AUSM/B IMA Troubleshooting Guide

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Contents

Introduction

This document is intended as a guide to troubleshooting the operation, administration, and maintenance of Inverse Multiplexing over ATM (IMA) on the MGX 8850 ATM User Service Module Model B (AUSM/B). It outlines troubleshooting tips and steps to detect an IMA failure, to isolate that failure, and to identify the root cause of the failure.

Before You Begin

Conventions

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

Prerequisites

Readers of this document should be knowledgeable of the following:

- IMA protocol and service as specified in the ATM Forum's Inverse Multiplexing for ATM (IMA) Specification Version 1.0.
- MGX 8850 AUSM/B

Components Used

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

Overview of the Cisco IMA Implementation

The MGX 8850 supports IMA through the AUSM/B. The Cisco implementation of IMA complies with the ATM Forum's Inverse Multiplexing for ATM (IMA) Specification Version 1.0 and adds the following features:

- Support of all ATM connection management available at the ATM Forum UNI 3.0/3.1 interface.
- Large scale deployment through the IMA group automatic restart.

Extensive tests have demonstrated that the Cisco MGX 8850 IMA AUSM/B is interoperable with several third party Customer Premises Equipment (CPE) devices that also implement IMA Version 1.0.

The standards−compliant IMA implementation in the AUSM/B supports multiple configurations, as follows:

- Multiple IMA groups, each consisting of up to eight physical links.
- Up to eight multiple, individual UNI ports.
- Mixed configuration with one or several physical links grouped in an IMA, and the rest of the physical links configured as individual ATM ports.
- Differential delay tolerance. Physical links provided by different carriers can be used within the same IMA group.

An IMA group may consist of one T1/E1 physical link. This is easily scalable, especially when a user has a bandwidth need of only one T1/E1 but anticipates the need for additional capacity in the future. Additional physical links may be added incrementally to the existing IMA group.

Troubleshooting IMA Service

This section provides procedures the network operator can use to supervise IMA service on the AUSM/B. It describes how to monitor and interpret the administrative status as well as the operational status of the IMA objects available on the AUSM/B. The procedures listed in this section are intended to be used through the AUSM Command Line Interface (CLI) over a local or remote connection. For information on how to perform the IMA supervision tasks through Cisco WAN Manager (CWM), refer to the Cisco WAN Manager Operations document.

The troubleshooting methodology used to manage IMA faults consists of identifying and understanding the following:

1. Symptom for each IMA fault, certain symptoms exist. The states of various IMA components will cause these symptoms to become apparent.
2. Cause for each symptom, one or more probable causes are provided. A failure cause is the interpretation of the operational and/or administrative status of a given IMA component.
3. Corrective action for each cause, corrective actions or information are given. To successfully restore IMA service, the network operator must perform some corrective action.

Identifying a Fault

The first step in troubleshooting the IMA is to recognize that a fault exists and to localize that fault. Complete the following steps to aid in fault isolation:

1. Check the alarm status of the nodes. You can do this from the CWM, or locally on the node.
2. Use either the CWM or the **dspcds** command locally to locate the source of the alarm within the node.
3. Use either the CWM or the **dspports** or **dsplns** command locally to locate the failure within the port or line on the card.

IMA Status

IMA operational status on the AUSM/B can be described by the *IMA Group state* and/or the *IMA Link state*.

IMA Group State

The IMA group near–end (NE) state describes the NE state of the IMA port at any given moment. The *IMA Group NE state* field is in the output of the **dspport** *port–number* command issued from the CLI. The following table shows the different IMA group operational states.

State	Description
Not Configured	The IMA group does not exist. This is the initial, default state.
Startup	The IMA group is configured and the Group State Machine (GSM) is waiting for startup at the far–end (FE). Once the FE successfully communicates that it has started–up and the group parameters (*M, Symmetry*) are accepted, the group moves to the *StartUpAck* state.
StartUpAck	The GSM received the StartUpAck message contained in an IMA Control Protocol (ICP) cell from the FE.
unsupportedM	The FE is not accepting the *M* group parameter.
incompSymm	The FE is not accepting the *symmetry* group parameter.
configAbortOther	Other group parameters are not supported by the FE.
insufficientlinks	The number of active links is less than the configured minimum number of links.
blocked	If the group is blocked for maintenance purposes, the GSM goes into this state.
operational	The IMA port can send and receive ATM cells from and to the IMA sublayer. The GSM goes into this state when there are sufficient links in both transmit (Tx) and receive (Rx) directions.

IMA Group Failure Status

The IMA group failure status describes the failure status of both the NE and the FE. Knowing the failure status helps determine the reason of the failure. The *IMAGrp Failure status* field is in the output of the **dspport** *port–number* command issued from the CLI. The following table describes the different IMA group failure states:

State	Description
No Failure	The IMA group is operational.

NE StartUp	The NE GSM is in startUp state.
FE StartUp	The FE GSM is in startUp state.
NE Invalid M	The FE does not support the M parameter of the NE.
FE Invalid M	The NE does not support the M parameter of the FE.
failed Assym NE	The FE does not support asymmetric operation of the NE.
failed Assym FE	The NE does not support asymmetric operation of the FE.
NE Insuff Links	The number of active links on the NE is less than the configured minimum number of links.
FE Insuff Links	The number of active links on the FE is less than the configured minimum number of links and the message is conveyed to the NE by an ICP cell.
Blocked NE	The NE is blocked for maintenance purposes.
Blocked FE	The FE is blocked for maintenance purposes.
Other reasons	The group has failed for other reasons.

IMA Link NE Rx and Transmit Tx State

The IMA link operational status describes the state of a given link configured as part of an IMA group on the NE. The link operational state is shown in the *LinkNeRxState* and *LinkNeTxState* fields of the **dspimaln** *imagroup−number line−number* or **dspimainfo** commands issued from the CLI. The following table describes the different IMA link operational states:

State	Description
Not In Group	The link is not configured within an IMA group, or the link has been removed from the group.
Unusable	A fault has been detected on the link. Can be due to line errors. (Use the dsplns command to check the lines.)
Usable	The link is ready to be used, and is waiting for the FE Tx to be usable or active.
Active	The link is active within its IMA group and is transmitting ATM layer cells.

NE Rx−Link Failure State

The IMA Rx−link failure status describes the failure states of the NE Rx−link. The NE Rx−link failure state is shown in the *LinkNeRxFailureStatus* field of the **dspimaln** *imagroup−number line−number* command issued from the CLI. The following table describes the different IMA Rx−link failure states:

State	Description
No Failure	The link is active within its IMA group and is transmitting ATM layer cells.
IMA Link Failure	A link defect has been detected at the NE.
LIF Failure	The LIF defect has been detected at the NE.
LODS Failure	The LODS defect has been detected at the NE.
Misconnected	The link failed the IMA test procedure.
Blocked	The link is inhibited.
Fault	The link is not active.
FE Tx Link Unusable	The FE link is configured but is not operating either because of persistent defects or inhibition.
FE Rx Link Unusable	The FE link is configured but failed.

Troubleshooting Case Examples

In all the troubleshooting examples used in this section, the term "problem" is used to refer to a situation where an IMA port is in Major or Minor alarm. A Major alarm is service−affecting and results in port and/or connection failure. All user traffic coming from the CPE is discarded during a Major alarm. An example of a Major alarm is the detection of a Loss of Signal (LOS) on an IMA link. A Minor alarm results in performance degradation. A connection routed over a port in Minor alarm will typically not fail, but the connection performance may be seriously degraded. An alarm could also be physical or statistical.

Example Case One

Problem Symptoms

The IMA port is in Major alarm. The Group NE state is *Startup*. No accepted link ("Lines present" = 0). Output from the **dsplns** command shows no alarm. Output from the **dspimainfo** command shows that all links are in the *NotInGroup* state and all the Rx LIDs are defaulted to 33 (0x21). Normally the LID should be less than 31. This means that the NE is not receiving any ICP cells from the FE. Output from the **dspimalncnt** command confirms that the NE is not receiving ICP cells.

Command Output

```
MGX1.1.2.AUSMB8.a > dspport 1

    IMA Group number :              1
    Port type :                     UNI
    Lines configured :              1.2.3.4
    Enable :                        Enabled
    IMA Port state :                Sig. Failure
    IMA Group Ne state :            Startup
    PortSpeed (cells/sec) :         14364
    GroupTxAvailCellRate (cells/sec) : 0
    ImaGroupTxFrameLength(cells) :  128
    LcpDelayTolerance (IMA frames) : 1
    ReadPtrWrPtrDiff (cells) :      4
    Minimun number of links :       3
```

```
MaxTolerableDiffDelay (msec) :      275
Lines Present :
ImaGroupRxImaId :                   0x21
ImaGroupTxImaId :                   0x0
Observed Diff delay (msec) :        0
Clock Mode :                        CTC
GroupAlpha :                        2
GroupBeta :                         2
GroupGamma :                        1
GroupConfiguration :                1
IMAGrp Failure status :             Ne StartUp
Timing Reference link :             1


MGX1.1.2.AUSMB8.a > dsplns

Line Conn  Type          Status/Coding   Length        XmtClock Alarm Stats
     Type                                              Source         Alarm
---- ----- ------------  ------ --------  ------------- -------- ----- -----
2.1 RJ-48 dsx1ESF       Ena/dsx1B8ZS    0-131 ft      LocalTim No    No
2.2 RJ-48 dsx1ESF       Ena/dsx1B8ZS    0-131 ft      LocalTim No    No
2.3 RJ-48 dsx1ESF       Ena/dsx1B8ZS    0-131 ft      LocalTim No    No
2.4 RJ-48 dsx1ESF       Ena/dsx1B8ZS    0-131 ft      LocalTim No    No
2.5 RJ-48 dsx1ESF       Ena/dsx1B8ZS    0-131 ft      LocalTim No    No
2.6 RJ-48 dsx1ESF       Ena/dsx1B8ZS    0-131 ft      LocalTim No    No
2.7 RJ-48 dsx1ESF       Ena/dsx1B8ZS    0-131 ft      LocalTim No    No
2.8 RJ-48 dsx1ESF       Ena/dsx1B8ZS    0-131 ft      LocalTim No    No
LineNumOfValidEntries: 8


MGX1.1.2.AUSMB8.a > dspimainfo

dspimainfo
Link Group  NeTx       NeRx      FeTx        FeRx        TxLID RxID
            State      State     State       State
------------------------------------------------------------------------
1    1     Unusable   Unusable  NotInGroup  NotInGroup  0     33
2    1     Unusable   Unusable  NotInGroup  NotInGroup  1     33
3    1     Unusable   Unusable  NotInGroup  NotInGroup  2     33
4    1     Unusable   Unusable  NotInGroup  NotInGroup  3     33
value = 0 = 0x0


MGX1.1.2.AUSMB8.a > dspimalncnt 1 1

IMA group number :              1
Line number :                   1
Icp Cells Received :            0
Icp Errored Cells Recvd :       0
Ima Violations Count :          0
Ima OIF anomalies :             4
Ima Ne Severely Errored Seconds : 0
Ima Fe Severely Errored Seconds : 0
Ima Ne Unavailable Seconds :    0
Ima Fe Unavailable Seconds :    0
Ima NeTx Unusable Seconds :     1541
Ima NeRx Unusable Seconds :     1541
Ima FeTx Unusable Seconds :     0
Ima FeRx Unusable Seconds :     0
Ima FeTx Num. Failues :         0
Ima FeRx Num. Failures :        0
# HEC errored cells :           0
# HEC errored seconds :         0
# Severely HEC errored seconds :  0
MGX1.1.2.AUSMB8.a > dspimaln 1 1
IMA Group number :       1
```

```
           Link number :              1
           ImaLink TxLId :            0x0
           ImaLink RxLId :            0x21
           LinkNeRxState :            Unusable
           LinkNeTxState :            Unusable
           LinkNeRxFailureStatus :    Ima Link Failure
           LinkFeRxState :            Not In Group
           LinkFeTxState :            Not In Group
           LinkFeRxFailureStatus :    No Failure
           LinkRelDelay :             0
           LinkRxTestPattern :        255
           Ne Link Tx Num Failures : 0
           Ne Link Rx Num Failures : 0
```

Probable Cause

The FE is not configured properly.

Once the group is brought up, the GSM enters the *Start_Up* state and checks the symmetry configuration and the *M* value from the FE. The only configuration that can be accepted is *M=128* and *symmetrical* configuration. In case of configuration mismatch, the GSM changes to the *Config_Aborted* state for a limited time and then changes to the *Start_Up* state. The GSM becomes stuck in the *Start_Up* state. Once the *M* value and the *symmetry* configuration received from the FE reach the NE, the GSM transitions to *Startup_Ack*, *Insufficient_Links*, and/or *Operational*.

Corrective Action

Check to ensure that the configuration of the FE matches the expected configuration.

Example Case Two

Problem Symptoms

The IMA port is in the *Active* state, but all configured links are not present. Output from the **dspports** and **dspport** commands shows that link 1 has been removed from the group. Output from the **dspimainfo** command shows the following:

- NE Rx and NE Tx of link 1 are *Usable*.
- FE Rx and FE Tx of link 1 are *Unusable* and the reason for the FE Rx failure is blocked.

    Note: Link 1 is receiving ICP cells.

Output from the **dsplns** command shows line 1 out of alarm.

Command Output

```
MGX1.1.2.AUSMB8.a > dspports

No ATM T1/E1 UNI ports currently active
List of IMA groups:
===================
ImaGrp PortType Conf  Avail     Lines configured Lines present    Tol Diff  Port Ste
                rate  rate                                        Delay(ms)
------ -------- ----- -----     --------------- ---------------  --------- --------
2.1    UNI      14364 10773     1.2.3.4         2.3.4            275       Active
NextPortNumAvailable: 7


MGX1.1.2.AUSMB8.a > dspport 1
```

```
IMA Group number :              1
Port type :                     UNI
Lines configured :              1.2.3.4
Enable :                        Enabled
IMA Port state :                Active
IMA Group Ne state :            operational
PortSpeed (cells/sec) :         14364
GroupTxAvailCellRate (cells/sec) : 10773
ImaGroupTxFrameLength(cells) :  128
LcpDelayTolerance (IMA frames) : 1
ReadPtrWrPtrDiff (cells) :      4
Minimun number of links :       2
MaxTolerableDiffDelay (msec) :  275
Lines Present :                 2.3.4
ImaGroupRxImaId :               0x21
ImaGroupTxImaId :               0x0
Observed Diff delay (msec) :    0
Clock Mode :                    CTC
GroupAlpha :                    2
GroupBeta :                     2
GroupGamma :                    1
GroupConfiguration :            1
IMAGrp Failure status :         No Failure
Timing reference link :         2


MGX1.1.2.AUSMB8.a > dsplns

Line Conn      Type    Status/Coding   Length        XmtClock Alarm Stats
     Type                                            Source         Alarm
---- -----  ------------  ------  --------  -------------  --------  -----  -----
2.1 RJ-48    dsx1ESF   Ena/dsx1B8ZS    0-131 ft    LocalTim   No    No
2.2 RJ-48    dsx1ESF   Ena/dsx1B8ZS    0-131 ft    LocalTim   No    No
2.3 RJ-48    dsx1ESF   Ena/dsx1B8ZS    0-131 ft    LocalTim   No    No
2.4 RJ-48    dsx1ESF   Ena/dsx1B8ZS    0-131 ft    LocalTim   No    No
2.5 RJ-48    dsx1ESF   Ena/dsx1B8ZS    0-131 ft    LocalTim   No    No
2.6 RJ-48    dsx1ESF   Ena/dsx1B8ZS    0-131 ft    LocalTim   No    No
2.7 RJ-48    dsx1ESF   Ena/dsx1B8ZS    0-131 ft    LocalTim   No    No
2.8 RJ-48    dsx1ESF   Ena/dsx1B8ZS    0-131 ft    LocalTim   No    No
LineNumOfValidEntries: 8


MGX1.1.2.AUSMB8.a > dspimainfo

Link      Group     NeTx     NeRx     FeTx     FeRx     TxLID  RxID
                    State    State    State    State
---------------------------------------------------------------------
1         1         Usable   Usable   Unusable Unusable  0      1
2         1         Active   Active   Active   Active    1      0
3         1         Active   Active   Active   Active    2      2
4         1         Active   Active   Active   Active    3      3


MGX1.1.2.AUSMB8.a > dspimaln 1 1

IMA Group number : 1
Link number :               1
ImaLink TxLId :             0x0
ImaLink RxLId :             0x1
LinkNeRxState :             Usable
LinkNeTxState :             Usable
LinkNeRxFailureStatus :     No Failure
LinkFeRxState :             Unusable
LinkFeTxState :             Unusable
LinkFeRxFailureStatus :     Blocked
LinkRelDelay :              0
```

```
            LinkRxTestPattern :           255
            Ne Link Tx Num Failures : 0
            Ne Link Rx Num Failures : 0


            MGX1.1.2.AUSMB8.a > dspimalncnt 1 1

            IMA group number :               1
            Line number :                    1
            Icp Cells Received :             12687
            Icp Errored Cells Recvd :        0
            Ima Violations Count :           0
            Ima OIF anomalies :              15
            Ima Ne Severely Errored Seconds : 0
            Ima Fe Severely Errored Seconds : 2
            Ima Ne Unavailable Seconds :     154
            Ima Fe Unavailable Seconds :     0
            Ima NeTx Unusable Seconds :      145
            Ima NeRx Unusable Seconds :      144
            Ima FeTx Unusable Seconds :      448
            Ima FeRx Unusable Seconds :      448
            Ima FeTx Num. Failues :          0
            Ima FeRx Num. Failures :         0
            # HEC errored cells :            0
            # HEC errored seconds :          0
            # Severely HEC errored seconds :  0
```

Probable Cause

Link 1 has been inhibited at the FE.

The Link State Machine (LSM) of link 1 is waiting to receive FE Tx=*Usable* before setting the NE
Rx=*Active*, and the LSM of link 1 is waiting to receive FE Tx=*Usable* before setting the NE Rx=*Active*.

Corrective Action

Link 1 should be activated at the FE. (When using a Cisco IOS based CPE, the CPE interface usually does not
need to be shut down.)

Example Case Three

Problem Symptoms

The IMA port is in Major Alarm. The NE group is in the *Start_Up* state. This time, the reason for the failure is
Insufficient Links. The resiliency (*Minimum number of links*) is set to 4; however, link 1 is not active. Output
from the **dspimainfo** command shows the following:

- The NE of link 1 is out of failure. Use the **dspimaln** *ima−group line−number* command to verify this.
- FE Rx and FE Tx of link 1 are *Unusable* and the reason for the FE Rx failure is blocked.

    Note: Link 1 is receiving ICP cells.

    Use the **dspimalncnt** *ima−group line−number* command to verify this.

Output from the **dsplns** command shows line 1 out of alarm.

Command Output

```
MGX1.1.2.AUSMB8.a > dspports

No ATM T1/E1 UNI ports currently active
List of IMA groups:
====================
ImaGrp PortType Conf  Avail     Lines configured  Lines present  Tol Diff  Port Ste
                rate  rate                                       Delay(ms)
------ -------- ----- -----     ---------------   ---------------  ---------  --------
2.1    UNI      14364  0        1.2.3.4                            275      Sig. Fae
NextPortNumAvailable: 6


MGX1.1.2.AUSMB8.a > dspport 1

IMA Group number :                  1
Port type :                         UNI
Lines configured :                  1.2.3.4
Enable :                            Enabled
IMA Port state :                    Sig. Failure
IMA Group Ne state :                insufficientlinks
PortSpeed (cells/sec) :             14364
GroupTxAvailCellRate (cells/sec) : 0
ImaGroupTxFrameLength(cells) :      128
LcpDelayTolerance (IMA frames) :    1
ReadPtrWrPtrDiff (cells) :          4
Minimun number of links :           4
MaxTolerableDiffDelay (msec) :      275
Lines Present :
ImaGroupRxImaId :                   0x21
ImaGroupTxImaId :                   0x0
Observed Diff delay (msec) :        0
Clock Mode :                        CTC
GroupAlpha :                        2
GroupBeta :                         2
GroupGamma :                        1
GroupConfiguration :                1
IMAGrp Failure status :             Ne StartUp
Timing reference link :             1


MGX1.1.2.AUSMB8.a > dspimainfo

Link     Group     NeTx    NeRx    FeTx      FeRx      TxLID RxID
                   State   State   State     State
-----------------------------------------------------------------
1        1         Usable  Usable  Unusable Unusable  0     1
2        1         Usable  Usable  Usable    Usable    1     0
3        1         Usable  Usable  Usable    Usable    2     2
4        1         Usable  Usable  Usable    Usable    3     3


MGX1.1.2.AUSMB8.a > dspimaln 1 1

IMA Group number :        1
Link number :             1
ImaLink TxLId :           0x0
ImaLink RxLId :           0x1
LinkNeRxState :           Usable
LinkNeTxState :           Usable
LinkNeRxFailureStatus :   No Failure
LinkFeRxState :           Unusable
LinkFeTxState :           Unusable
LinkFeRxFailureStatus :   Blocked
LinkRelDelay :            0
```

```
        LinkRxTestPattern :          255
        Ne Link Tx Num Failures : 0
        Ne Link Rx Num Failures : 0
```

Probable Cause

Link 1 has been inhibited at the FE.

The LSM of link 1 is waiting to receive FE Tx=*Usable* before setting the NE Rx=*Active*, and the LSM of link 1 is waiting to receive FE Rx=*Usable* before setting the NE Tx=*Active*.

Corrective Action

Link 1 should be activated at the FE. (When using a Cisco IOS−based CPE, the CPE interface usually does not need to be shut down.) Or, the resiliency should be changed to a lower value (3, 2 or 1).

Example Case Four

Problem Symptoms

The IMA port is in Major alarm.

Output of the **dspport** command shows the following:

  • The NE IMA group is in the *Insufficient Links* state.
  • The resiliency (*Minimum number of links*) is set to 3, however only two links (from the four configured) are present.

Output of the **dspimainfo** command shows that the FE Rx and FE Tx of links 2 and 4 are not in the IMA group.

Output of the **dsplns** commands show that there are physical alarms on line 2 and 4.

Command Output

```
MGX1.1.2.AUSMB8.a > dspports

No ATM T1/E1 UNI ports currently active
List of IMA groups:
==================
ImaGrp PortType Conf  Avail Lines configured Lines present  Tol Diff  Port Ste
                 rate  rate                                  Delay(ms)
------ -------- ----- ----- --------------- --------------- --------- --------
2.1    UNI      14364 7182  1.2.3.4         1.3             275       Fail(Ma)
NextPortNumAvailable: 8


MGX1.1.2.AUSMB8.a > dspport 1

IMA Group number :               1
Port type :                      UNI
Lines configured :               1.2.3.4
Enable :                         Modify
IMA Port state :                 Fail(Maj alm)
IMA Group Ne state :             insufficientlinks
PortSpeed (cells/sec) :          14364
GroupTxAvailCellRate (cells/sec) : 7182
ImaGroupTxFrameLength(cells) :   128
LcpDelayTolerance (IMA frames) : 1
```

```
ReadPtrWrPtrDiff (cells) :          4
Minimun number of links :           3
MaxTolerableDiffDelay (msec) :      275
Lines Present :                     1.3
ImaGroupRxImaId :                   0x21
ImaGroupTxImaId :                   0x0
Observed Diff delay (msec) :        0
Clock Mode :                        CTC
GroupAlpha :                        2
GroupBeta :                         2
GroupGamma :                        1
GroupConfiguration :                1
IMAGrp Failure status :             Ne Insuff Links
Timing reference link :             1


MGX1.1.2.AUSMB8.a > dspimainfo

Link      Group      NeTx      NeRx      FeTx      FeRx      TxLID RxID
                     State     State     State     State
-----------------------------------------------------------------------
1         1          Active    Active    Active    Active      0     1
2         1          Usable    Unusable NotInGroup NotInGroup  1     0
3         1          Active    Active    Active    Active      2     2
4         1          Usable    Unusable NotInGroup NotInGroup  3     3


MGX1.1.2.AUSMB8.a > dsplns

Line Conn      Type      Status/Coding    Length        XmtClock Alarm Stats
     Type                                               Source         Alarm
---- ----- ------------ ------ -------- ------------- -------- ----- -----
2.1 RJ-48    dsx1ESF    Ena/dsx1B8ZS    0-131 ft      LocalTim No     No
2.2 RJ-48    dsx1ESF    Ena/dsx1B8ZS    0-131 ft      LocalTim Yes    Yes
2.3 RJ-48    dsx1ESF    Ena/dsx1B8ZS    0-131 ft      LocalTim No     No
2.4 RJ-48    dsx1ESF    Ena/dsx1B8ZS    0-131 ft      LocalTim Yes    Yes
2.5 RJ-48    dsx1ESF    Ena/dsx1B8ZS    0-131 ft      LocalTim No     No
2.6 RJ-48    dsx1ESF    Ena/dsx1B8ZS    0-131 ft      LocalTim No     No
2.7 RJ-48    dsx1ESF    Ena/dsx1B8ZS    0-131 ft      LocalTim No     No
2.8 RJ-48    dsx1ESF    Ena/dsx1B8ZS    0-131 ft      LocalTim No     No
LineNumOfValidEntries: 8
```

Probable Cause

There is a fault at the physical level of links 2 and 4.

Corrective Action

Check the T1 circuits.

Example Case Five

Probable Symptoms

The IMA port is in Major alarm.

Output of the **dspport** *port−number* command shows the following:

- The NE IMA group is in the *Insufficient Links* state.
- The resiliency (*Minimum number of links*) is set to 3, however only two links (6 and 8) are present.

Output of the **dspimainfo** command shows the following:

- The FE Rx and FE Tx of link 5 are in the *NotInGroup* state.
- The NE Rx is in the *Unusable* state.

Output of the **dspimaln** *ima−group line−number* command shows Lods failure on link 5.

Output of the **dsplns** command shows no alarm.

After clearing the IMA line counters with the **clrimalncnt** *ima−group line−number* command and issuing the **dspimalncnt** *ima−group line−number* command, it appears that link 5 is no longer receiving ICP cells.

Command Output

```
MGX1.1.2.AUSMB8.a > dspports

No ATM T1/E1 UNI ports currently active
List of IMA groups:
==================
ImaGrp PortType Conf  Avail Lines configured Lines present  Tol Diff Port Ste
                rate  rate                                  Delay(ms)
------ -------- ----- ----- --------------- --------------- --------- --------
2.2    UNI      14364 7182  5.6.7.8         6.8             275       Fail(Ma)
NextPortNumAvailable: 6


MGX1.1.2.AUSMB8.a > dspport 2

IMA Group number :              2
Port type :                     UNI
Lines configured :              5.6.7.8
Enable :                        Enabled
IMA Port state :                Fail(Maj alm)
IMA Group Ne state :            insufficientlinks
PortSpeed (cells/sec) :         14364
GroupTxAvailCellRate (cells/sec) : 7182
ImaGroupTxFrameLength(cells) :  128
LcpDelayTolerance (IMA frames) : 1
ReadPtrWrPtrDiff (cells) :       4
Minimun number of links :       3
MaxTolerableDiffDelay (msec) :  275
Lines Present :                 6.8
ImaGroupRxImaId :               0x0
ImaGroupTxImaId :               0x1
Observed Diff delay (msec) :    0
Clock Mode :                    CTC
GroupAlpha :                    2
GroupBeta :                     2
GroupGamma :                    1
GroupConfiguration :            1
IMAGrp Failure status :         Ne Insuff Links
Timing reference link :         6


MGX1.1.2.AUSMB8.a > dspimainfo

Link Group   NeTx      NeRx     FeTx        FeRx        TxLID   RxID
             State     State    State       State
--------------------------------------------------------------------------
5    2       Usable    Unusable NotInGroup  NotInGroup  0       1
6    2       Active    Active   Active      Active      1       2
7    2       Unusable  Unusable NotInGroup  NotInGroup  2       33
8    2       Active    Active   Active      Active      3       0
```

```
MGX1.1.2.AUSMB8.a > dspimaln 2 5

IMA Group number :          2
Link number :               5
ImaLink TxLId :             0x0
ImaLink RxLId :             0x1
LinkNeRxState :             Unusable
LinkNeTxState :             Usable
LinkNeRxFailureStatus :     Ima Link Failure
LinkFeRxState :             Unusable
LinkFeTxState :             Usable
LinkFeRxFailureStatus :     Lods Failure
LinkRelDelay :              0
LinkRxTestPattern :         255
Ne Link Tx Num Failures : 1
Ne Link Rx Num Failures : 1


MGX1.1.2.AUSMB8.a > dsplns

Line Conn      Type        Status/Coding    Length         XmtClock Alarm Stats
     Type                                                  Source         Alarm
---- ----- ------------ ------ -------- ------------- -------- ----- -----
2.5  RJ-48 dsx1ESF          Ena/dsx1B8ZS 0-131 ft      LocalTim No    No
2.6  RJ-48 dsx1ESF          Ena/dsx1B8ZS 0-131 ft      LocalTim No    No
2.7  RJ-48 dsx1ESF          Ena/dsx1B8ZS 0-131 ft      LocalTim No    No
2.8  RJ-48 dsx1ESF          Ena/dsx1B8ZS 0-131 ft      LocalTim No    No
LineNumOfValidEntries: 8


MGX1.1.2.AUSMB8.a > dspimalncnt 2 5

IMA group number :                  2
Line number :                       5
Icp Cells Received :                0
Icp Errored Cells Recvd :          0
Ima Violations Count :             0
Ima OIF anomalies :                6
Ima Ne Severely Errored Seconds : 0
Ima Fe Severely Errored Seconds : 0
Ima Ne Unavailable Seconds :       53
Ima Fe Unavailable Seconds :       53
Ima NeTx Unusable Seconds :        0
Ima NeRx Unusable Seconds :        53
Ima FeTx Unusable Seconds :        0
Ima FeRx Unusable Seconds :        53
Ima FeTx Num. Failues :            0
Ima FeRx Num. Failures :           0
# HEC errored cells :              0
# HEC errored seconds :            0
# Severely HEC errored seconds :  0
```

Probable Cause

Link 5 is misconnected. It is connected to a different IMA group than the rest of the links.

Corrective Action

Check connectivity.

Example Case Six

Problem Symptoms

The IMA port is in Major alarm.

Output from the **dspport** *port−number* command shows the following:

- The NE group is in the **StartUpAck** state ready to go into *Operational* or *Insufficient Link* status.
- The resiliency (*Minimum number of links*) is set to 2, and no link is present.
- The group Tx ID is 0x0.

Output from the **dspimainfo** shows the following:

- The NE Tx is in the *Unusable* state and the NE Rx is in the *Usable* state.
- FE Tx and FE Rx are in the *Unusable* state.

Command Output

```
MGX1.1.2.AUSMB8.a > dspport 1

IMA Group number :                  1
Port type :                         UNI
Lines configured :                  1.2.3
Enable :                            Enabled
IMA Port state :                    Sig. Failure
IMA Group Ne state :                StartUpAck
PortSpeed (cells/sec) :             10773
GroupTxAvailCellRate (cells/sec) :  0
ImaGroupTxFrameLength(cells) :      128
LcpDelayTolerance (IMA frames) :    1
ReadPtrWrPtrDiff (cells) :          4
Minimun number of links :           2
MaxTolerableDiffDelay (msec) :      275
Lines Present :
ImaGroupRxImaId :                   0x21
ImaGroupTxImaId :                   0x0
Observed Diff delay (msec) :        0
Clock Mode :                        CTC
GroupAlpha :                        2
GroupBeta :                         2
GroupGamma :                        1
GroupConfiguration :                1
IMAGrp Failure status :             Ne StartUp
Timing reference link :             1


MGX1.1.2.AUSMB8.a > dspimainfo

Link   Group      NeTx      NeRx      FeTx      FeRx       TxLID    RxID
                  State     State     State     State
-----------------------------------------------------------------
1     1          Unusable  Usable    Unusable  Unusable   0        1
2     1          Unusable  Usable    Unusable  Unusable   1        3
3     1          Unusable  Usable    Unusable  Unusable   2        2
```

Probable Cause

The NE seems to have successfully negotiated the configuration (*Symmetry* and *M*). The links are sending and receiving ICP cells. The FE is expecting group Rx ID of 0x1 while the Tx ID of the AUSM/B is 0x0, as

shown below:

```
3600-T1# show contro atm2/ima1

    ?
    ?
    ATM channel number is 0
    link members are 0xF, active links are 0x0
    Group status is insufficientLinksFe, 4 links configured,
    Group Info: Configured links bitmap 0xF, Active links bitmap 0x0,
    Tx/Rx IMA_id 0x21/0x1,
    NE Group status is startUp,
    frame length 0x80, Max Diff Delay 0,
    2 min links, clock mode ctc, symmetry symmetricOperation, trl 0,
    Group Failure status is insufficientLinksFe.
    Test pattern procedure is disabled
    SAR counter totals across all links and groups:
    0 cells output, 0 cells stripped
    0 cells input, 15169705 cells discarded, 0 AAL5 frames discarded
    0 pci bus err, 0 dma fifo full err, 0 rsm parity err
    0 rsm syn err, 0 rsm/seg q full err, 0 rsm overflow err
    0 hs q full err, 0 no free buff q err, 0 seg underflow err
    0 host seg stat q full err
```

Corrective Action

Restart the IMA group on the FE.

Description of the dspport Command Output

The following table provides a description of the various fields shown within the output of the **dspport** and the **dspimagrp** commands:

Counter/Field	Description
IMA Group number	A number from 1 to 8 assigned to the IMA port. This is a logical port number. Up to eight IMA groups may be enabled for each AUSM/B. The IMA group number is synonymous with an IMA port and is independent from the line number.
Port type	Defines the header format of the ATM cell flowing on the port. This parameter should match with the one used by the CPE connected to the port. Two values may be used, UNI and NNI.
Lines configured	This is the number (N) of transmission links configured/designated as an IMA group. A port may comprise up to eight T1/E1 lines.This field shows the current lines configured as one port. The lines are separated by

|	
	dots.
Enable	This parameter shows the administrative status of the port as *enable*, *modify* or *disabled*. Use the **addimagrp** command to enable a port. Use the **cnfimagrp** command to modify a port. Use the **delimagrp** command to disable a port.
IMA Port state	The current state of the IMA group (*active*, *B/w changed*, *Sig. Failure*, *Fail*).
IMA Group NE state	*Operational*, *Startup*, *insufficientlinks*.
PortSpeed	The speed of the port is in Cells Per Second (Cell/S). This depends on the number of the links in the IMA group and the configuration of the physical interface of each link (T1, Clear E1, Normal E1). The total bandwidth of the port is calculated as the total of the number of lines configured.
GroupTxAvailCellRate	The current cell rate (truncated value in cells per second) provided by the IMA group in the transmit direction, considering all the transmit links in the active state (out of error/alarm and not in loop mode). The generic formula for the link rate with N active links is: N * link rate * (M−1) / M, where M is the IMA Frame length. With M+128, then: Eight T1 lines have a rate of 28728 cells/second. Eight normal E1 lines have a rate of 35920 cells/second. Eight clear E1 lines have a rate of 38312 cells/second.
ImaGroupTxFrameLength	The unit of measurement is cells. An IMA Frame is used as the unit of control in the IMA protocol. The ICP cells are used to carry IMA control cells. This parameter represents the period at which ICP cells are transmitted. The current implementation supports (by default) only M=128 and can not be changed.
LcpDelayTolerance	The number of IMA Frames for

	which an ICP cell on any link can be missed before the IMA state machine should remove the link from the IMA group. The ICP cell shall be sent on each link once per IMA frame, hence every M−1 cells. This parameter is defaulted to 1. It is hard−coded and can not be changed.
ReadPtrWrPtrDiff	This is the desired difference (in cells) between the read and the read pointers in the delay compensation buffer for all links in the current IMA group. A lower value reduces the latency in the buffer but also increases the probability of an IMA group being stalled for a cell−time due to a slower link in the IMA group. This parameter is defaulted to 4. It is hard−coded and can not be changed.
Minimum number of links	The current configured degree of resiliency in the IMA group. It specifies the minimum number of T1/E1 lines to be active (out of error or alarms) before the IMA group is brought down.
MaxTolerableDiffDelay	This indicates the maximum tolerable differential delay in milliseconds between the various links in the IMA group. The default value is variable and depends on the type of AUSM card. The maximum delay is 275 ms for an IMA group consisting of T1 lines and 200 ms for an IMA group consisting of E1 lines. The configurable range for that parameter is 0 to 275 for T1 and 0 to 200 for E1.
Lines Present	A list of the N T1/E1 lines present within the IMA group. The transmit IMA port distributes ATM cells arriving from the ATM layer (including any unassigned cells) over the N links present in a cyclic round robin fashion, and on a cell−by−cell basis. A line may be automatically removed (deactivated) from an IMA group upon a physical failure or IMA protocol failure. The list of the current active lines are separated by

	"."
ImaGroupRxImaId	This is the remote IMA group ID used by the far end to differentiate between IMA groups. The IMA group?s IMA ID is assigned during start−up. It is represented as a hex value (0x).
ImaGroupTxImaId	This is the local IMA group ID used by the local end to differentiate between IMA groups. It is represented as a hex value (0x).
Observed Diff delay	The time, in mS, measured between arriving cells on different lines within an IMA group. The differential delay between the links in the IMA group is determined through the received ICP cells.
Clock Mode	Transmit clocking mode used by the near end of the IMA group. Two transmit clock modes are defined by the ATMF in the IMA specification: Common timing clock (CTC) and Independent timeing clock (ITC). In the current implementation only the default value of CTC is supported on the AUSM/B. However, the card is capable of supporting the ITC from the hardware perspective. CTC: all the transmit clocks of the links in the group are derived from the same source. ITC: At least one link has a transmit clock different from the clock source of the rest of the links in the group. The transmit IMA is allowed to indicate that it is in the ITC mode even if all the transmit clocks of the links in the group are derived from the same source.
GroupAlpha	This indicates the "alpha" value used to specify the number of consecutive invalid ICP cells to be detected before moving to the *IMA HUNT* state. Only the default value of 2 is supported. It can not be specified or modified through the CLI.
GroupBeta	This indicates the "beta" value used to specify the number of consecutive errored ICP cells to be detected before moving to the *IMA*

	HUNT state. Only the default value of 2 is supported. It can not be specified or modified through the CLI.
GroupGamma	This indicates the "gamma" value used to specify the number of consecutive valid ICP cells to be detected before moving to the *IMA SYNC* state from the *PRESYNC* state. Only the default value of 1 is supported. It can not be specified or modified through the UI.
GroupConfiguration	This indicates the "symmetry" mode the IMA group is configured with. The current implementation supports only one mode, Symmetric, represented by the value 1. It can not be specified or modified through the UI.
IMAGrp Failure status	*No Failure*, *NE StartUp*, *NE Insuff Links*.
Timing reference link	This is the link selected as the reference to derive the rate at which the IMA data cells could be exchanged between the IMA.

Differential Delay Operation

The figure below shows an IMA group of five links. The group has been provisioned with a maximum tolerable differential delay of 50 ms. The links cleared a Physical alarm in the following order: 1, 2, 3, 4, and 5. Which link(s) will be selected in the group, and which will be rejected for being out of the delay tolerance range?
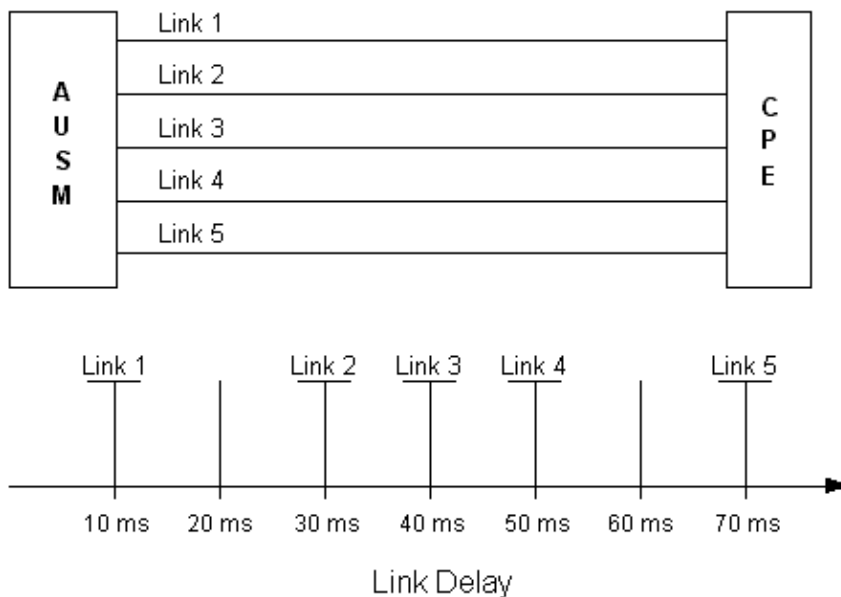
Differential delay is the cumulative amount of time that links take to clear their alarms. In this case, we have an accumulating delay of 10 ms, 20 ms, 30 ms, 40 ms, 50 ms, 60 ms, and 70 ms. The differential delay algorithm goes over all links in the ascending order of link numbers to evaluate the delay. Links 1, 2, 3, and 4 will be selected within the group, because their cumulative delay is within the maximum tolerable differential delay of 50 ms. Link 5 will be rejected from the group, and will enter the *LODS error* state.

Related Information

- **Troubleshooting ATM IMA Links on Cisco 2600 and 3600 Routers**
- **Troubleshooting Bouncing IMA Links**
- **The ATM Forum   Approved Technical Specifications**
- **Cisco WAN Manager Operations**
- **Cisco WAN Switching Solutions   Cisco Documentation**
- **Guide to New Names and Colors for WAN Switching Products**
- **Software Center   WAN Switching Software**
- **Technical Support   Cisco Systems**

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