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Tech Notes

Troubleshooting Rejected Calls and ATM Signaling RELEASE Messages

TAC Notice: What's Changing on TAC Web

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Introduction

The private User-Network Interface (UNI) defines a signaling protocol that runs between an end system like a router or Cisco Catalyst 5000/6000 ATM module and the ATM switch to which the router interface is connected. The two UNI devices exchange signaling messages that follow ATM Forum and International Telecommunication Union Telecommunication Standardization Sector (ITU-T) standards. The ITU-T standards for UNI signaling are Q.2931 and Q.2971. The ATM Forum standards are UNI 3.x and UNI 4.0.

UNI protocols support three general message types, as explained in Understanding and Troubleshooting ATM UNI Signaling:

- Call Establishment—Includes SETUP, CONNECT, and CONNECT ACKNOWLEDGE

- Call Maintenance/Miscellaneous—Includes STATUS and STATUS ENQUIRY

- Call Clearing—Includes RELEASE and RELEASE COMPLETE

All UNI messages begin with a 9-byte header. This header includes a 2-byte message type field.

This document is designed to assist with troubleshooting UNI signaling issues. Importantly, it explains the fields in RELEASE and RELEASE COMPLETE messages, particularly location values and cause codes.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

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

Conventions

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

Call Rejection Procedures

A called user can reject a call with a RELEASE or a RELEASE COMPLETE, depending on where and when the problem is detected.

- Under normal conditions, the called user sends a RELEASE message with the appropriate cause code. The switch responds by releasing resources for the call, initiating call clearing toward the calling user, and sending a RELEASE COMPLETE message back to the called user.

- Under exceptional conditions, the called user sends a RELEASE COMPLETE with the appropriate cause code before allocating any resources to the call. An immediate RELEASE COMPLETE is sent when the called user can determine that the call must be rejected as soon as it receives the SETUP message. The switch responds by releasing its resources and clearing the call toward the *calling* user.

Note that a connection exists or does not exist per connection segment. A RELEASE COMPLETE is locally significant only and does not indicate that the entire connection has been released.

Exception Handling Procedures

Networking protocols frequently use state machines that take a device or interface through several stages to normal operation. UNI recommendations specify ATM call control states for both the user (U) side and the network (N) side. These states are explained in Understanding and Troubleshooting ATM UNI Signaling. Refer also to Annex A of the International Telecommunication Union Q.2931

specification.

A RELEASE COMPLETE message is expected by the user side when it is in the Null (U0), Call Initiated (U1), or Release Request (U11) state and by the network side when it is in the Null (N0), Call Present (N6), or Release Request (N11) state. Receiving a RELEASE COMPLETE in any other state causes the device to implement so-called exception handling procedures and immediately clear all resources for a call.

Several types of errors can occur. These errors include wrong message encoding, status errors like receiving a message not expected in the given state, missing information elements (IEs), and IEs incorrectly contained in a message.

Cause Information Element

RELEASE and RELEASE COMPLETE messages include the cause IE, which communicates several pieces of important information during call clearing. The cause IE and its contents (including the location and cause values) are specified in the ITU-T Q.850 standard and in the ATM Forum UNI 3.x/UNI 4.0 standards.

On the Catalyst 8500 series and the Cisco Lightstream 1010, issue the **debug atm sig-packet** and **debug atm sig-all** commands to capture the message contents and cause codes.

⚠ **Caution:** Before issuing **debug** commands, refer to Important Information on Debug Commands.

The following capture from an ATM Sniffer illustrates the format of the RELEASE and RELEASE COMPLETE signaling messages and the cause IE. The two most important values are the `Location` and `Cause` fields.

```
    Frame 10: Protocol Discriminator:     Q.2931 user-network call control message
    Call Reference Length:      3 bytes
      Direction Flag:           Message sent to the side originating call
      Value:                    0x00096e
    Message Type:               Release (0x4d)
      Message AI Flag:          Ignore Action Indicator Field
      Action Indicator Field:   Not significant
      Message Length:           6 bytes
    Information Element Name:    Cause (0x08)
      Coding Standard:          ITU-T standardized
      Instruction Flag:         Ignore Instruction Field
      Instruction Field:        Not significant
      Element Length:           2 bytes
      Location:                 Private network serving the local user
      Cause:                    Message not compatible with call state (101)

    Frame 11:

    Protocol Discriminator:     Q.2931 user-network call control message
    Call Reference Length:      3 bytes
      Direction Flag:           Message sent from the side originating call
      Value:                    0x00096e
    Message Type:               Release Complete (0x5a)
      Message AI Flag:          Ignore Action Indicator Field
```

```
      Action Indicator Field:    Not significant
      Message Length:            6 bytes
  Information Element Name:       Cause (0x08)
      Coding Standard:           ITU-T standardized
      Instruction Flag:          Ignore Instruction Field
      Instruction Field:         Not significant
      Element Length:            2 bytes
      Location:                  User
      Cause:                     Destination out of order (27)
```

The `Location` field describes where the reason for the RELEASE of the connection has been detected. It enables you to see which device actually initiated the release and, in the case of unusual cause values, which device detected the problem that led to the call clearing. The possible values are shown in this table:

Coding	Location
0x0	user
0x1	private network serving local user
0x2	public network serving local user
0x3	transit network
0x4	public network serving remote user
0x5	private network serving remote user
0x7	international network
0xa	network beyond interworking point

The `cause` value consists of two subfields: a class and a cause value in this class. Q.850 includes most of these cause values.

Coding	Class
0	normal event
1	normal event
2	resource not available
3	service or option not available
4	service or option not implemented
5	invalid message
6	protocol error
7	interworking

UNI 3.1 Cause Definitions

- Normal Class Definitions

- [Resource Unavailable Class Definitions](#)

- [Service or Option Not Available Class Definitions](#)

- [Service or Option Not Implemented Class Definitions](#)

- [Invalid Message Class Definitions](#)

- [Protocol Error Class Definitions](#)

Normal Class Definitions

Cause Number	Description	Explanation
1	unallocated (unassigned) number	Called party cannot be reached because, although the number is in a valid format, it is not currently assigned (allocated).
3	no route to destination	Called party cannot be reached because the network through which the call has been routed does not serve the destination desired. This cause is supported on a network-dependent basis.
10	virtual path connection identifier (VPCI)/virtual channel identifier (VCI) unacceptable	Virtual channel most recently identified is not acceptable to the sending entity for use in this call.
16	normal call clearing	Call is being cleared because one of the users involved in the call has requested that the call be cleared. Under normal situations the source of this cause is not the network.
17	user busy	Called party is unable to accept another call because the user busy condition has been encountered. This cause value may be generated by the called user or by the network.
	no user	Used when a called party does not respond to a call establishment message with a

18	responding	connect indication within the prescribed period of time allocated.
21	call rejected	Indicates that the equipment sending this cause does not wish to accept this call, although it could have accepted the call because the equipment sending this cause is neither busy nor incompatible.
22	number changed	Returned to a calling party when the called party number indicated by the calling user is no longer assigned. The new called party number may optionally be included in the diagnostic field. If a network does not support this capability, cause number 1, "unallocated (unassigned) number", shall be used.
23	user rejects all calls with calling line ID restriction (CLIR)	Returned by the called party when the call is offered without calling party number information and the called party requires this information.
27	destination out of order	Indicates that the destination indicated by the user cannot be reached because the interface to the destination is not functioning correctly. The term "not functioning correctly" indicates that a signaling message was unable to be delivered to the remote user; for example, a physical layer or a signaling ATM adaptation layer (SAAL) failure at the remote user, user equipment off-line.
28	invalid number format (address incomplete)	Indicates that the called user cannot be reached because the called party number is not in a valid format or is not complete.

30	response to STATUS ENQUIRY	Included in the STATUS message when the reason for generating the STATUS message was the prior receipt of a STATUS ENQUIRY message.
31	normal, unspecified	Reports a normal event only when no other cause in the normal class applies.

Resource Unavailable Class Definitions

Cause Number	Description	Explanation
35	requested VPCI/VCI not available	Indicates that the requested VPCI/VCI is not available.
38	network out of order	Indicates that the network is not functioning correctly and that the condition is likely to last a relatively long period of time; for example, immediately reattempting the call is not likely to be successful.
41	temporary failure	Indicates that the network is not functioning correctly and that the condition is not likely to last a long period of time; for example, the user may wish to make another call attempt immediately.
43	access information discarded	Indicates that the network could not deliver access information to the remote user as requested—in other words, ATM adaptation layer (AAL) parameters, broadband low-layer information, broadband high-layer information, or subaddress as indicated in the diagnostic.
45	no VPCI/VCI available	Indicates that there is no appropriate VPCI/VCI presently available to handle the call.
47	resource unavailable, unspecified	Reports a resource unavailable event only when no other cause in the resource unavailable class applies.

Service or Option Not Available Class Definitions

Cause Number	Description	Explanation
49	quality of service (QoS) unavailable	Indicates that the QoS parameters are not available. Check QoS class, cell transfer delay (CTD), cell delay variation (CDV), and cell loss ratio (CLR).
51	user cell rate not available	Indicates that the requested traffic parameters are not available. Check peak cell rate (PCR), sustainable cell rate (SCR), maximum burst size (MBS) and minimum cell rate (MCR).
57	service category not authorized	Indicates that the user has requested a service category which is implemented by the equipment that generated this cause but the user is not authorized to use.
58	service category not presently available	Indicates that the user requested a service category which is implemented by the device that generated the cause, but the service category is not available at this time on the device.
63	service or option not available, unspecified	Reports a service or option not available event only when no other cause in the service or option not available class applies.

Service or Option Not Implemented Class Definitions

Cause Number	Description	Explanation
65	bearer capability not implemented	Indicates that the equipment sending this cause does not support the bearer capability requested.
	unsupported	Indicates that the combination of traffic parameters contained in the ATM traffic descriptor IE

	combination of traffic parameters	and the requested service category are not supported. Note that there are other IEs that can cause this error code to be returned.
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Invalid Message Class Definitions

Cause Number	Description	Explanation
81	invalid call reference value	Indicates that the equipment sending this cause has received a message with a call reference which is not currently in use on the UNI.
82	identified channel does not exist	Indicates that the equipment sending this cause has received a request to use a channel not activated on the interface for a call.
88	incompatible destination	Indicates that the equipment sending this cause has received a request to establish a call which has broadband low-layer information, broadband high-layer information, or other compatibility attributes which cannot be accommodated.
89	invalid endpoint reference value	Indicates that the equipment sending this cause has received a message with an endpoint reference which is currently not in use on the UNI.
91	invalid transit network selection	Indicates that a transit network identification was received that is of an incorrect format as defined in Annex D.
92	too many pending add party requests	Indicates a temporary condition when the calling party sends an add party message but the network is unable to accept another add party message because its queues are full.
93	ATM adaptation layer (AAL) parameters	Indicates that the equipment sending this cause has received a request to establish a call

	cannot be supported	which has AAL parameters that cannot be accommodated.

Protocol Error Class Definitions

Cause Number	Description	Explanation
96	mandatory information element is missing	Indicates that the equipment sending this cause has received a message which is missing an IE that must be present in the message before the message can be processed.
97	message type nonexistent or not implemented	Indicates that the equipment sending this cause has received a message with a message type it does not recognize either because this is a message not defined or defined but not implemented by the equipment sending this cause.
99	information element nonexistent or not implemented	Indicates that the equipment sending this cause has received a message which includes IEs not recognized because the IE identifiers are not defined or are defined but not implemented by the equipment sending the cause. This cause indicates that the IEs were discarded. However, the IE is not required to be present in the message in order for the equipment sending this cause to process the message.
100	invalid information element contents	Indicates that the equipment sending this cause has received an IE which it has implemented; however, one or more of the fields in the IE are coded in a way that has not been implemented by the equipment ending this cause.
101	message not compatible with call state	Indicates that a message has been received which is incompatible with the call state.
102	recovery on timer	Indicates that a procedure has been initiated by the expiration of

	expiration	a timer in association with error handling procedures.
111	protocol error, unspecified	Reports a protocol error event only when no other cause in the protocol error class applies.

ATM Signaling Specifications

This table lists important standards and specifications to consult for further information on ATM signaling:

Specification	Description
International Telecommunications Union	
Q.2110	Broadband ISDN (BISDN) AAL—Service-Specific Connection-Oriented Protocol (SSCOP)
Q.2130	BISDN AAL—service-specific coordination function (SSCF) for support of signaling at the UNI
Q.2610	BISDN—usage of cause and location in BISDN user part and digital subscriber signaling system 2 (DSS 2)
Q.2931	UNI Layer 3 specification for basic call/connection control
Q.2951	(Clauses 1, 2, 3, 4, 5, 6 and 8)—Stage 3 description for number identification supplementary services using BISDN DSS 2—Basic call
Q.2957	Stage 3 description for additional information transfer supplementary services using BISDN DSS 2—Basic call; Clause 1—User-to-user signaling (UUS)
Q.2961	BISDN—DSS 2—additional traffic parameters
ATM Forum	
UNI 3.1	ATM UNI specification V3.1
UNI 4.0	ATM UNI specification V4.0

Related Information

- **ATM Signaling and Addressing**
- **ATM Routing with IISP and PNNI**
- **Troubleshooting Switch Router ATM Network Connections**
- **Technical Support - Cisco Systems**

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