

Gateway to Gatekeeper (H.235) and Gatekeeper to Gatekeeper (IZCT) Security Troubleshooting Guide

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Introduction

Intradomain Gateway to Gatekeeper Security

- Time Stamp Passed in the Tokens
- How Cisco Implements the H.235 Recommendation
- How to Configure the Security Levels
- H.235 Usage on a Per-call Level without IVR
- Major Issues
- Debugs and Call Flow for the Different Levels
- Gateway IOS Problem
- Security with Alternate Endpoints
- OSP Token Support
- Different Levels of Security for each Endpoint or Zone

Interdomain Gatekeeper to Gatekeeper Security

- Implement Gatekeeper to Gatekeeper Security
- Gatekeeper Configuration
- IZCT Call Flow
- Call Flow with Debugs

Related Information

Introduction

H.323 networks have different kinds of configurations and call flows. This document discusses most of the security concerns with H.323 networks that involve gatekeepers. This document summarizes the way each feature works and how to troubleshoot it with an explanation on most of the debugs. This document does not address the overall security of VoIP.

This document covers these features:

- **Intradomain Gateway to Gatekeeper Security** This security is based on H.235, in which H.323 calls are authenticated, authorized, and routed by a gatekeeper. The gatekeeper is considered a known and trusted entity in a sense that the gateway does not authenticate it when the gateway tries to register with it.
- **Interdomain Gatekeeper to Gatekeeper Security** This security covers authenticating and authorizing of H.323 calls between the administrative domains of Internet Telephone Service Providers (ITSPs) using **InterZone Clear Token (IZCT)**. This document covers only the portion where the terminating gatekeeper sends a token in its location confirmation (LCF) message so that it authenticates the answerCall Admission Request (ARQ). Location request (LRQ) validation is not included in this feature. LRQ validation is a feature scheduled for a future Cisco IOS® Software release.

Definitions

Acronym	Definition
ARQ	Admission Request A Registration, Admission, and Status Protocol (RAS) message sent from an H.323

	endpoint to a gatekeeper that requests an admission to establish a call.
ACF	Admission Confirm A RAS message sent from the gatekeeper to the endpoint that confirms the acceptance of a call.
ARJ	Admission Rejection A RAS message from the gatekeeper to the endpoint that rejects the admission request.
CAT	Cisco Access Token The H.235 Clear Token.
CHAP	Challenge Handshake Authentication Protocol An authentication protocol where a challenge is used.
GCF	Gatekeeper Confirm A RAS message sent from a gatekeeper to the H.323 endpoint that confirms the discovery of the gatekeeper.
GRQ	Gatekeeper Request A RAS message sent from an H.323 endpoint to discover the gatekeeper.
H.235	ITU recommendation for security and encryption for H-Series (H.323 and other H.245-based) multimedia terminals.
IZCT	InterZone Clear Token An IZCT is generated in the originating gatekeeper when an LRQ is initiated or an ACF is about to be sent for an intrazone call within the ITSP administrative domain.
LRQ	Location Request A RAS message sent from a gatekeeper to the next hop gatekeeper or call leg to trace and route the call.
RAS	Registration, Admission, and Status A protocol that allows a gatekeeper to perform registration, admission, and status checks of the endpoint.
RCF	Registration Confirm A RAS message sent from the gatekeeper to the endpoint that confirms the registration.
RRJ	Registration Reject A RAS message sent from the gatekeeper that rejects the registration request.
RRQ	Registration Request A RAS message sent from the endpoint to the gatekeeper that requests to register with it.
RIP	Request In Progress A RAS message sent from a gatekeeper to the sender that states the call is in progress.

Intradomain Gateway to Gatekeeper Security

H.323 is an ITU recommendation that addresses securing real-time communication over insecure networks. This involves two major areas of concern: authentication and privacy. There are two types of authentication, according to H.235:

- Symmetric encryption–based authentication that requires no prior contact between the communicating entities.
- Based on the ability to have some prior shared secret (further referenced as subscription based), two forms of subscription–based authentication are provided:
 - ◆ password
 - ◆ certificate

Time Stamp Passed in the Tokens

A time stamp is used to prevent replay attacks. Therefore, it is needed for a mutually acceptable reference to time (from which to derive time stamps). The amount of acceptable time skew is a matter of local implementation.

How Cisco Implements the H.235 Recommendation

Cisco uses a Challenge Handshake Authentication Protocol (CHAP)–like authentication scheme as the basis for its gateway to its gatekeeper H.235 implementation. This allows you to leverage Authentication, Authorization, and Accounting (AAA), using existing functionality to perform the actual authentication. It also means that the gatekeeper is not required to have access to a database of gateway IDs, user account numbers, passwords, and PINs. The scheme is based on H.235, section 10.3.3. It is described as subscription–based password with hashing.

However, instead of using H.225 cryptoTokens, this method uses H.235 clearTokens with fields populated appropriately for use with RADIUS. This token is referred to as the Cisco Access Token (CAT). You can always perform authentication locally on the gatekeeper instead of using a RADIUS server.

The use of cryptoTokens requires that the gatekeeper either maintains or has some way to acquire passwords for all of the users and gateways. This is because the token field of the cryptoToken is specified such that the authenticating entity needs the password to generate its own token against which to compare the received one.

Cisco gatekeepers completely ignore cryptoTokens. However, vocalTek gatekeepers and others who support H.235 section 10.3.3 use the cryptoTokens to authenticate the gateway. Cisco gatekeepers use the CAT to authenticate the gateway. Since the gateway does not know what type of gatekeeper it talks to, it sends both in the RRQ. The authenticationCapability in the GRQ are for the cryptoToken and indicate that the MD5 hashing is the authentication mechanism (although the CAT also uses MD5).

Refer to Cisco H.323 Gateway Security and Accounting Enhancements for more information.

How to Configure the Security Levels

- Endpoint– or Registration–level Security

With Registration Security enabled on the gatekeeper, the gateway is required to include a CAT in all heavyweight RRQ messages. The CAT, in this case, contains information which authenticates the gateway itself to the gatekeeper. The gatekeeper formats a message to a RADIUS server which authenticates the information contained in the token. It responds back to the gatekeeper with either an Access–Accept or Access–Reject. This, in turn, responds to the gateway with either an RCF or an RRJ.

If a call is then placed from a successfully authenticated gateway, that gateway generates a new CAT upon receipt of an ACF from the gatekeeper using the gateway password. This CAT is identical to the one generated during registration except for the time stamp. It is placed in the outgoing SETUP

message. The destination gateway extracts the token from the SETUP message and places it in the destination side ARQ. The gatekeeper uses RADIUS to authenticate the originating gateway before it sends the destination side ACF. This prevents a non-authenticated endpoint that knows the address of a gateway from using it to circumvent the security scheme and accessing the public switched telephone network (PSTN).

Therefore, in this level, there is no need to include any tokens in the originating ARQs.

Type **[no] security token required-for registration** from the gatekeeper command-line interface (CLI) to configure the gatekeeper. The *no* option of the command causes the gatekeeper to no longer check for tokens in RAS messages.

Type **[no] security password <PASSWORD> level endpoint** from the gateway CLI to configure the gateway. The *no* option of the command causes the gateway to no longer generate tokens for RAS messages.

- Per-call Level Security

Per-call security builds upon registration-level security. In addition to meeting registration security requirements, a gateway is also required to include Access Tokens in all originating side ARQ messages when Per-call security is enabled on the gatekeeper. The token in this case contains information which identifies the user of the gateway to the gatekeeper. This information is obtained using an Interactive Voice Response (IVR) script on the gateway. This prompts users to enter their User ID and PIN from the keypad before they place a call.

The CAT contained in the originating ARQ is authenticated by RADIUS in the same way as described earlier in Endpoint- or Registration-level Security. After it receives the ACF, the gateway generates a new CAT using its password and sends it within the H.225 SETUP message to the terminating gateway.

Type **[no] security token required-for all** from the gatekeeper CLI to configure the gatekeeper. The *no* option of the command causes the gatekeeper to no longer check for tokens in RAS messages.

Type **[no] security password <PASSWORD> level per-call** from the gateway CLI to configure the gateway. The *no* option of the command causes the gateway to no longer generate tokens for RAS messages.

- All Level Security

This allows the gateway to include a CAT in all RAS messages needed for registration and for calls. Therefore, it is a combination of the above two levels. With this option, the validation of CAT in ARQ messages is based on the account number and PIN of the user who makes a call. The validation of the CAT sent in all of the other RAS messages is based on the password configured for the gateway. Therefore, it is similar to the Per-call level.

Type **[no] security token required-for all** from the gatekeeper CLI to configure the gatekeeper. The *no* option of the command causes the gatekeeper to no longer check for tokens in RAS messages.

Type **[no] security password <PASSWORD> level all** from the gateway CLI to configure the gateway. The *no* option of the command causes the gateway to no longer generate tokens for RAS messages.

H.235 Usage on a Per-call Level without IVR

H.235 cannot be used on a per-call level without IVR. If there is no IVR to collect an account and PIN, the gateway needs to send the ARQ without a Clear Token (but with a crypto token). Since the Cisco gatekeeper

only accepts Clear Tokens, the call is rejected by the gatekeeper with a reason of security denial.

This example shows the **h225 asn1** debugs collected from an **originating gateway (OGW)** that is not configured for an IVR to collect the account and PIN. The RRQ message has a Clear Token, but the ARQ does not. An ARJ message is sent back to the gateway.

```
Mar 4 01:31:24.358: H235 OUTGOING ENCODE BUFFER ::= 61 000100C0
2B955BEB 08003200 32003200 32000006 006F0067 00770000
Mar 4 01:31:24.358:
Mar 4 01:31:24.358: RAS OUTGOING PDU ::=
value RasMessage ::= registrationRequest :
{
  requestSeqNum 29
  protocolIdentifier { 0 0 8 2250 0 3 }
  discoveryComplete FALSE
  callSignalAddress
  {
  }
  rasAddress
  {
    ipAddress :
    {
      ip 'AC100D0F'H
      port 57514
    }
  }
  terminalType
  {
    mc FALSE
    undefinedNode FALSE
  }
  gatekeeperIdentifier {"ogk1"}
  endpointVendor
  {
    vendor
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
  }
  timeToLive 60
  tokens
```

!--- Clear Token is included in the RRQ message.

```
{
  {
    tokenOID { 1 2 840 113548 10 1 2 1 }
    timeStamp 731208684
    challenge 'F57C3C65B59724B9A45C93F98CCF9E45'H
    random 12
    generalID {"ogw"}
  }
}
cryptoTokens
{
  cryptoEPPwdHash :
  {
    alias h323-ID : {"ogw"}
    timeStamp 731208684
    token
    {
      algorithmOID { 1 2 840 113549 2 5 }
```

```

    params
    {
    }
    hash "D7F85666AF3B881ADD876DD61C20D5D9"
    }
}
keepAlive TRUE
endpointIdentifier {"81F5E24800000001"}
willSupplyUUIEs FALSE
maintainConnection TRUE
}
Mar 4 01:31:24.370: RAS OUTGOING ENCODE BUFFER ::= 0E 40001C06 0008914A
00030000 0100AC10 0D0FE0AA 0003006F 0067006B 003100B5 00001212 EF000200
3B2F014D 000A2A86 4886F70C 0A010201 C02B955B EB10F57C 3C65B597 24B9A45C
93F98CCF 9E45010C 06006F00 67007700 002A0104 02006F00 670077C0 2B955BEB
082A8648 86F70D02 05008080 D7F85666 AF3B881A DD876DD6 1C20D5D9 0180211E
00380031 00460035 00450032 00340038 00300030 00300030 00300030 00300031
01000180
Mar 4 01:31:24.378: h323chan_dgram_send:Sent UDP msg. Bytes sent: 173 to
172.16.13.35:1719
Mar 4 01:31:24.378: RASLib::GW_RASSendRRQ:
3640-1#debug RRQ (seq# 29) sent to 172.16.13.35
Mar 4 01:31:24.462: h323chan_chn_process_read_socket
Mar 4 01:31:24.462: h323chan_chn_process_read_socket: fd (2) of type CONNECTED has data
Mar 4 01:31:24.462: h323chan_chn_process_read_socket: h323chan accepted/connected
Mar 4 01:31:24.462: h323chan_dgram_rcvdata:rcvd from [172.16.13.35:1719] on so
ck[2]
Mar 4 01:31:24.466: RAS INCOMING ENCODE BUFFER ::= 12 40001C06 0008914A
00030006 006F0067 006B0031 1E003800 31004600 35004500 32003400 38003000
30003000 30003000 30003000 310F8A01 0002003B 01000180
Mar 4 01:31:24.466:
Mar 4 01:31:24.466: RAS INCOMING PDU ::=
value RasMessage ::= registrationConfirm :
{
  requestSeqNum 29
  protocolIdentifier { 0 0 8 2250 0 3 }
  callSignalAddress
  {
  }
  gatekeeperIdentifier {"ogk1"}
  endpointIdentifier {"81F5E24800000001"}
  alternateGatekeeper
  {
  }
  timeToLive 60
  willRespondToIRR FALSE
  maintainConnection TRUE
}
Mar 4 01:31:24.470: RCF (seq# 29) rcvd
Mar 4 01:32:00.220: H225 NONSTD OUTGOING PDU ::=
value ARQnonStandardInfo ::=
{
  sourceAlias
  {
  }
  sourceExtAlias
  {
  }
  callingOctet3a 129
  interfaceSpecificBillingId "ISDN-VOICE"
}
Mar 4 01:32:00.220: H225 NONSTD OUTGOING ENCODE BUFFER ::= 80 000008A0
01810B12 4953444E 2D564F49 4345
Mar 4 01:32:00.220:
Mar 4 01:32:00.220: H235 OUTGOING ENCODE BUFFER ::= 61 000100C0

```

2B955C0F 08003200 32003200 32000006 006F0067 00770000

Mar 4 01:32:00.224:

Mar 4 01:32:00.224: RAS OUTGOING PDU ::=

value RasMessage ::= **admissionRequest** :

```
{
  requestSeqNum 30
  callType pointToPoint : NULL
  callModel direct : NULL
  endpointIdentifier {"81F5E24800000001"}
  destinationInfo
  {
    e164 : "3653"
  }
  srcInfo
  {
    e164 : "5336",
    h323-ID : {"ogw"}
  }
  bandwidth 1280
  callReferenceValue 5
  nonStandardData
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '80000008A001810B124953444E2D564F494345'H
  }
  conferenceID 'E1575DA6175611CC8014A6051561649A'H
  activeMC FALSE
  answerCall FALSE
  canMapAlias TRUE
  callIdentifier
  {
    guid 'E1575DA6175611CC8015A6051561649A'H
  }
  cryptoTokens
```

!--- Only cryptoTokens are included, no clear ones.

```
{
  cryptoEPPwdHash :
  {
    alias h323-ID : {"ogw"}
    timeStamp 731208720
    token
    {
      algorithmOID { 1 2 840 113549 2 5 }
      params
      {
      }
      hash "105475A4C0A833E7DE8E37AD3A8CFFF"
    }
  }
  willSupplyUUIES FALSE
}
```

Mar 4 01:32:00.236: RAS OUTGOING ENCODE BUFFER::= 27 88001D00 F0003800
31004600 35004500 32003400 38003000 30003000 30003000 30003000 31010180
69860201 80866940 02006F00 67007740 05000005 40B50000 12138000 0008A001
810B1249 53444E2D 564F4943 45E1575D A6175611 CC8014A6 05156164 9A056120
01801100 E1575DA6 175611CC 8015A605 1561649A 2A010402 006F0067 0077C02B
955C0F08 2A864886 F70D0205 00808010 5475A4C0 A833E7DE 8E370AD3 A8CFFF01 00
Mar 4 01:32:00.240: h323chan_dgram_send:Sent UDP msg. Bytes sent: 170 to

```

172.16.13.35:1719
Mar 4 01:32:00.240: RASLib::GW_RASSendARQ: ARQ (seq# 30) sent to 172.16.13.35
Mar 4 01:32:00.312: h323chan_chn_process_read_socket
Mar 4 01:32:00.312: h323chan_chn_process_read_socket: fd (2) of type CONNECTED has data
Mar 4 01:32:00.312: h323chan_chn_process_read_socket: fd (2) of type CONNECTED has data
Mar 4
3640-1#01:32:00.312: h323chan_chn_process_read_socket: h323chan accepted/connected
Mar 4 01:32:00.312: h323chan_dgram_rcvdata:rcvd from [172.16.13.35:1719] on so
ck[2]
Mar 4 01:32:00.312: RAS INCOMING ENCODE BUFFER ::= 2C 001D8001 00
Mar 4 01:32:00.312:
Mar 4 01:32:00.312: RAS INCOMING PDU ::=
value RasMessage ::= admissionReject :

!--- ARQ is rejected with a security denial reason.

{
  requestSeqNum 30
  rejectReason securityDenial : NULL
}
Mar 4 01:32:00.312: ARJ (seq# 30) rcvd

```

Refer to the Configuration Tasks section of Cisco H.235 Accounting and Security Enhancements for Cisco Gateways for more information on IVR configuration.

Major Issues

The major issues you need to be concerned with include:

- Configuration of the gateway and gatekeeper
- RADIUS configuration on the gatekeeper and the RADIUS server
- Network Time Protocol (NTP) You must have the same time on all gateways and gatekeepers. Because the authentication information includes a timestamp, it is important that all the Cisco H.323 Gateways and the Gatekeepers (or other entity that performs the authentication) be synchronized. The Cisco H.323 Gateways must be synchronized using NTP.
- Software failure due to a bug

Debugs and Call Flow for the Different Levels

Since all level security covers both registration and per-call cases, the lab is set up with that level of security for this exercise. The call flows for the registration part and a normal VoIP call are explained in the configuration here.

Note: The configuration here is not complete. More commands follow in between the debug outputs. It is designed to show what problem can happen if you do not check all things such as configuration, NTP, and RADIUS. In addition, the gateway is authenticated on the gatekeeper locally so that you are able to see what values are set for the gateway ID and password. This configuration is snipped so that only the related configuration is shown.

```

!
interface Ethernet0/0
 ip address 172.16.13.15 255.255.255.224
 half-duplex
 h323-gateway voip interface
 h323-gateway voip id gka-1 ipaddr 172.16.13.35 1718

!--- The gatekeeper name is gka-1.

h323-gateway voip h323-id gwa-1@cisco.com

```

!--- The gateway H323-ID is gwa-1@cisco.com.

```
h323-gateway voip tech-prefix 1#  
!  
!  
gateway  
!  
line con 0  
  exec-timeout 0 0  
  logging synchronous  
line aux 0  
line vty 0 4  
  exec-timeout 0 0  
  password ww  
  logging synchronous  
end
```

!--- No NTP is configured.

!--- The snipped gatekeeper configuration is like this:

```
!  
aaa new-model  
aaa authentication login default local  
aaa authentication login h323 local  
aaa authorization exec default local  
aaa authorization exec h323 local  
aaa accounting connection h323 start-stop group radius  
!  
username gwa-1 password 0 2222  
username gwa-2 password 0 2222  
!  
gatekeeper  
  zone local gka-1 cisco.com 172.16.13.35  
  security token required-for all
```

!--- The gatekeeper is configured for the "All level security".

```
no shutdown  
!  
!  
line con 0  
  exec-timeout 0 0  
line aux 0  
line vty 0 4  
  password ww  
line vty 5 15  
!  
no scheduler max-task-time  
no scheduler allocate  
ntp master
```

!--- This gatekeeper is set as an NTP master.

```
!  
end
```

These debugs are turned on in this example:

- **debug ras**
- **debug h225 asn1**
- **debug radius**
- **debug aaa authentication**

- **debug aaa authorization**

The first thing that occurs is that the gateway sends a GRQ to the gatekeeper and the gatekeeper sends a GCF to the gateway. The gateway then sends an RRQ and waits for either an RCF or RRJ.

In the previous configuration, the gateway is not set for any level of security so that its GRQ carries no **authenticationCapability** that is needed for the tokens. However, the gatekeeper still sends back a GCF as this output shows:

```
*Mar 2 13:32:45.413: RAS INCOMING ENCODE BUFFER ::= 00 A0000006
0008914A 000200AC 100D0FD2 C6088001 3C050401 00204002 00006700 6B006100
2D003102 400E0067 00770061 002D0031 00400063 00690073 0063006F 002E0063
006F006D 0080CC
*Mar 2 13:32:45.421:
*Mar 2 13:32:45.425: RAS INCOMING PDU ::=
```

```
value RasMessage ::= gatekeeperRequest :
```

```
{
  requestSeqNum 1
  protocolIdentifier { 0 0 8 2250 0 2 }
  rasAddress ipAddress :
  {
    ip 'AC100D0F'H
    port 53958
  }
  endpointType
  {
    gateway
    {
      protocol
      {
        voice :
        {
          supportedPrefixes
          {
            {
              prefix e164 : "1#"
            }
          }
        }
      }
    }
  }
  mc FALSE
  undefinedNode FALSE
}
gatekeeperIdentifier {"gka-1"}
endpointAlias
{
  h323-ID : {"gwa-1@cisco.com"},
```

```
!--- The H.323-ID of the gateway is gwa-1@cisco.com.
```

```
  e164 : "99"
}
}
```

```
*Mar 2 13:32:45.445: RAS OUTGOING PDU ::=
```

```
value RasMessage ::= gatekeeperConfirm :
```

```
{
  requestSeqNum 1
  protocolIdentifier { 0 0 8 2250 0 3 }
  gatekeeperIdentifier {"gka-1"}
  rasAddress ipAddress :
  {
```

```
    ip 'AC100D23'H
    port 1719
  }
}
```

*!--- The gateway sends an RRQ message to the gatekeeper with the
!--- IP address sent in the GCF. This RRQ does not carry any Token information
!--- because security is not configured on the gateway.*

```
*Mar 2 13:32:45.477: RAS INCOMING ENCODE BUFFER ::= 0E C0000106 0008914A
00028001 00AC100D 0F06B801 00AC100D 0FD2C608 80013C05 04010020 40000240
0E006700 77006100 2D003100 40006300 69007300 63006F00 2E006300 6F006D00
80CC0800 67006B00 61002D00 3100B500 00120E8A 02003B01 000100
```

```
*Mar 2 13:32:45.489:
```

```
*Mar 2 13:32:45.493: RAS INCOMING PDU ::=
```

```
value RasMessage ::= registrationRequest :
```

```
{
  requestSeqNum 2
  protocolIdentifier { 0 0 8 2250 0 2 }
  discoveryComplete TRUE
  callSignalAddress
  {
    ipAddress :
    {
      ip 'AC100D0F'H
      port 1720
    }
  }
  rasAddress
  {
    ipAddress :
    {
      ip 'AC100D0F'H
      port 53958
    }
  }
  terminalType
  {
    gateway
    {
      protocol
      {
        voice :
        {
          supportedPrefixes
          {
            {
              prefix e164 : "1#"
            }
          }
        }
      }
    }
  }
  mc FALSE
  undefinedNode FALSE
}
terminalAlias
{
  h323-ID : {"gwa-1@cisco.com"},
  e164 : "99"
}
gatekeeperIdentifier {"gka-1"}
endpointVendor
{
  vendor
```

```
{
  t35CountryCode 181
  t35Extension 0
  manufacturerCode 18
}
}
timeToLive 60
keepAlive FALSE
willSupplyUUIES FALSE
}
```

*!--- Since the gateway does not include any tokens and
!--- the gatekeeper is set to authenticate
!--- all endpoints and calls, the gatekeeper rejects the gateway request.
!--- It sends an RRJ with the **securityDenial** reason.*

*Mar 2 13:32:45.525: RAS OUTGOING PDU ::=

```
value RasMessage ::= registrationReject :
{
  requestSeqNum 2
  protocolIdentifier { 0 0 8 2250 0 3 }
  rejectReason securityDenial : NULL
}
```

!--- Gatekeeper rejects the RRQ with security denial reason.

```
  gatekeeperIdentifier {"gka-1"}
}
```

*Mar 2 13:32:45.529: RAS OUTGOING ENCODE BUFFER ::= 14 80000106
0008914A 00038301 00080067 006B0061 002D0031
*Mar 2 13:32:45.533:

*!--- Configure the **security password 2222 level all** command on the gateway.
!--- The configuration of the gateway appears like this:*

```
!
gateway
  security password 0356095954 level all
```

!--- The password is hashed.

!

*!--- As soon as you make this change the gateway
!--- sends a new GRQ to the gatekeeper.
!--- You see the **authenticationCapability** and **algorithmOIDS**.*

*Mar 2 13:33:15.551: RAS INCOMING ENCODE BUFFER ::= 02 A0000206
0008914A 000200AC 100D0FD2 C6088001 3C050401 00204002 00006700 6B006100
2D003102 400E0067 00770061 002D0031 00400063 00690073 0063006F 002E0063
006F006D 0080CC0C 30020120 0A01082A 864886F7 0D0205

*Mar 2 13:33:15.563:

*Mar 2 13:33:15.567: RAS INCOMING PDU ::=

```
value RasMessage ::= gatekeeperRequest :
{
  requestSeqNum 3
  protocolIdentifier { 0 0 8 2250 0 2 }
  rasAddress ipAddress :
  {
    ip 'AC100D0F'H
    port 53958
  }
  endpointType
  {
```

```

gateway
{
  protocol
  {
    voice :
    {
      supportedPrefixes
      {
        {
          prefix e164 : "1#"
        }
      }
    }
  }
  mc FALSE
  undefinedNode FALSE
}
gatekeeperIdentifier {"gka-1"}
endpointAlias
{
  h323-ID : {"gwa-1@cisco.com"},
  e164 : "99"
}
authenticationCapability
{
  pwdHash : NULL
}
algorithmOIDs
{
  { 1 2 840 113549 2 5 }
}
}

```

This explains some of the messages in the GRQ:

- **authenticationCapability** This field only has the value of pwdHash. It indicates that the MD5 hashing is the authentication mechanism.
- **algorithmOIDs** The algorithm Object ID. In this case it carries the value (1 2 840 113549 2 5) which is the object ID for Message Digest 5 hashing.

(1 2 840 113549 2 5) translates to iso(1) member-body(2) US(840) rsadsi(113549) digestAlgorithm(2) md5(5). Hence Cisco does MD5 password hashing.

Rsadsi stands for RSA data security Inc. RSA Data Security, Inc.'s Open Systems Interconnection (OSI) object identifier is 1.2.840.113549 (0x2a, 0x86, 0x48, 0x86, 0xf7, 0x0d in hex), as registered by the American National Standards Institute (ANSI).

The gatekeeper again sends a GCF as the previous message. The gateway then sends an RRQ with certain fields to describe the tokens it uses to be authenticated. The **asn1 RRQ** message that is sent is shown in this example.

```

*Mar 2 13:33:15.635: RAS INCOMING ENCODE BUFFER::= 0E C0000306
0008914A 00028001 00AC100D 0F06B801 00AC100D 0FD2C608 80013C05 04010020
40000240 0E006700 77006100 2D003100 40006300 69007300 63006F00 2E006300
6F006D00 80CC0800 67006B00 61002D00 3100B500 00120EEA 02003B47 014D000A
2A864886 F70C0A01 0201C02B 92A53610 B9D84DAE 58F6CB4B 5EE5DFB6 B92DD281
01011E00 67007700 61002D00 31004000 63006900 73006300 6F002E00 63006F00
6D000042 01040E00 67007700 61002D00 31004000 63006900 73006300 6F002E00
63006F00 6DC02B92 A536082A 864886F7 0D020500 80802B21 B94F3980 ED12116C
56B79F4B 4CDB0100 0100
*Mar 2 13:33:15.667:

```

```

*Mar 2 13:33:15.671: RAS INCOMING PDU ::=
value RasMessage ::= registrationRequest :
{
  requestSeqNum 4
  protocolIdentifier { 0 0 8 2250 0 2 }
  discoveryComplete TRUE
  callSignalAddress
  {
    ipAddress :
    {
      ip 'AC100D0F'H
      port 1720
    }
  }
  rasAddress
  {
    ipAddress :
    {
      ip 'AC100D0F'H
      port 53958
    }
  }
  terminalType
  {
    gateway
    {
      protocol
      {
        voice :
        {
          supportedPrefixes
          {
            {
              prefix e164 : "1#"
            }
          }
        }
      }
    }
  }
  mc FALSE
  undefinedNode FALSE
}
terminalAlias
{
  h323-ID : {"gwa-1@cisco.com"},
  e164 : "99"
}
gatekeeperIdentifier {"gka-1"}
endpointVendor
{
  vendor
  {
    t35CountryCode 181
    t35Extension 0
    manufacturerCode 18
  }
}
timeToLive 60
tokens

```

!--- Clear Token, or what is called CAT.

```

{
  {
    tokenOID { 1 2 840 113548 10 1 2 1 }
  }
}

```

```

timeStamp 731030839
challenge 'B9D84DAE58F6CB4B5EE5DFB6B92DD281'H
random 1
generalID {"gwa-1@cisco.com"}
}
}
cryptoTokens

```

!--- CryptoToken field.

```

{
  cryptoEPPwdHash :
  {
    alias h323-ID : {"gwa-1@cisco.com"}
    timeStamp 731030839
    token
    {
      algorithmOID { 1 2 840 113549 2 5 }
      params
      {
      }
      hash "2B21B94F3980ED12116C56B79F4B4CDB"
    }
  }
}
keepAlive FALSE
willSupplyUUIES FALSE
}

```

Before the response is discussed, some of the related fields in the above RRQ message are explained here. There are two types of tokens: a clear token or CAT) and a crypto token.

As mentioned before, Cisco gatekeepers ignore the crypto tokens. However, the gateway still sends both because it does not know to what type of gatekeeper it is talking. Since other vendors might use crypto tokens, the gateway sends both.

This explains the ClearToken syntax.

- **tokenOID** The Object ID to identify the token.
- **timeStamp** The current Coordinated Universal Time (UTC) time of the gateway. Seconds since 00:00 1/1/1970 UTC.

It is used as an implied CHAP–Challenge as if it had initially come from the gatekeeper.

- **challenge** A 16–byte MD5 message digest generated by the gateway using these fields:

challenge = [random + GW/User Password + timeStamp] MD5 Hash

RADIUS performs this calculation (since it knows the random number, the gateway password, and the CHAP challenge) to determine what the challenge should be: CHAP Response = [CHAP ID + UserPassword + CHAP Challenge] MD5 Hash

- **random** A one–byte value used by RADIUS to identify this particular request.

The gateway increments a variable module of 256 for each authentication request to satisfy this RADIUS requirement.

- **generalID** The gateway H323–ID or the user account number based on the level of security and the type of RAS message.

Note: All of these fields are important. However, more attention is given to both the time stamp and the generalID. In this case, the time stamp is **731030839** and the generalID is **gwa-1@cisco.com**.

The cryptoToken in the RRQ contains information about the gateway that generates the token. This includes the gateway ID (which is the H.323 ID configured on the gateway) and the gateway password.

This field contains one of the cryptoToken types defined for the CryptoH323Token field specified in H.225. Currently, the only type of cryptoToken supported is the cryptoEPPwdHash.

These fields are contained within the cryptoEPPwdHash field:

- **alias** The gateway alias, which is the H.323 ID of the gateway.
- **timestamp** The current time stamp.
- **token** The Message Digest 5 (MD5)–encoded PwdCertToken. This field contains these items:
 - ◆ **timestamp** The same as the timestamp of the cryptoEPPwdHash.
 - ◆ **password** The password of the gateway.
 - ◆ **generalID** The same gateway alias as the one included in the cryptoEPPwdHash.
 - ◆ **tokenID** The object ID.

View the response from the gatekeeper in this example.

```
*Mar 2 13:33:15.723: RAS OUTGOING PDU ::=
value RasMessage ::= registrationReject :
{
  requestSeqNum 4
  protocolIdentifier { 0 0 8 2250 0 3 }
  rejectReason securityDenial : NULL
}

!--- The gatekeeper rejects the RRQ with securityDenial reason.

  gatekeeperIdentifier {"gka-1"}
}

*Mar 2 13:33:15.727: RAS OUTGOING ENCODE BUFFER ::= 14 80000306 0008914A
00038301 00080067 006B0061 002D0031
*Mar 2 13:33:15.731:
```

The RRQ is rejected by the gatekeeper. The reason for this is because there was no NTP set in the configuration of the gateway. The gatekeeper checks the time stamp of the token to see if it is within an acceptable window relative to its own time. Currently this window is +/- 30 seconds around the UTC time of the gatekeeper.

A token outside of this window causes the gatekeeper to discard this message. This prevents replay attacks from someone who tries to reuse a snooped token. In practice, all gateways and gatekeepers need to use NTP to avoid this time skew problem. The gatekeeper finds that the time stamp in the token is within the acceptable window of its time. Therefore, it does not check with RADIUS to authenticate the gateway.

The gateway is then configured for NTP pointing to the gatekeeper as the NTP master, so that both the gateway and gatekeeper have the same time. When this occurs, the gateway sends a new RRQ and this time the gatekeeper replies back to the new RRQ with an RRJ.

These debugs are from the gatekeeper. Debugs run to see if the gatekeeper goes to the authentication phase.

```
Mar 2 13:57:41.313: RAS INCOMING ENCODE BUFFER ::= 0E C0005906 0008914A
00028001 00AC100D 0F06B801 00AC100D 0FD2C608 80013C05 04010020 40000240
0E006700 77006100 2D003100 40006300 69007300 63006F00 2E006300 6F006D00
80CC0800 67006B00 61002D00 3100B500 00120EEA 02003B47 014D000A 2A864886
F70C0A01 0201C02B 9367D410 7DD4C637 B6DD4E34 0883A7E5 E12A2B78 012C1E00
67007700 61002D00 31004000 63006900 73006300 6F002E00 63006F00 6D000042
```

```
01040E00 67007700 61002D00 31004000 63006900 73006300 6F002E00 63006F00
6DC02B93 67D4082A 864886F7 0D020500 8080ED73 946B13E9 EAED6F4D FED13478
A6270100 0100
Mar 2 13:57:41.345:
Mar 2 13:57:41.349: RAS INCOMING PDU ::=
value RasMessage ::= registrationRequest :
{
  requestSeqNum 90
  protocolIdentifier { 0 0 8 2250 0 2 }
  discoveryComplete TRUE
  callSignalAddress
  {
    ipAddress :
    {
      ip 'AC100D0F'H
      port 1720
    }
  }
  rasAddress
  {
    ipAddress :
    {
      ip 'AC100D0F'H
      port 53958
    }
  }
  terminalType
  {
    gateway
    {
      protocol
      {
        voice :
        {
          supportedPrefixes
          {
            {
              prefix e164 : "1#"
            }
          }
        }
      }
    }
  }
  mc FALSE
  undefinedNode FALSE
}
terminalAlias
{
  h323-ID : {"gwa-1@cisco.com"},
  e164 : "99"
}
gatekeeperIdentifier {"gka-1"}
endpointVendor
{
  vendor
  {
    t35CountryCode 181
    t35Extension 0
    manufacturerCode 18
  }
}
timeToLive 60
tokens
{
```

```

    {
      tokenOID { 1 2 840 113548 10 1 2 1 }
      timeStamp 731080661
      challenge '7DD4C637B6DD4E340883A7E5E12A2B78'H
      random 44
      generalID {"gwa-1@cisco.com"}
    }
  }
  cryptoTokens
  {
    cryptoEPPwdHash :
    {
      alias h323-ID : {"gwa-1@cisco.com"}
      timeStamp 731080661
      token
      {
        algorithmOID { 1 2 840 113549 2 5 }
        paramS
        {
          }
        hash "ED73946B13E9EAED6F4DFED13478A627"
      }
    }
  }
  keepAlive FALSE
  willSupplyUUIEs FALSE
}

```

```

Mar 2 13:57:41.401: AAA: parse name=<no string> idb type=-1 tty=-1
Mar 2 13:57:41.405: AAA/MEMORY: create_user (0x81416060) user='gwa-1@cisco.com'
ruser='NULL' ds0=0port='NULL' rem_addr='NULL' authen_type=CHAP
service=LOGIN priv=0 initial_task_id='0'
Mar 2 13:57:41.405: AAA/AUTHEN/START (2845574558): port='' list='h323'
action=LOGIN service=LOGIN
Mar 2 13:57:41.405: AAA/AUTHEN/START (2845574558): found list h323
Mar 2 13:57:41.405: AAA/AUTHEN/START (2845574558): Method=LOCAL
Mar 2 13:57:41.405: AAA/AUTHEN (2845574558): User not found, end of method list
Mar 2 13:57:41.405: AAA/AUTHEN (2845574558): status = FAIL

```

!--- Authentication fails. The user is not found on the list.

```

Mar 2 13:57:41.405: voip_chapstyle_auth: astruct.status = 2
Mar 2 13:57:41.405: AAA/MEMORY: free_user (0x81416060) user='gwa-1@cisco.com'
ruser='NULL' port='NULL' rem_addr='NULL' authen_type=CHAP service=LOGIN priv=0
Mar 2 13:57:41.409: RAS OUTGOING PDU ::=
value RasMessage ::= registrationReject :
{
  requestSeqNum 90
  protocolIdentifier { 0 0 8 2250 0 3 }
  rejectReason securityDenial : NULL
  gatekeeperIdentifier {"gka-1"}
}

```

After configuring NTP, the gatekeeper still rejects the RRQ. This time, however, it goes through the authentication process for that gateway. The gatekeeper rejects the RRQ because the user (here the gateway ID) is not found on the list of valid users on the RADIUS. The gateway is authenticated locally in the configuration of the gatekeeper. On the user list you see gwa-1. However, that is not the right user since the user in the RRQ is gwa-1@cisco.com.

Also, once the username gwa-1@cisco.com password 0 2222 command is configured on the gatekeeper, the gatekeeper confirms the RRQ and the gateway is registered.

In this lab, another gateway (gwa-2) is registered to the same gatekeeper (gka-1). A call is made from gwa-1@cisco.com to gwa-2 to see how the ARQ, ACF, and setup messages look.

These debugs collected are from the originating and terminating gateway (gwa-2).

- **debug h225 asn1**
- **debug ras**
- **debug voip ccapi inout**

An explanation of some of the debug messages is included.

Before you print the debugs from the originating/terminating gateway, this text explains the call flow:

1. When a SETUP message is received from the PSTN, the gateway sends an ARQ to and receives an ACF from the gatekeeper.
2. When the gateway receives the ACF, the gateway generates a CAT using the gateway password, H323-ID alias, and current time. The token is placed in the Call Control Block (CCB).
3. When the gateway sends the SETUP message to the terminating gateway, it retrieves the access token from the CCB and places it in the nonStandardParameter field of a clearToken within the SETUP message.
4. The terminating gateway removes the token from the SETUP message, converts it from a nonStandardParameter into a CAT, and places it into the ARQ.
5. The gatekeeper checks the time stamp of the token to see if it is within an acceptable window relative to its own time. Currently this window is +/- 30 seconds around the UTC time of the gatekeeper. A token outside of this window causes the gatekeeper to discard this message. This causes the call to be rejected.
6. If the token is acceptable, the gatekeeper formats a RADIUS access request packet, fills in the appropriate attributes to verify a CHAP challenge and sends it to a RADIUS server.
7. Based on the assumption that the gateway's alias is known at the server, the server locates the password associated with this alias and generates its own CHAP response using the alias, password, and the CHAP challenge from the gatekeeper. If its CHAP response matches the one received from the gatekeeper, the server sends an Access Accept packet to the gatekeeper. If they do not match, or if the gateway's alias is not in the server's database, the server sends an Access Reject packet back to the gatekeeper.
8. The gatekeeper responds to the gateway with an ACF if it receives an Access Accept, or an ARJ with cause code **securityDenial** if it receives an Access Reject. If the gateway receives an ACF, the call is connected.

This example shows the debug from the originating gateway.

Note: The **h225 asn1** debugs for the setup is not in this example since it is the same as seen in the terminating gateway example that follows the originating gateway example.

```
Mar 2 19:39:07.376: cc_api_call_setup_ind (vdbPtr=0x6264AB2C,
callInfo={called=3653,called_oct3=0x81,calling=,calling_oct3=0x81,calling_oct3a=0x0,
calling_xlated=false,subscriber_type_str=RegularLine,fdest=1,peer_tag=5336,
prog_ind=3},callID=0x61DDC2A8)
Mar 2 19:39:07.376: cc_api_call_setup_ind type 13 , prot 0
Mar 2 19:39:07.376: cc_process_call_setup_ind (event=0x6231F0C4)
Mar 2 19:39:07.380: >>>>CCAPI handed cid 30 with tag 5336 to app "DEFAULT"
Mar 2 19:39:07.380: sess_appl: ev(24=CC_EV_CALL_SETUP_IND), cid(30), disp(0)
Mar 2 19:39:07.380: sess_appl: ev(SSA_EV_CALL_SETUP_IND), cid(30), disp(0)
Mar 2 19:39:07.380: ssaCallSetupInd
Mar 2 19:39:07.380: ccCallSetContext (callID=0x1E, context=0x6215B5A0)
Mar 2 19:39:07.380: ssaCallSetupInd cid(30), st(SSA_CS_MAPPING),oldst(0),
ev(24)ev->e.evCallSetupInd.nCallInfo.finalDestFlag = 1
Mar 2 19:39:07.380: ssaCallSetupInd finalDest cllng(1#5336), cllcd(3653)
Mar 2 19:39:07.380: ssaCallSetupInd cid(30), st(SSA_CS_CALL_SETTING),oldst(0),
ev(24)dpMatchPeersMoreArg result= 0
Mar 2 19:39:07.380: ssaSetupPeer cid(30) peer list: tag(3653) called number (3653)
```

```

Mar 2 19:39:07.380: ssaSetupPeer cid(30), destPat(3653), matched(4), prefix(),
peer(62664554), peer->encapType (2)
Mar 2 19:39:07.380: ccCallProceeding (callID=0x1E, prog_ind=0x0)
Mar 2 19:39:07.380: ccCallSetupRequest (Inbound call = 0x1E, outbound peer =3653,
dest=, params=0x62327730 mode=0, *callID=0x62327A98, prog_ind = 3)
Mar 2 19:39:07.380: ccCallSetupRequest numbering_type 0x81
Mar 2 19:39:07.380: ccCallSetupRequest encapType 2 clid_restrict_disable 1
null_orig_clg 1 clid_transparent 0 callingNumber 1#5336
Mar 2 19:39:07.380: dest pattern 3653, called 3653, digit_strip 0
Mar 2 19:39:07.380: callingNumber=1#5336, calledNumber=3653, redirectNumber=
display_info= calling_oct3a=0
Mar 2 19:39:07.384: accountNumber=, finalDestFlag=1,
guid=6aef.3a87.165c.11cc.8040.d661.b74f.9390
Mar 2 19:39:07.384: peer_tag=3653
Mar 2 19:39:07.384: ccIFCallSetupRequestPrivate: (vdbPtr=0x621B2360, dest=,
callParams={called=3653,called_oct3=0x81, calling=1#5336,calling_oct3=0x81,
calling_xlated=false, subscriber_type_str=RegularLine, fdest=1,
voice_peer_tag=3653},mode=0x0) vdbPtr type = 1
Mar 2 19:39:07.384: ccIFCallSetupRequestPrivate: (vdbPtr=0x621B2360, dest=,
callParams={called=3653, called_oct3 0x81, calling=1#5336,calling_oct3
0x81, calling_xlated=false, fdest=1, voice_peer_tag=3653}, mode=0x0, xltrc=-5)
Mar 2 19:39:07.384: ccSaveDialpeerTag (callID=0x1E, dialpeer_tag=0xE45)
Mar 2 19:39:07.384: ccCallSetContext (callID=0x1F, context=0x621545DC)
Mar 2 19:39:07.384: ccCallReportDigits (callID=0x1E, enable=0x0)
Mar 2 19:39:07.384: cc_api_call_report_digits_done (vdbPtr=0x6264AB2C,
callID=0x1E, disp=0)
Mar 2 19:39:07.384: sess_appl: ev(52=CC_EV_CALL_REPORT_DIGITS_DONE), cid(30),disp(0)
Mar 2 19:39:07.384: cid(30)st(SSA_CS_CALL_SETTING)ev(SSA_EV_CALL_REPORT_DIGITS_DONE)
oldst(SSA_CS_MAPPING)cfid(-1)csize(0)in(1)fDest(1)
Mar 2 19:39:07.384: -cid2(31)st2(SSA_CS_CALL_SETTING)oldst2(SSA_CS_MAPPING)
Mar 2 19:39:07.384: ssaReportDigitsDone cid(30) peer list: (empty)
Mar 2 19:39:07.384: ssaReportDigitsDone callid=30 Reporting disabled.
Mar 2 19:39:07.388: H225 NONSTD OUTGOING PDU ::=
value ARQnonStandardInfo ::=
{
    sourceAlias
    {
    }
    sourceExtAlias
    {
    }
    interfaceSpecificBillingId "ISDN-VOICE"
}
Mar 2 19:39:07.388: H225 NONSTD OUTGOING ENCODE BUFFER::= 80 00000820
0B124953 444E2D56 4F494345
Mar 2 19:39:07.388:
Mar 2 19:39:07.388: H235 OUTGOING ENCODE BUFFER::= 61 000100C0 2B93B7DA
08003200 32003200 3200001E 00670077 0061002D 00310040 00630069 00730063
006F002E 0063006F 006D0000
Mar 2 19:39:07.392:
Mar 2 19:39:07.392: RAS OUTGOING PDU ::=
value RasMessage ::= admissionRequest :

```

!--- The ARQ is sent to the gatekeeper.

```

{
requestSeqNum 549
callType pointToPoint : NULL
callModel direct : NULL
endpointIdentifier {"8155346000000001"}
destinationInfo
{
    e164 : "2#3653"
}
srcInfo
{

```

```

    e164 : "1#5336",
    h323-ID : {"gwa-1@cisco.com"}
  }
  bandwidth 640
  callReferenceValue 15
  nonStandardData
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '80000008200B124953444E2D564F494345'H
  }
  conferenceID '6AEF3A87165C11CC8040D661B74F9390'H
  activeMC FALSE
  answerCall FALSE
  canMapAlias TRUE
  callIdentifier
  {
    guid '6AEF3A87165C11CC8041D661B74F9390'H
  }
  tokens

```

!--- Token is included since there is an all level of security.

```

  {
    {
      tokenOID { 1 2 840 113548 10 1 2 1 }
      timeStamp 731101147
      challenge '1CADDBA948A8291C1F134035C9613E3E'H
      random 246
      generalID {"gwa-1@cisco.com"}
    }
  }
  cryptoTokens
  {
    cryptoEPPwdHash :
    {
      alias h323-ID : {"gwa-1@cisco.com"}
      timeStamp 731101147
      token
      {
        algorithmOID { 1 2 840 113549 2 5 }
        params
        {
        }
        hash "5760B7B4877335B7CD24BD24E4A2AA89"
      }
    }
  }
  willSupplyUUIEs FALSE
}

```

```

Mar 2 19:39:07.408: RAS OUTGOING ENCODE BUFFER::= 27 88022400 F0003800
31003500 35003300 34003600 30003000 30003000 30003000 30003000 31010280
50698602 02804086 69400E00 67007700 61002D00 31004000 63006900 73006300
6F002E00 63006F00 6D400280 000F40B5 00001211 80000008 200B1249 53444E2D
564F4943 456AEF3A 87165C11 CC8040D6 61B74F93 9004E320 01801100 6AEF3A87
165C11CC 8041D661 B74F9390 48014D00 0A2A8648 86F70C0A 010201C0 2B93B7DA
101CADDB A948A829 1C1F1340 35C9613E 3E0200F6 1E006700 77006100 2D003100
40006300 69007300 63006F00 2E006300 6F006D00 00420104 0E006700 77006100
2D003100 40006300 69007300 63006F00 2E006300 6F006DC0 2B93B7DA 082A8648
86F70D02 05008080 5760B7B4 877335B7 CD24BD24 E4A2AA89 0100

```

```

Mar 2 19:39:07.412: h323chan_dgram_send:Sent UDP msg. Bytes sent: 291 to
172.16.13.35:1719

Mar 2 19:39:07.416: RASLib::GW_RASsendARQ: ARQ (seq# 549) sent to 172.16.13.35
Mar 2 19:39:07.432: h323chan_dgram_rcvdata:rcvd from [172.16.13.35:1719] on sock[1]

Mar 2 19:39:07.432: RAS INCOMING ENCODE BUFFER ::= 2B 00022440 028000AC
100D1706 B800EF1A 00C00100 020000
Mar 2 19:39:07.432:
Mar 2 19:39:07.432: RAS INCOMING PDU ::=
value RasMessage ::= admissionConfirm :

```

!--- Received from the gatekeeper with no tokens.

```

{
  requestSeqNum 549
  bandwidth 640
  callModel direct : NULL
  destCallSignalAddress ipAddress :
  {
    ip 'AC100D17'H
    port 1720
  }
  irrFrequency 240
  willRespondToIRR FALSE
  uuiesRequested
  {
    setup FALSE
    callProceeding FALSE
    connect FALSE
    alerting FALSE
    information FALSE
    releaseComplete FALSE
    facility FALSE
    progress FALSE
    empty FALSE
  }
}

```

```

Mar 2 19:39:07.436: ACF (seq# 549) rcvd

```

This example shows the debugs from the **terminating gateway (TGW)**. Notice that the TGW has set up the second leg since it got ACF, and the call is connected.

```

Mar 2 19:39:07.493: PDU DATA = 6147C2BC

```

```

value H323_UserInformation ::=
{
  h323-uu-pdu
  {
    h323-message-body setup :
    {
      protocolIdentifier { 0 0 8 2250 0 2 }
      sourceAddress
      {
        h323-ID : {"gwa-1@cisco.com"}
      }
    }
  }
}

```

!--- Setup is sent from gwa-1@cisco.com gateway.

```

}
sourceInfo
{
  gateway
  {

```

```

protocol
{
  voice :
  {
    supportedPrefixes
    {
      {
        prefix e164 : "1#"
      }
    }
  }
}
mc FALSE
undefinedNode FALSE
}
activeMC FALSE
conferenceID '6AEF3A87165C11CC8040D661B74F9390'H
conferenceGoal create : NULL
callType pointToPoint : NULL
sourceCallSignalAddress ipAddress :
{
  ip 'AC100D0F'H
  port 11032
}
callIdentifier
{
  guid '6AEF3A87165C11CC8041D661B74F9390'H
}
tokens

```

!--- Setup includes the Clear Token (CAT).

```

{
  {
    tokenOID { 1 2 840 113548 10 1 2 1 }
    timeStamp 731101147
    challenge 'AFBAAFDF79446B9D8CE164DB8C111A87'H
    random 247
    generalID {"gwa-1@cisco.com"}
    nonStandard
    {
      nonStandardIdentifier { 0 1 2 4 }
      data '2B93B7DBAFBAAFDF79446B9D8CE164DB8C111A87...'H
    }
  }
}
fastStart
{
  '0000000C6013800A04000100AC100D0F4673'H,
  '400000060401004C6013801114000100AC100D0F...'H
}
mediaWaitForConnect FALSE
canOverlapSend FALSE
}
h245Tunneling TRUE
nonStandardControl
{
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
  }
}

```

```
    }
    data 'E001020001041504039090A31803A983811E0285...'H
  }
}
}
```

```
RAW_BUFFER ::=
E0 01020001 04150403 9090A318 03A98381 1E028583 70058133 36353302 80060004
00000003
Mar 2 19:39:07.509: PDU DATA = 6147F378
value H323_UU_NonStdInfo ::=
{
  version 2
  protoParam qsigNonStdInfo :
  {
    iei 4
    rawMesg '04039090A31803A983811E028583700581333635...'H
  }
  progIndParam progIndIEinfo :
  {
    progIndIE '00000003'H
  }
}
```

PDU DATA = 6147F378

```
value ARQnonStandardInfo ::=
{
  sourceAlias
  {
  }
  sourceExtAlias
  {
  }
}
```

```
RAW_BUFFER ::=
00 0000
Mar 2 19:39:07.517: RAW_BUFFER ::=
61 000100C0 2B93B7DA 08003200 32003200 3200000A 00670077 0061002D
00320000
Mar 2 19:39:07.517: PDU DATA = 6147C2BC
value RasMessage ::= admissionRequest :
```

!--- An answer ARQ is sent to the gatekeeper to authenticate the caller.

```
{
  requestSeqNum 22
  callType pointToPoint : NULL
  callModel direct : NULL
  endpointIdentifier {"81F5989C00000002"}
  destinationInfo
  {
    e164 : "2#3653"
  }
  srcInfo
  {
    e164 : "1#5336"
  }
  srcCallSignalAddress ipAddress :
  {
    ip 'AC100D0F'H
  }
}
```

```

    port 11032
  }
  bandwidth 640
  callReferenceValue 2
  nonStandardData
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '000000'H
  }
  conferenceID '6AEF3A87165C11CC8040D661B74F9390'H
  activeMC FALSE
  answerCall TRUE
  canMapAlias FALSE
  callIdentifier
  {
    guid '6AEF3A87165C11CC8041D661B74F9390'H
  }
  tokens

```

!--- CAT is included.

```

{
  {
    tokenOID { 0 4 0 1321 1 2 }
    timeStamp 731101147
    challenge 'AFBAAFDF79446B9D8CE164DB8C111A87'H
    random 247
    generalID {"gwa-1@cisco.com"}
  }
}
cryptoTokens
{
  cryptoEPPwdHash :
  {
    alias h323-ID : {"gwa-2"}
    timeStamp 731101147
    token
    {
      algorithmOID { 1 2 840 113549 2 5 }
      params
      {
      }
      hash "8479E7DE63AC17C6A46E9E19659568"
    }
  }
}
willSupplyUUIES FALSE
}

```

```

RAW_BUFFER:=
27 98001500 F0003800 31004600 35003900 38003900 43003000 30003000 30003000
30003000 32010280 50698601 02804086 6900AC10 0D0F2B18 40028000 0240B500
00120300 00006AEF 3A87165C 11CC8040 D661B74F 939044E3 20010011 006AEF3A
87165C11 CC8041D6 61B74F93 9044014D 00060400 8A290102 C02B93B7 DA10AFBA
AFDF7944 6B9D8CE1 64DB8C11 1A870200 F71E0067 00770061 002D0031 00400063
00690073 0063006F 002E0063 006F006D 00002E01 04040067 00770061 002D0032
C02B93B7 DA082A86 4886F70D 02050080 808479E7 0DE63AC1 7C6A46E9 E1965905
680100
Mar 2 19:39:07.533: h323chan_dgram_send:Sent UDP msg. Bytes sent: 228
to 172.16.13.35:1719

```

```
Mar 2 19:39:07.533: RASLib::GW_RASsendARQ: ARQ (seq# 22) sent to 172.16.13.35
Mar 2 19:39:07.549: h323chan_dgram_rcvdata:rcvd from [172.16.13.35:1719]
on sock[1]
RAW_BUFFER:=
2B 00001540 028000AC 100D1706 B800EF1A 00C00100 020000
Mar 2 19:39:07.549: PDU DATA = 6147C2BC
value RasMessage ::= admissionConfirm :
```

!--- ACF is received from the gatekeeper.

```
{
  requestSeqNum 22
  bandwidth 640
  callModel direct : NULL
  destCallSignalAddress ipAddress :
  {
    ip 'AC100D17'H
    port 1720
  }
  irrFrequency 240
  willRespondToIRR FALSE
  uuiesRequested
  {
    setup FALSE
    callProceeding FALSE
    connect FALSE
    alerting FALSE
    information FALSE
    releaseComplete FALSE
    facility FALSE
    progress FALSE
    empty FALSE
  }
}
```

```
Mar 2 19:39:07.553: ACF (seq# 22) rcvd
Mar 2 19:39:07.553: cc_api_call_setup_ind (vdbPtr=0x61BC92EC,
callInfo={called=2#3653,called_oct3=0x81,calling=1#5336,calling_oct3=0x81,
calling_oct3a=0x0,subscriber_type_str=Unknown, fdest=1 peer_tag=5336,
prog_ind=3},callID=0x6217CC64)
Mar 2 19:39:07.553: cc_api_call_setup_ind type 0 , prot 1
Mar 2 19:39:07.553: cc_api_call_setup_ind (vdbPtr=0x61BC92EC,
callInfo={called=2#3653, calling=1#5336, fdest=1 peer_tag=5336},
callID=0x6217CC64)
Mar 2 19:39:07.553: cc_process_call_setup_ind (event=0x61E1EAF0)
Mar 2 19:39:07.553: >>>>CCAPI handed cid 9 with tag 5336 to app "DEFAULT"
Mar 2 19:39:07.553: sess_appl: ev(25=CC_EV_CALL_SETUP_IND), cid(9), disp(0)
Mar 2 19:39:07.553: sess_appl: ev(SSA_EV_CALL_SETUP_IND), cid(9), disp(0)
Mar 2 19:39:07.553: ssaCallSetupInd
Mar 2 19:39:07.553: ccCallSetContext (callID=0x9, context=0x62447A28)
Mar 2 19:39:07.553: ssaCallSetupInd cid(9), st(SSA_CS_MAPPING),oldst(0),
ev(25)ev->e.evCallSetupInd.nCallInfo.finalDestFlag = 1
Mar 2 19:39:07.553: ssaCallSetupInd finalDest cllng(1#5336), cllcd(2#3653)
Mar 2 19:39:07.553: ssaCallSetupInd cid(9), st(SSA_CS_CALL_SETTING),oldst(0),
ev(25)dpMatchPeersMoreArg result= 0
Mar 2 19:39:07.557: ssaSetupPeer cid(9) peer list: tag(3653)
called number (2#3653)
Mar 2 19:39:07.557: ssaSetupPeer cid(9), destPat(2#3653), matched(5),
prefix(21), peer(620F1EF0), peer->encapType (1)
Mar 2 19:39:07.557: ccCallProceeding (callID=0x9, prog_ind=0x0)
Mar 2 19:39:07.557: ccCallSetupRequest (Inbound call = 0x9, outbound peer
=3653, dest=, params=0x61E296C0 mode=0, *callID=0x61E299D0, prog_ind = 3)
Mar 2 19:39:07.557: ccCallSetupRequest numbering_type 0x81
Mar 2 19:39:07.557: dest pattern 2#3653, called 2#3653, digit_strip 1
Mar 2 19:39:07.557: callingNumber=1#5336, calledNumber=2#3653,
```

```
redirectNumber=display_info= calling_oct3a=0
Mar 2 19:39:07.557: accountNumber=, finalDestFlag=1,
guid=6aef.3a87.165c.11cc.8040.d661.b74f.9390
Mar 2 19:39:07.557: peer_tag=3653
Mar 2 19:39:07.557: ccIFCallSetupRequestPrivate: (vdbPtr=0x61E4473C, dest=,
callParams={called=2#3653,called_oct3=0x81, calling=1#5336,calling_oct3=0x81,
subscriber_type_str=Unknown, fdest=1, voice_peer_tag=3653},mode=0x0) vdbPtr
type = 6
Mar 2 19:39:07.557: ccIFCallSetupRequestPrivate: (vdbPtr=0x61E4473C, dest=,
callParams={called=2#3653, called_oct3 0x81, calling=1#5336,calling_oct3 0x81,
fdest=1, voice_peer_tag=3653}, mode=0x0, xltrc=-4)
Mar 2 19:39:07.557: ccSaveDialpeerTag (callID=0x9, dialpeer_tag=
Mar 2 19:39:07.557: ccCallSetContext (callID=0xA, context=0x6244D9EC)
Mar 2 19:39:07.557: ccCallReportDigits (callID=0x9, enable=0x0)
```

Gateway IOS Problem

In the same lab, IOS image 12.2(6a) is loaded on the OGW. When a call is made, it is noticed that the OGW still sends a Clear Token based on its password even though the gateway is not configured for IVR to collect the Account/PIN. In addition, the gatekeeper configured for the all level accepts that call. This is documented in Cisco bug ID CSCdw43224 (registered customers only) .

Security with Alternate Endpoints

As mentioned earlier in this document, end-to-end call security is provided with the use of access tokens that are sent in the clearTokens field in the RAS/H.225 messages. When enabling such security, the source gateway forwards the access token received from the gatekeeper in an ACF to the destination H.323 endpoint in the H.225 SETUP message. This destination H.323 endpoint then forwards the access token received in the SETUP message to the gatekeeper in its admission request. By doing this, it gives the remote gatekeeper the ability to admit calls based on the validity of the access token. The contents of the access token are up to the entity that generates it. In order to minimize security holes and to guard against man-in-the-middle attacks, gatekeepers can encode destination specific information in the access token. This means that when alternateEndpoints are provided in an ACF, the gatekeeper can provide a separate access token for each alternateEndpoint specified.

When it first attempts to establish a connection, the Cisco gateway sends the access token it has received in the clearToken field of the ACF with the address in the destCallSignalAddress field. If this attempt is unsuccessful and the Cisco gateway proceeds to attempt connections with an alternate endpoint, it uses the associated access token (if it is available) from the alternateEndpoints list. If the alternateEndpoints list received in the ACF does not include access tokens, but the ACF includes an access token, the Cisco gateway includes this access token in all attempts to connect with an alternate endpoint.

OSP Token Support

Currently the Open Settlement Protocol (OSP) and its tokens are only supported on Cisco gateways. There is no support on the gatekeeper. The gateway recognizes OSP tokens received from a settlement server and inserts them into the Q.931 setup message to a terminating gateway.

Different Levels of Security for each Endpoint or Zone

Currently you are unable to configure different levels of security for each endpoint or zone. The security level is for all zones managed by that gatekeeper. A feature request can be opened for such an issue.

Interdomain Gatekeeper to Gatekeeper Security

Interdomain gatekeeper to gatekeeper security provides the ability to validate intradomain and interdomain gatekeeper-to-gatekeeper requests on a per-hop basis. This means that the destination gatekeeper terminates the CAT and generates a new one if the gatekeeper decides to forward the LRQ onwards. If the gatekeeper detects an invalid LRQ signature it responds by sending a Location Reject (LRJ).

Implement Gatekeeper to Gatekeeper Security

The originating gatekeeper generates an IZCT when an LRQ is initiated or an ACF is about to be sent in case of an intra-zone call. This token is traversed through its routing path. Along the path, each gatekeeper updates the destination gatekeeper ID and/or source gatekeeper ID, if necessary, to reflect the zone information. The terminating gatekeeper generates a token with its password. This token is carried back in the location confirmation (LCF) messages and passed to OGW. The OGW includes this token in the H.225 SETUP message. When the TGW receives the token, it is forwarded in the ARQ answerCall and validated by the terminating gatekeeper (TGK) without any need for a RADIUS server.

The authentication type is based on password with hashing as described in ITU H.235. Specifically, the encryption method is MD5 with password hashing.

The purpose of the IZCT is to know if the LRQ has arrived from a foreign domain, from which zone, and from which carrier. It is also used to pass a token to the OGW in the LCF from the TGK. Within the IZCT format, this information is required:

- srcCarrierID Source carrier identification
- dstCarrierID Destination carrier identification
- intCarrierID Intermediate carrier identification
- srcZone Source zone
- dstZone Destination zone
- interzone type
 - ◆ INTRA_DOMAIN_CISCO
 - ◆ INTER_DOMAIN_CISCO
 - ◆ INTRA_DOMAIN_TERM_NOT_CISCO
 - ◆ INTER_DOMAIN_ORIG_NOT_CISCO

This feature works fine without any need for a carrier ID from the gateway or a Carrier Sensitive Routing (CSR) server. In such case, the fields about the carrier ID are empty. The examples here do not include any carrier ID. For a detailed call flow, release and platform support, and configurations, refer to Inter-Domain Gatekeeper Security Enhancement.

Gatekeeper Configuration

The IZCT feature requires this configuration on the gatekeeper.

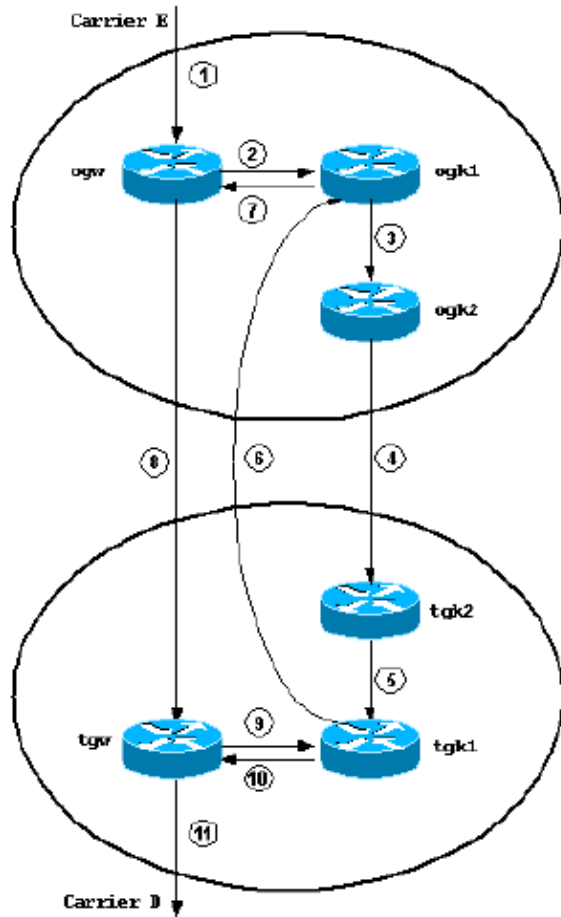
```
Router(gk-config)#  
[no] security izct password <PASSWORD>
```

The password needs to be six to eight characters. Identify which zone is in a foreign domain like this:

```
Router(config-gk)#  
zone remote other-gatekeeper-name other-domain-name other-gatekeeper-ip-address  
[port-number] [cost cost-value [priority priority-value]] [foreign-domain]
```

IZCT Call Flow

This diagram shows the IZCT flow.



In this configuration, the names of the gateways and gatekeepers are the same as those used in the IZCT call flow diagram but with lower case. The call flow is explained after the configuration, with debug explanations.

To explain the IZCT feature and call flow, the first example does not have the intradomain gateway to gatekeeper security. After that, there are examples where the TGW is not able to generate the IZCT so that the TGK1 rejects the call. This is to show that the feature works as designed. All of these setups are based on the topology in the IZCT call flow diagram.

Example 1: Call flow for gatekeeper to gatekeeper security only

This example shows the related configurations of all gateways and gatekeepers.

OGW Configuration	TGW Configuration
<pre>! hostname ogw !controller E1 3/0 pri-group timeslots 1-2,16 ! interface Ethernet0/0 ip address 172.16.13.15 255.255.255.224 half-duplex h323-gateway voip interface</pre>	<pre>hostname tgw ! controller E1 0 clock source line primary ds0-group 0 timeslots 1-2 type r2-digital r2-compelled ! interface Ethernet0 ip address 172.16.13.23 255.255.255.224</pre>

<pre> h323-gateway voip id ogk1 ipaddr 172.16.13.35 1718 h323-gateway voip h323-id ogw h323-gateway voip tech-prefix 1# ! voice-port 3/0:15 ! dial-peer voice 5336 pots incoming called-number . destination-pattern 5336 direct-inward-dial port 3/0:15 prefix 21 ! dial-peer voice 3653 voip incoming called-number . destination-pattern 3653 session target ras dtmf-relay h245-alphanumeric codec g711ulaw ! gateway ! ntp clock-period 17178791 ntp server 172.16.13.35 end </pre>	<pre> h323-gateway voip interface h323-gateway voip id tgk1 ipaddr 172.16.13.41 1718 h323-gateway voip h323-id tgw h323-gateway voip tech-prefix 2# ! voice-port 0:0 compand-type a-law ! dial-peer voice 3653 pots application test1 incoming called-number . destination-pattern 3653 port 0:0 prefix 21 ! dial-peer voice 5336 voip incoming called-number . destination-pattern 5336 session target ras dtmf-relay h245-alphanumeric codec g711ulaw ! gateway ! ntp clock-period 17179814 ntp server 172.16.13.35 end </pre>
--	--

OGK1 Configuration	TGK1 Configuration
<pre> ! hostname ogk1 ! interface Ethernet0/0 ip address 172.16.13.35 255.255.255.224 half-duplex ! gatekeeper zone local ogk1 domainA.com 172.16.13.35 zone remote ogk2 domainA.com 172.16.13.14 1719 zone prefix ogk2 36* zone prefix ogk1 53* security izct password 111222 gw-type-prefix 1#* default- technology no shutdown ! ! no scheduler max-task-time no scheduler allocate ntp master ! end </pre>	<pre> ! hostname tgk1 ! interface Ethernet0/0 ip address 172.16.13.41 255.255.255.224 ip directed-broadcast half-duplex ! gatekeeper zone local tgk1 domainB.com 172.16.13.41 zone remote tgk2 domainB.com 172.16.13.16 1719 </pre>

OGK2 Configuration	TGK2 Configuration
<pre> ! hostname ogk2 ! interface Ethernet0/0 ip address 172.16.13.14 </pre>	<pre> ! security izct password 111222 gw-type-prefix 2#* default- technology no shutdown interface Ethernet0/0 ! ip address 172.16.13.16 ntp clock-period 17179797 ntp server 172.16.13.35 ! end </pre>

<pre> 255.255.255.224 full-duplex ! gatekeeper zone local ogk2 domainA.com zone remote ogk1 domainA.com 172.16.13.35 1719 zone remote tgk2 domainB.com 172.16.13.16 1719 foreign-domain zone prefix tgk2 36* zone prefix ogk1 53* security izct password 111222 lrq forward-queries no shutdown ! ntp clock-period 17208242 ntp server 172.16.13.35 ! end </pre>	<pre> 255.255.255.224 half-duplex ! gatekeeper zone local tgk2 domainB.com zone remote tgk1 domainB.com 172.16.13.41 1719 zone remote ogk2 domainA.com 172.16.13.14 1719 foreign-domain zone prefix tgk1 36* zone prefix ogk2 53* security izct password 111222 lrq forward-queries no shutdown ! ntp clock-period 17179209 ntp server 172.16.13.35 ! end </pre>
--	--

Call Flow with Debugs

These examples use the debugs to explain the call flow.

1. A user on carrier E calls a user on carrier D.

```

Mar 4 15:31:19.989: cc_api_call_setup_ind
  (vdbPtr=0x6264ADF0, callInfo={called=3653,
called_oct3=0x80,calling=4085272923,calling_oct3=0x21,calling_oct3a=0x80
calling_xlated=false,subscriber_type_str=RegularLine,fdest=1,peer_tag=5336,
prog_ind=0},callID=0x6219F9F0)
Mar 4 15:31:19.993: cc_api_call_setup_ind type 13 , prot 0
Mar 4 15:31:19.993: cc_process_call_setup_ind (event=0x6231A6B4)
Mar 4 15:31:19.993: >>>CCAPI handed cid 7 with tag 5336 to app "DEFAULT"
Mar 4 15:31:19.993: sess_appl: ev(24=CC_EV_CALL_SETUP_IND), cid(7), disp(0)
Mar 4 15:31:19.993: sess_appl: ev(SSA_EV_CALL_SETUP_IND), cid(7), disp(0)
Mar 4 15:31:19.993: ssaCallSetupInd
Mar 4 15:31:19.993: ccCallSetContext (callID=0x7, context=0x621533F0)
Mar 4 15:31:19.997: ssaCallSetupInd cid(7), st(SSA_CS_MAPPING),oldst(0),
ev(24) ev->e.evCallSetupInd.nCallInfo.finalDestFlag = 1
Mar 4 15:31:19.997: ssaCallSetupInd finalDest cllng(4085272923), cllcd(3653)
Mar 4 15:31:19.997: ssaCallSetupInd cid(7), st(SSA_CS_CALL_SETTING),oldst(0),
ev(24)dpMatchPeersMoreArg result= 0
Mar 4 15:31:19.997: ssaSetupPeer cid(7) peer list: tag(3653) called number (3653)
Mar 4 15:31:19.997: ssaSetupPeer cid(7), destPat(3653), matched(4), prefix(),
peer(626640B0), peer->encapType (2)
Mar 4 15:31:19.997: ccCallProceeding (callID=0x7, prog_ind=0x0)
Mar 4 15:31:19.997: ccCallSetupRequest (Inbound call = 0x7, outbound peer=3653,
dest=,
  params=0x62327730 mode=0, *callID=0x62327A98, prog_ind = 0)
Mar 4 15:31:19.997: ccCallSetupRequest numbering_type 0x80
Mar 4 15:31:19.997: ccCallSetupRequest encapType 2 clid_restrict_disable 1 null
_orig_clg 0 clid_transparent 0 callingNumber 4085272923
Mar 4 15:31:19.997: dest pattern 3653, called 3653, digit_strip 0
Mar 4 15:31:19.997: callingNumber=4085272923, calledNumber=3653, redirectNumber
= display_info= calling_oct3a=80
Mar 4 15:31:19.997: accountNumber=, finalDestFlag=1,
guid=221b.686c.17cc.11cc.8010.a049.e052.4766
Mar 4 15:31:19.997: peer_tag=3653
Mar 4 15:31:19.997: ccIFCallSetupRequestPrivate: (vdbPtr=0x621B2360, dest=,
callParams={called=3653,called_oct3=0x80, calling=4085272923,calling_oct3=0x21,
calling_xlated=false, subscriber_type_str=RegularLine, fdest=1, voice_peer_tag=365
3},mode=0x0) vdbPtr type = 1
Mar 4 15:31:19.997: ccIFCallSetupRequestPrivate: (vdbPtr=0x621B2360, dest=,

```

```
callParams={called=3653, called_oct3 0x80, calling=4085272923,calling_oct3 0x21,
calling_xlated=false, fdest=1, voice_peer_tag=3653}, mode=0x0, xltrc=-5)
Mar 4 15:31:20.001: ccSaveDialpeerTag (callID=0x7, dialpeer_tag=0xE45)
Mar 4 15:31:20.001: ccCallSetContext (callID=0x8, context=0x6215388C)
Mar 4 15:31:20.001: ccCallReportDigits (callID=0x7, enable=0x0)
```

2. Since the originating gateway's dialpeer (tag=3653) is configured for RAS, it sends an ARQ to OGK1.

```
Mar 4 15:31:20.001: H225 NONSTD OUTGOING PDU ::=
```

```
value ARQnonStandardInfo ::=
{
  sourceAlias
  {
  }
  sourceExtAlias
  {
  }
  callingOctet3a 128
  interfaceSpecificBillingId "ISDN-VOICE"
}
```

```
Mar 4 15:31:20.005: H225 NONSTD OUTGOING ENCODE BUFFER::= 80 000008A0
01800B12 4953444E 2D564F49 4345
```

```
Mar 4 15:31:20.005:
```

```
Mar 4 15:31:20.005: RAS OUTGOING PDU ::=
```

```
value RasMessage ::= admissionRequest :
```

```
!--- ARQ is sent out to ogk1.
```

```
{
requestSeqNum 1109
callType pointToPoint : NULL
callModel direct : NULL
endpointIdentifier {"81567A4000000001"}
destinationInfo
{
  e164 : "3653"
}
srcInfo
{
  e164 : "4085272923",
  h323-ID : {"ogw"}
}
bandWidth 640
callReferenceValue 4
nonStandardData
{
  nonStandardIdentifier h221NonStandard :
  {
    t35CountryCode 181
    t35Extension 0
    manufacturerCode 18
  }
  data '80000008A001800B124953444E2D564F494345'H
}
conferenceID '221B686C17CC11CC8010A049E0524766'H
activeMC FALSE
answerCall FALSE
canMapAlias TRUE
callIdentifier
{
  guid '221B686C17CC11CC8011A049E0524766'H
}
```

```
willSupplyUUIEs FALSE
}
```

```
Mar 4 15:31:20.013: RAS OUTGOING ENCODE BUFFER ::= 27 88045400 F0003800
31003500 36003700 41003400 30003000 30003000 30003000 30003000 31010180
69860204 8073B85A 5C564002 006F0067 00774002 80000440 B5000012 13800000
08A00180 0B124953 444E2D56 4F494345 221B686C 17CC11CC 8010A049 E0524766
04E02001 80110022 1B686C17 CC11CC80 11A049E0 52476601 00
Mar 4 15:31:20.017: h323chan_dgram_send:Sent UDP msg. Bytes sent: 130 to
172.16.13.35:1719
```

```
Mar 4 15:31:20.017: RASLib::GW_RASSendARQ: ARQ (seq# 1109) sent to
172.16.13.35
```

3. When OGK1 receives the ARQ, it determines that the destination is serviced by the remote zone OGK2. It then identifies that an IZCT is needed (through CLI: **security izct password <pwd>**). OGK1 proceeds to create the IZCT before the LRQ is sent. It then sends the IZCT and the LRQ out to OGK2 and sends an RIP message back to OGW.

```
Mar 4 15:31:19.927: H225 NONSTD OUTGOING PDU ::=
value LRQnonStandardInfo ::=
```

```
{
  ttl 6
  nonstd-callIdentifier
  {
    guid '221B686C17CC11CC8011A049E0524766'H
  }
  callingOctet3a 128
  gatewaySrcInfo
  {
    e164 : "4085272923",
    h323-ID : {"ogw"}
  }
}
```

```
Mar 4 15:31:19.935: H225 NONSTD OUTGOING ENCODE BUFFER ::= 82 86B01100
221B686C 17CC11CC 8011A049 E0524766 01801002 048073B8 5A5C5640
02006F00 670077
```

```
Mar 4 15:31:19.939:
```

```
Mar 4 15:31:19.939: PDU ::=
```

```
value IZCToken ::=
```

```
!--- The gatekeeper creates and sends out the IZCT.
```

```
{
  izctInterZoneType intraDomainCisco : NULL
```

```
!--- The destination is in the same domain, it is intraDomainCisco type.
```

```
  izctSrcZone "ogk1"
```

```
!--- The source zone is ogk1.
```

```
)
```

```
Mar 4 15:31:19.943: ENCODE BUFFER ::= 07 00C06F67 6B310473 72630464
73740469 6E74
```

```
Mar 4 15:31:19.947:
```

```
Mar 4 15:31:19.947: RAS OUTGOING PDU ::=
```

```
value RasMessage ::= locationRequest :
```

```
!--- LRQ is sent out to ogk2.
```

```

{
  requestSeqNum 2048
  destinationInfo
  {
    e164 : "3653"
  }
  nonStandardData
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '8286B01100221B686C17CC11CC8011A049E05247...'H
  }
  replyAddress ipAddress :
  {
    ip 'AC100D23'H
    port 1719
  }
  sourceInfo
  {
    h323-ID : {"ogk1"}
  }
  canMapAlias TRUE
  tokens

```

!--- The IZCT is included.

```

{
  {
    tokenOID { 1 2 840 113548 10 1 0 }
    nonStandard
    {
      nonStandardIdentifier { 1 2 840 113548 10 1 0 }
      data '0700C06F676B31047372630464737404696E74'H
    }
  }
}

```

```

Mar 4 15:31:19.967: RAS OUTGOING ENCODE BUFFER::= 4A 8007FF01 01806986
40B50000
12288286 B0110022 1B686C17 CC11CC80 11A049E0 52476601 80100204 8073B85A
5C56400
2 006F0067 007700AC 100D2306 B70BA00B 01400300 6F006700 6B003101
802B0100 80092A
86 4886F70C 0A010009 2A864886 F70C0A01 00130700 C06F676B 31047372
63046473 74046
96E 74
Mar 4 15:31:19.983:
Mar 4 15:31:19.987: IPSOCK_RAS_sendto: msg length 122 from 172.16.13.35:1719
to 172.16.13.14: 1719
Mar 4 15:31:19.987: RASLib::RASSendLRQ: LRQ (seq# 2048) sent to 172.16.13.14
Mar 4 15:31:19.987: RAS OUTGOING PDU ::=

```

value RasMessage ::= **requestInProgress** :

!--- RIP message is sent back to OGW.

```

{
  requestSeqNum 1109
  delay 9000
}

```

```

Mar 4 15:31:19.991: RAS OUTGOING ENCODE BUFFER ::= 80 05000454 2327
Mar 4 15:31:19.991:
Mar 4 15:31:19.991: IPSOCK_RAS_sendto: msg length 7 from 172.16.13.35:1719 to
172.16.13.15: 57076
Mar 4 15:31:19.991: RASLib::RASSendRIP: RIP (seq# 1109) sent to 172.16.13.15
4. When OGK2 receives the LRQ, it checks the IZCT. From the configuration it finds that the LRQ
needs to also contain an IZCT. OGK2 then creates a new IZCT by changing the izctSrcZone and
izctDstZone to be ogk2 and forwards the LRQ to TGK2. After it sends out the LRQ to TGK2, it sends
back a RIP message to OGK1.

```

If the gatekeepers are part of a cluster, the cluster name is used for the SrcZone or DstZone.

```

Mar 4 15:31:20.051: RAS OUTGOING PDU ::=

value RasMessage ::= requestInProgress :

!--- RIP message is sent back to OGK1.

{
  requestSeqNum 2048
  delay 6000
}

Mar 4 15:31:20.055: RAS OUTGOING ENCODE BUFFER ::= 80 050007FF 176F
Mar 4 15:31:20.055:
Mar 4 15:31:20.055: IPSOCK_RAS_sendto: msg length 7 from 172.16.13.14:1719 to
172.16.13.35: 1719
Mar 4 15:31:20.059: RASLib::RASSendRIP: RIP (seq# 2048) sent to 172.16.13.35
Mar 4 15:31:20.059: H225 NONSTD OUTGOING PDU ::=

value LRQnonStandardInfo ::=
{
  ttl 5
  nonstd-callIdentifier
  {
    guid '221B686C17CC11CC8011A049E0524766'H
  }
  callingOctet3a 128
  gatewaySrcInfo
  {
    e164 : "4085272923",
    h323-ID : {"ogw"}
  }
}

Mar 4 15:31:20.063: H225 NONSTD OUTGOING ENCODE BUFFER ::= 82 06B01100
221B686C 17CC11CC 8011A049 E0524766 01801002 048073B8 5A5C5640 02006F00 670077
Mar 4 15:31:20.072:
Mar 4 15:31:20.072: PDU ::=

value IZCToken ::=
{
  izctInterZoneType intraDomainCisco : NULL

!--- This is still intraDomain since message OGK1 is
!--- not a foreign domain.

  izctSrcZone "ogk2"

!--- ScrZone and DstZone become ogk2.

  izctDstZone "ogk2"
}

```

```
Mar 4 15:31:20.076: ENCODE BUFFER ::= 47 00C06F67 6B32066F 676B3204 73726304
64737404 696E74
Mar 4 15:31:20.080:
Mar 4 15:31:20.080: RAS OUTGOING PDU ::=
```

```
value RasMessage ::= locationRequest :
```

```
!--- The LRQ is forwarded to TGK2.
```

```
{
  requestSeqNum 2048
  destinationInfo
  {
    e164 : "3653"
  }
  nonStandardData
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '8206B01100221B686C17CC11CC8011A049E05247...'H
  }
  replyAddress ipAddress :
  {
    ip 'AC100D23'H
    port 1719
  }
  sourceInfo
  {
    h323-ID : {"ogk1"}
  }
  canMapAlias TRUE
  tokens
```

```
!--- IZCT is included.
```

```
{
  {
    tokenOID { 1 2 840 113548 10 1 0 }
    nonStandard
    {
      nonStandardIdentifier { 1 2 840 113548 10 1 0 }
      data '4700C06F676B32066F676B320473726304647374...'H
    }
  }
}
```

```
Mar 4 15:31:20.104: RAS OUTGOING ENCODE BUFFER ::= 4A 8007FF01
01806986 40B50000 12288206 B0110022 1B686C17 CC11CC80 11A049E0 52476601
80100204 8073B85A 5C564002 006F0067 007700AC 100D2306 B70BA00B 01400300
6F006700 6B003101 80300100 80092A86 4886F70C 0A010009 2A864886 F70C0A01
00184700 C06F676B 32066F67 6B320473 72630464 73740469 6E74
```

```
Mar 4 15:31:20.120:
```

```
Mar 4 15:31:20.120: IPSOCK_RAS_sendto: msg length 127 from 172.16.13.14:1719
to 172.16.13.16: 1719
```

```
Mar 4 15:31:20.124: RASLib::RASSendLRQ: LRQ (seq# 2048) sent to 172.16.13.16
```

5. TGK2 determines that the LRQ comes from a foreign domain. It updates the IZCT's dstZone with its own ID and interZoneType as INTER_DOMAIN_CISCO. It then creates a new CAT and passes the updated IZCT and the LRQ to TGK1.

TGK2 treats the zone from which an LRQ is received as a foreign-domain zone in either of these two scenarios:

- ◆ The TGK2's remote zone list does not contain the zone from which an LRQ is received.
- ◆ The TGK2's remote zone list contains the zone from which an LRQ is received. The zone is marked with a foreign-domain flag.

It then sends a Request In Progress message back to OGK1.

```
Mar 4 15:31:20.286: RAS OUTGOING PDU ::=
value RasMessage ::= requestInProgress :

!--- The RIP message is sent back to
!--- OGK1 since lrq-forward queries are configured on OGK2 and TGK2.

{
  requestSeqNum 2048
  delay 6000
}

Mar 4 15:31:20.286: RAS OUTGOING ENCODE BUFFER::= 80 050007FF 176F
Mar 4 15:31:20.286:
Mar 4 15:31:20.286: IPSOCK_RAS_sendto: msg length 7 from 172.16.13.16:1719 to
172.16.13.35: 1719
Mar 4 15:31:20.286: RASLib::RASSendRIP: RIP (seq# 2048) sent to 172.16.13.35
Mar 4 15:31:20.286: H225 NONSTD OUTGOING PDU ::=

value LRQnonStandardInfo ::=
{
  ttl 4
  nonstd-callIdentifier
  {
    guid '221B686C17CC11CC8011A049E0524766'H
  }
  callingOctet3a 128
  gatewaySrcInfo
  {
    e164 : "4085272923",
    h323-ID : {"ogw"}
  }
}

Mar 4 15:31:20.290: H225 NONSTD OUTGOING ENCODE BUFFER::= 81 86B01100
221B686C 17CC11CC 8011A049 E0524766 01801002 048073B8 5A5C5640 02006F00 670077
Mar 4 15:31:20.290:
Mar 4 15:31:20.290: PDU ::=
value IZCToken ::=

!--- The IZCT information.

{
  izctInterZoneType interDomainCisco : NULL

!--- The zone type is interDomain since the OGK2
!--- in a foreign domain is configured in TGK2.

  izctSrcZone "ogk2"

!--- SrcZone is still ogk2.

  izctDstZone "tgk2"

!--- DstZone changed to tgk2.

}
```

```
Mar 4 15:31:20.294: ENCODE BUFFER::= 47 20C06F67 6B320674 676B3204
73726304 64737404 696E74
Mar 4 15:31:20.294:
Mar 4 15:31:20.294: RAS OUTGOING PDU ::=
value RasMessage ::= locationRequest :
```

!--- LRQ is sent to TGK1.

```
{
  requestSeqNum 2048
  destinationInfo
  {
    e164 : "3653"
  }
  nonStandardData
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '8186B01100221B686C17CC11CC8011A049E05247...'H
  }
  replyAddress ipAddress :
  {
    ip 'AC100D23'H
    port 1719
  }
  sourceInfo
  {
    h323-ID : {"ogk1"}
  }
  canMapAlias TRUE
  tokens
```

!--- The IZCT is included.

```
{
  {
    tokenOID { 1 2 840 113548 10 1 0 }
    nonStandard
    {
      nonStandardIdentifier { 1 2 840 113548 10 1 0 }
      data '4720C06F676B320674676B320473726304647374...'H
    }
  }
}
```

```
Mar 4 15:31:20.302: RAS OUTGOING ENCODE BUFFER::= 4A 8007FF01 01806986
40B50000 12288186 B0110022 1B686C17 CC11CC80 11A049E0 52476601 80100204
8073B85A 5C564002 006F0067 007700AC 100D2306 B70BA00B 01400300 6F006700
6B003101 80300100 80092A86 4886F70C 0A010009 2A864886 F70C0A01 00184720
C06F676B 32067467 6B320473 72630464 73740469 6E74
```

```
Mar 4 15:31:20.306:
```

```
Mar 4 15:31:20.306: IPSOCK_RAS_sendto: msg length 127 from 172.16.13.16:1719
to 172.16.13.41: 1719
```

```
Mar 4 15:31:20.306: RASLib::RASSendLRQ: LRQ (seq# 2048) sent to 172.16.13.41
```

6. Normally TGK1 updates the IZCT's dstCarrierID to Carrier E, which is determined by the routing process. However, since no carriers are used, you do not see that. TGK1 generates a hash token with the IZCT's password. It sends an LCF with the updated IZCT in it to OGK1. This izctHash is used to authenticate the answerCall ARQ that TGK1 receives from the TGW when the later receives the VoIP setup message from OGW.

```
Mar 4 15:31:20.351: PDU ::=
value IZCToken ::=
```

```
!--- IZCT with a hash is generated to be sent back to TGK2.
```

```
{
  izctInterZoneType interDomainCisco : NULL
  izctSrcZone "ogk2"
  izctDstZone "tgk2"
  izctTimestamp 731259080
  izctRandom 3
  izctHash '5A7D5E18AA658A6A4B4709BA5ABEF2B9'H
}
```

```
Mar 4 15:31:20.355: ENCODE BUFFER ::= 7F 20C06F67 6B320674 676B32C0 2B9620C7
0103105A 7D5E18AA 658A6A4B 4709BA5A BEF2B904 73726304 64737404 696E74
```

```
Mar 4 15:31:20.355:
```

```
Mar 4 15:31:20.355: RAS OUTGOING PDU ::=
value RasMessage ::= locationConfirm :
```

```
!--- LCF is sent back to OGK1 since lrq-forward queries
!--- are configured on OGK2 and TGK2.
```

```
{
  requestSeqNum 2048
  callSignalAddress ipAddress :
  {
    ip 'AC100D17'H
    port 1720
  }
  rasAddress ipAddress :
  {
    ip 'AC100D17'H
    port 55762
  }
  nonStandardData
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '000140020074006700770600740067006B003101...'H
  }
  destinationType
  {
    gateway
    {
      protocol
      {
        voice :
        {
          supportedPrefixes
          {
            }
          }
        }
      }
    }
  }
  mc FALSE
  undefinedNode FALSE
}
tokens
```

```
!--- The IZCT is included.
```

```

    {
      {
        tokenOID { 1 2 840 113548 10 1 0 }
        nonStandard
        {
          nonStandardIdentifier { 1 2 840 113548 10 1 0 }
          data '7F20C06F676B320674676B32C02B9620C7010310...'H
        }
      }
    }
  }
}

```

```

Mar 4 15:31:20.367: RAS OUTGOING ENCODE BUFFER ::= 4F 07FF00AC
100D1706 B800AC10 0D17D9D2 40B50000 122F0001 40020074 00670077 06007400
67006B00 31011001 40020074 00670077 00AC100D 1706B800 00000000 00000000
00104808 0880013C 05010000 48010080 092A8648 86F70C0A 0100092A 864886F7
0C0A0100 307F20C0 6F676B32 0674676B 32C02B96 20C70103 105A7D5E 18AA658A
6A4B4709 BA5ABEF2 B9047372 63046473 7404696E 74

```

```
Mar 4 15:31:20.371:
```

```
Mar 4 15:31:20.371: IPSOCK_RAS_sendto: msg length 154 from 172.16.13.41:1719 to
172.16.13.35: 1719
```

```
Mar 4 15:31:20.371: RASLib::RASSendLCF: LCF (seq# 2048) sent to 172.16.13.35
```

7. OGK1 extracts the IZCT from the LCF and sends it in an ACF to the OGW.

```
Mar 4 15:31:20.316: PDU ::=
value IZCToken ::=
```

```
!--- The extracted IZCT.
```

```

{
  izctInterZoneType interDomainCisco : NULL
  izctSrcZone "ogk2"
  izctDstZone "tgk2"
  izctTimestamp 731259080
  izctRandom 3
  izctHash '5A7D5E18AA658A6A4B4709BA5ABEF2B9'H
}

```

```
Mar 4 15:31:20.324: ENCODE BUFFER ::= 7F 20C06F67 6B320674 676B32C0 2B9620C7 0103105A
7D5E18AA 658A6A4B 4709BA5A BEF2B904 73726304 64737404 696E74
```

```
Mar 4 15:31:20.328:
```

```
Mar 4 15:31:20.332: RAS OUTGOING PDU ::=
value RasMessage ::= admissionConfirm :
```

```
!--- ACF is sent back to OGW with the hashed IZCToken.
```

```

{
  requestSeqNum 1109
  bandwidth 640
  callModel direct : NULL
  destCallSignalAddress ipAddress :
  {
    ip 'AC100D17'H
    port 1720
  }
  irrFrequency 240
  tokens
}

```

```
!--- The IZCT is included.
```

```

{
  {
    tokenOID { 1 2 840 113548 10 1 0 }
    nonStandard
    {

```

```

        nonStandardIdentifier { 1 2 840 113548 10 1 0 }
        data '7F20C06F676B320674676B32C02B9620C7010310...'H
    }
}
}
willRespondToIRR FALSE
uuiesRequested
{
    setup FALSE
    callProceeding FALSE
    connect FALSE
    alerting FALSE
    information FALSE
    releaseComplete FALSE
    facility FALSE
    progress FALSE
    empty FALSE
}
}

```

```

Mar 4 15:31:20.352: RAS OUTGOING ENCODE BUFFER ::= 2B 00045440 028000AC 100D1706
B800EF1A 08C04801 0080092A 864886F7 0C0A0100 092A8648 86F70C0A 0100307F 20C06F67
6B320674 676B32C0 2B9620C7 0103105A 7D5E18AA 658A6A4B 4709BA5A BEF2B904 73726304
64737404 696E7401 00020000
Mar 4 15:31:20.364:
Mar 4 15:31:20.364: IPSOCK_RAS_sendto: msg length 97 from 172.16.13.35:1719 to
172.16.13.15: 57076
Mar 4 15:31:20.368: RASLib::RASSendACF: ACF (seq# 1109) sent to 172.16.13.15

```

8. The OGW sends the IZCT to the TGW in the H.225 SETUP message.

```

Mar 4 15:31:20.529: H225.0 OUTGOING PDU ::=
value H323_UserInformation ::=
{
    h323-uu-pdu
    {
        h323-message-body setup :

```

!--- H.225 SETUP message is sent to TGW.

```

{
    protocolIdentifier { 0 0 8 2250 0 2 }
    sourceAddress
    {
        h323-ID : {"ogw"}
    }
    sourceInfo
    {
        gateway
        {
            protocol
            {
                voice :
                {
                    supportedPrefixes
                    {
                        {
                            prefix e164 : "1#"
                        }
                    }
                }
            }
        }
    }
    mc FALSE
    undefinedNode FALSE
}

```

```

activeMC FALSE
conferenceID '221B686C17CC11CC8010A049E0524766'H
conferenceGoal create : NULL
callType pointToPoint : NULL
sourceCallSignalAddress ipAddress :
{
  ip 'AC100D0F'H
  port 11003
}
callIdentifier
{
  guid '221B686C17CC11CC8011A049E0524766'H
}
tokens

```

!--- The hashed IZCT information is included in the setup message.

```

{
  {
    tokenOID { 1 2 840 113548 10 1 0 }
    nonStandard
    {
      nonStandardIdentifier { 1 2 840 113548 10 1 0 }
      data '7F20C06F676B320674676B32C02B9620C7010310...'H
    }
  }
}
fastStart
{
  '0000000C6013800A04000100AC100D0F4125'H,
  '400000060401004C6013801114000100AC100D0F...'H
}
mediaWaitForConnect FALSE
canOverlapSend FALSE
}
h245Tunneling TRUE
nonStandardControl
{
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '6001020001041F04038090A31803A983816C0C21...'H
  }
}
}
}

```

9. The TGW passes the IZCT to the TGK1 in an ARQ answerCall.

```

Mar 4 15:31:20.613:
Mar 4 15:31:20.613: RAS OUTGOING PDU ::=
value RasMessage ::= admissionRequest :

```

!--- ARQ answerCall type is sent to TGK1.

```

{
requestSeqNum 78
callType pointToPoint : NULL
callModel direct : NULL
endpointIdentifier {"617D829000000001"}
destinationInfo
{
  e164 : "3653"
}
}

```

```

}
srcInfo
{
  e164 : "4085272923",
  h323-ID : {"ogw"}
}
srcCallSignalAddress ipAddress :
{
  ip 'AC100D0F'H
  port 11003
}
bandWidth 1280
callReferenceValue 3
nonStandardData
{
  nonStandardIdentifier h221NonStandard :
  {
    t35CountryCode 181
    t35Extension 0
    manufacturerCode 18
  }
  data '80000008800180'H
}
conferenceID '221B686C17CC11CC8010A049E0524766'H
activeMC FALSE
answerCall TRUE
canMapAlias TRUE
callIdentifier
{
  guid '221B686C17CC11CC8011A049E0524766'H
}
tokens

```

!--- The hashed IZCToken information is included.

```

{
  {
    tokenOID { 1 2 840 113548 10 1 0 }
    nonStandard
    {
      nonStandardIdentifier { 1 2 840 113548 10 1 0 }
      data '7F20C06F676B320674676B32C02B9620C7010310...'H
    }
  }
}
willSupplyUUIEs FALSE
}

```

10. TGK1 authenticates the destination IZCT successfully. This is because TGK1 generates the hash in the IZCT and it sends back an ACF to the TGW.

```

Mar 4 15:31:20.635:
Mar 4 15:31:20.635: PDU ::=
value IZCToken ::=

```

!--- The extracted IZCT from the ARQ to be validated.

```

{
  izctInterZoneType interDomainCisco : NULL
  izctSrcZone "ogk2"
  izctDstZone "tgk2"
  izctTimestamp 731259080
  izctRandom 3
  izctHash '5A7D5E18AA658A6A4B4709BA5ABEF2B9'H
}

```

```

Mar 4 15:31:20.639: RAS OUTGOING PDU ::=

```

```

value RasMessage ::= admissionConfirm :

!--- After the IZCT is validated, ACF is sent back to TGW.

{
  requestSeqNum 78
  bandwidth 1280
  callModel direct : NULL
  destCallSignalAddress ipAddress :
  {
    ip 'AC100D17'H
    port 1720
  }
  irrFrequency 240
  willRespondToIRR FALSE
  uuiesRequested
  {
    setup FALSE
    callProceeding FALSE
    connect FALSE
    alerting FALSE
    information FALSE
    releaseComplete FALSE
    facility FALSE
    progress FALSE
    empty FALSE
  }
}

```

11. The TGW establishes the call toward Carrier D after it receives the ACF.

Example 2: Call failed because TGW is not able to extract the IZCT from the received setup message.

This example is based on the same topology and configuration as Example 1. In this example, the software of the TGW is changed to a version where the IZCT is not supported. In such a case, the TGW is not able to extract the IZCT from the setup message. This causes the TGK1 to reject the call with a disconnect reason of security denial.

This example shows only the setup message, ARQ, and the ARJ on the TGW since the call flow is the same as Example 1.

```

Mar 4 19:50:32.346: PDU DATA = 6147C2BC
value H323_UserInformation ::=
{
  h323-uu-pdu
  {
    h323-message-body setup :

!--- H.225 SETUP message is received with a token included.

{
  protocolIdentifier { 0 0 8 2250 0 2 }
  sourceAddress
  {
    h323-ID : {"ogw"}
  }
  sourceInfo
  {
    gateway
    {
      protocol
      {
        voice :

```

```

    {
      supportedPrefixes
      {
        {
          prefix e164 : "1#"
        }
      }
    }
  }
  mc FALSE
  undefinedNode FALSE
}
activeMC FALSE
conferenceID '56CA67C817F011CC8014A049E0524766'H
conferenceGoal create : NULL
callType pointToPoint : NULL
sourceCallSignalAddress ipAddress :
{
  ip 'AC100D0F'H
  port 11004
}
callIdentifier
{
  guid '56CA67C817F011CC8015A049E0524766'H
}
tokens

```

!--- Hashed IZCT is included.

```

{
  {
    tokenOID { 1 2 840 113548 10 1 0 }
    nonStandard
    {
      nonStandardIdentifier { 1 2 840 113548 10 1 0 }
      data '7F20C06F676B320674676B32C02B965D85010410...'H
    }
  }
}
fastStart
{
  '0000000C6013800A04000100AC100D0F45D9'H,
  '400000060401004C6013801114000100AC100D0F...'H
}
mediaWaitForConnect FALSE
canOverlapSend FALSE
}
h245Tunneling TRUE
nonStandardControl
{
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '6001020001041F04038090A31803A983816C0C21...'H
  }
}
}
}

```

RAW_BUFFER::=

60 01020001 041F0403 8090A318 03A98381 6C0C2180 34303835 32373239 32337005

```
80333635 33
Mar 4 19:50:32.362: PDU DATA = 6147F378
value H323_UU_NonStdInfo ::=
{
  version 2
  protoParam qsigNonStdInfo :
  {
    iei 4
    rawMesg '04038090A31803A983816C0C2180343038353237...'H
  }
}
```

```
PDU DATA = 6147F378
value ARQnonStandardInfo ::=
{
  sourceAlias
  {
  }
  sourceExtAlias
  {
  }
  callingOctet3a 128
}
```

```
RAW_BUFFER::=
80 00000880 0180
Mar 4 19:50:32.366: PDU DATA = 6147C2BC
value RasMessage ::= admissionRequest :
```

!--- ARQ is sent out. There is no token in it.

```
{
  requestSeqNum 23
  callType pointToPoint : NULL
  callModel direct : NULL
  endpointIdentifier {"617D829000000001"}
  destinationInfo
  {
    e164 : "3653"
  }
  srcInfo
  {
    e164 : "4085272923"
  }
  srcCallSignalAddress ipAddress :
  {
    ip 'AC100D0F'H
    port 11004
  }
  bandwidth 640
  callReferenceValue 1
  nonStandardData
  {
    nonStandardIdentifier h221NonStandard :
    {
      t35CountryCode 181
      t35Extension 0
      manufacturerCode 18
    }
    data '80000008800180'H
  }
  conferenceID '56CA67C817F011CC8014A049E0524766'H
  activeMC FALSE
  answerCall TRUE
}
```

```
canMapAlias FALSE
callIdentifier
{
  guid '56CA67C817F011CC8015A049E0524766'H
}
willSupplyUUIES FALSE
}

RAW_BUFFER:=
27 98001600 F0003600 31003700 44003800 32003900 30003000 30003000 30003000
30003000 31010180 69860104 8073B85A 5C5600AC 100D0F2A FC400280 000140B5
00001207 80000008 80018056 CA67C817 F011CC80 14A049E0 52476644 E0200100
110056CA 67C817F0 11CC8015 A049E052 47660100
Mar 4 19:50:32.374: h323chan_dgram_send:Sent UDP msg. Bytes sent: 117 to
172.16.13.41:1719
Mar 4 19:50:32.374: RASLib::GW_RASSendARQ: ARQ (seq# 23) sent to 172.16.13.41
Mar 4 19:50:32.378: h323chan_dgram_rcvdata:rcvd from [172.16.13.41:1719]
on sock[1]
RAW_BUFFER:=
2C 00168001 00
Mar 4 19:50:32.378: PDU DATA = 6147C2BC
value RasMessage ::= admissionReject :

!--- ARJ is received with a reason of security denial.

{
  requestSeqNum 23
  rejectReason securityDenial : NULL
}

Mar 4 19:50:32.378: ARJ (seq# 23) rcvd
```

Related Information

- [Inter-Domain Gatekeeper Security Enhancement](#)
 - [Cisco H.235 Accounting and Security Enhancements for Cisco Gateways](#)
 - [Cisco IOS Debug Command Reference, Release 12.3](#)
 - [Voice Technology Support](#)
 - [Voice and Unified Communications Product Support](#)
 - [Recommended Reading: Troubleshooting Cisco IP Telephony](#)
 - [Technical Support & Documentation – Cisco Systems](#)
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