical alarms. These counters are read and reset by software every few seconds. The software then calculates the error rate

and generates the appropriate statistical alarm when the threshold is passed. The statistical alarm does not result in reroutes; it is for information only. Alarms are in a hierarchy as shown below. When a lower-level alarm is present, higher-level counts will not be increased; if there is an out of frame (OOF) alarm (see description below), multiframe counts will not be increased.

Hardware alarms are determined by the NTC or CIP firmware. The criteria is discussed below. (Up to Release 5.2, an alarm condition must last one second before the alarm is declared. In Release 5.2, the time can be varied). Hardware alarms do cause connection reroutes. The appropriate remote alarm is also sent on the trunk for a hardware alarm. Hardware alarms can be distinguished from statistical alarms of the same name by the (RED), (YEL), or (BLU) label displayed with the alarm. Hardware alarms also have a hierarchy. When a packet line has been broken and restored, the log will show a series of alarms; typically loss of signal, loss of frame, and loss of multiframe as each level of synchronization is recovered.

For example, "Out of frame (RED)" is a hardware alarm declared by the firmware when the OOF criteria have persisted for one second. "Out Of Frame" is a statistical alarm showing how many frame errors have been logged as a percentage of frames received.

Commands to Display Alarms

The alarm status of lines and trunks can be seen using the **dspclns** and **dapplns** commands. The error counts for lines and trunks can be seen using the **dspclnerrs** and **dsplnerrs** commands.

The detailed error counts for lines and trunks can be seen using the **dapclnerrs N** and **dsplnerrs N** commands, where **N** is the circuit line or packet line number. This screen lists all the statistical alarm and hardware alarm categories with their error counts, the errored-ten-seconds (ETS) counts, and the present alarm status (clear, MINOR or MAJOR).

The different error screens also show packets dropped by type. Packet drops are due to queuing in the NTC and are not directly related to alarms. However, when an alarm occurs on a trunk, packets will be queued until it clears or connections are rerouted. This may result in packet drops.

Alarm and Configuration Table

Synchronization Level	Statistical Alarms	Hardware Alarms
Data integrity	Pkt err (PLN only) Fer CRC	Comm. Fall (PLN only) Fer
Packet Synchronization	Pkt oof (PLN only)	Pkt oof (PLN only) Rmt Alarm (PLN only)
Multiframe Synchronization	Oom (CLN only) AIS16 (CLN only)	Oom (CLN only) Rmt Oom (CLN only) AIS 16 (CLN only)

Frame Synchronization	Oof	Oof AIS Rmt 0of
Bit Synchronization	LOS Bad Clock (SR only)	LOS Bad Clock (SR Only)

See the following section of this document for explanations of the alarm conditions.

Hardware alarms are integrated for one second on the card before reporting to software. They result in connection reroutes and remote alarms once the software has been informed.

Detailed Explanation of Alarm Conditions

Comm Fail

The Comm Fail test has failed. This test is initiated by one node, sending a special packet to the node terminating each packet line. The far node recognizes the packet and returns an acknowledgment on the same packet line. If the initiating node does not receive the acknowledgment within a time-out period, it retries. After a number of retries, it declares a fail alarm. The Comm Fail alarm is an indication that the data path down the packet line and back is errored. Its parameters can be changed with the SuperUser commands **cnfnodparm** and **cnfcftst**. It has the effect of a hardware alarm; connections are rerouted away from the packet line, which is treated as unusable until the Comm. Fail test passes.

Pkt err

The packet error (Pkt err) alarm indicates the rate of incorrect Cyclic Redundancy Checks (CRCs) decoded on packet headers has reached the configured threshold. On the NTC, idle packets are checked for CRC on all four bytes. Information packets are checked for CRC on the first four bytes of the packet. The packet error alarm is an indication of deteriorating trunk quality.

FER

The frame error (FER) alarm indicates isolated frame words in timeslot 0 of a G.704 circuit or packet line have been received in error.

CRC err

This is a statistical alarm generated when the CRC4 in timeslot 0 has reached an error threshold.

Pkt oof

The NTC has detected incorrect CRC on the last four packets received. It assumes it has lost packet sync. The alarm is cleared when two consecutive CRCs have been decoded correctly. While an NTC is in pkt oof alarm, it sends the remote alarm packet to the other end of the packet line.

Rmt alarm

The NTC is receiving remote alarm (Rmt alarm) packets from the far end of the packet line. There is no problem in the local NTCs receiving circuit, but the remote alarm may indicate a problem with the local transmit circuit, the trunk, or the remote receive circuit.

Out of Multiframe (OOM)

This only applies to circuit lines running in CAS mode. If the multiframe sync word is not seen in timeslot 16 of frame 0 for two consecutive occasions (17 frames) the OOM alarm is set. The circuit line is conditioned and all its connections failed. The remote out of multiframe bit is set to inform the far end. One correct multiframe sync word is needed to clear the alarm.

Rmt OOM

The remote out of multiframe alarm is set on reception of the remote out of multiframe bit (bit 6) in timeslot 16 of frame 0 of a circuit line for three consecutive multiframe. It indicates that the far end cannot find the multiframe sync word. This may mean a problem with the transmitting circuit of the local CIP or in the line itself or the receiving circuit of the far end.

AIS 16

AIS 16 indicates the CIP is receiving the alarm indication signal (AIS) in timeslot 16 for two consecutive frames. The AIS alarm is usually set by a transmission device detecting a problem; it is an all-1s bit stream in timeslot 16.

OOF

The out of frame alarm is declared on a G.704 trunk when the frame alignment signal has not been seen for the last three occasions (covering 5 frames). It is cleared when the frame word has been seen on two consecutive occasions (3 frames). When the oof alarm is declared, the remote alarm bit is set.

Rmt oof

The remote out of frame alarm is set on reception of the remote alarm bit (bit 3) in timeslot 0 for three consecutive NFAS frames.

AIS

The alarm indication signal alarm is set when the last FAS and NFAS frames have included less than 3 0s in timeslot 0 (the AIS is an all 1s signal). The AIS is normally set by transmission equipment detecting a fault.

LOS

Loss of signal (LOS) is detected by the interface IC on the back card. It indicates no transitions have been detected on the line. The most likely cause is an open-circuit between the IPX and the next

device attached.

Bad Clock

The substrate backcard can declare **bad clock** if the clock it is receiving from the trunk deviates from its configured rate by more than a specified amount.

Related Information

- [WAN Switching Products Tips](#)
 - [Cisco WAN Solutions Product Information](#)
 - [WAN Switching Top Issues](#)
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