

CISCO VALIDATED PROFILE

# Enterprise Routing Voice, 4G LTE, and GETVPN

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# Profile Introduction

Cisco is transforming the network edge with the Cisco ASR1K/ISR4K Series Aggregation Services Routers, a new line of midrange routers that establish a new price-to-performance class offering, benefiting both enterprises and service providers. These routers provide a great opportunity for simplifying the WAN edge and significantly decreasing network-operating expenses. By efficiently integrating a critical set of WAN edge functions such as WAN aggregation, Internet edge services, VPN termination, etc. into a single platform, this solution can help enterprises meet their business objectives by facilitating deployment of advanced service in a secure, scalable, and reliable manner while minimizing the total cost of ownership.

Cisco WAN aggregation solutions distinguish themselves from other solutions by offering multiservice routers with the highest performance, availability, and density for concurrent data, as well as security, voice, and application-acceleration services with the maximum headroom for growth. The solutions feature embedded security, performance, and memory enhancement. High-performance interfaces featuring the latest WAN technologies can help enterprises meet the needs of the most demanding WAN network.

This document covers enterprise solution profiles built with the below features.

## Security

The Cisco IOS Group Encrypted Transport VPN (GETVPN) is a tunnel-less VPN technology that provides end-to-end security for network traffic. Cisco IOS GETVPN preserves the original source and destination IP address information in the header of the encrypted packet for optimal routing. It is therefore largely suited for enterprise running over private multiprotocol label switching (MPLS).

## Voice

This profile covers basic voice features, media gateway control protocol (MGCP), H323 call flow, Cisco Unified Survivable Remote Site Telephony (SRST), conferencing, and MGCP Foreign eXchange Subscriber (FXS) analog endpoints interoperated with IP phones. Cisco Unifies Communication Manager (CUCM) controls the MGCP endpoint and the IP phones. MGCP enables the remote control and management of voice and data communications devices at the edge of multiservice IP packet networks. MGCP simplifies the configuration and administration of voice gateways and supports multiple (redundant) call agents, eliminating the potential for a single point of failure in controlling the Cisco IOX gateway in the network.

## 4G LTE

The Cisco 4G LTE solution include standalone wireless routers, modular router plus 4G LTE interface modules, and antennas. Cisco combines the speed, reliability, and rapid deployment benefits of 4G LTE wireless networks with the intelligent routing capabilities of Cisco ISRs. That means that the rich Cisco IOS software service set, long available over landlines, now reaches across the wireless WAN. You get the enhanced quality of service (QoS), security, and other Layer 3 networking services you enjoy with your Cisco landline routers in the mobile WAN. That is unique to the Cisco solution.

**Table 1** Profile feature summary

| Deployment areas | Features  |
|------------------|---|
| Security         | <ul style="list-style-type: none"> <li>GETVPN GM</li> <li>GETVPN key server (KS) with mixed group</li> <li>COOP KS</li> <li>Group security association</li> <li>GM registration</li> <li>Public Key Infrastructure (PKI)-based authentication</li> <li>Local ACL on GETVPN group member (GM)</li> </ul>   |
| Key management   | <ul style="list-style-type: none"> <li>PKI client authentication/enrollment directly to root certification authority (CA)</li> <li>PKI client authentication/enrollment via registration authorities (RA)</li> <li>PKI client authentication/enrollment to Microsoft CA</li> <li>PKI client rollover with root enroll retry with auto enroll when CA not reachable</li> </ul> |
| 4G LTE           | <ul style="list-style-type: none"> <li>4G dialer/chat-script</li> <li>NAT over 4G LTE</li> <li>Network mobility (NEMO) mobile routing</li> <li>Proxy mobile IP (PMIP) routing</li> </ul>  |
| Voice            | <ul style="list-style-type: none"> <li>MGCP</li> <li>H323</li> <li>SRST</li> <li>Conferencing</li> </ul>  |
| Troubleshooting  | <ul style="list-style-type: none"> <li>Wireshark</li> </ul>   |

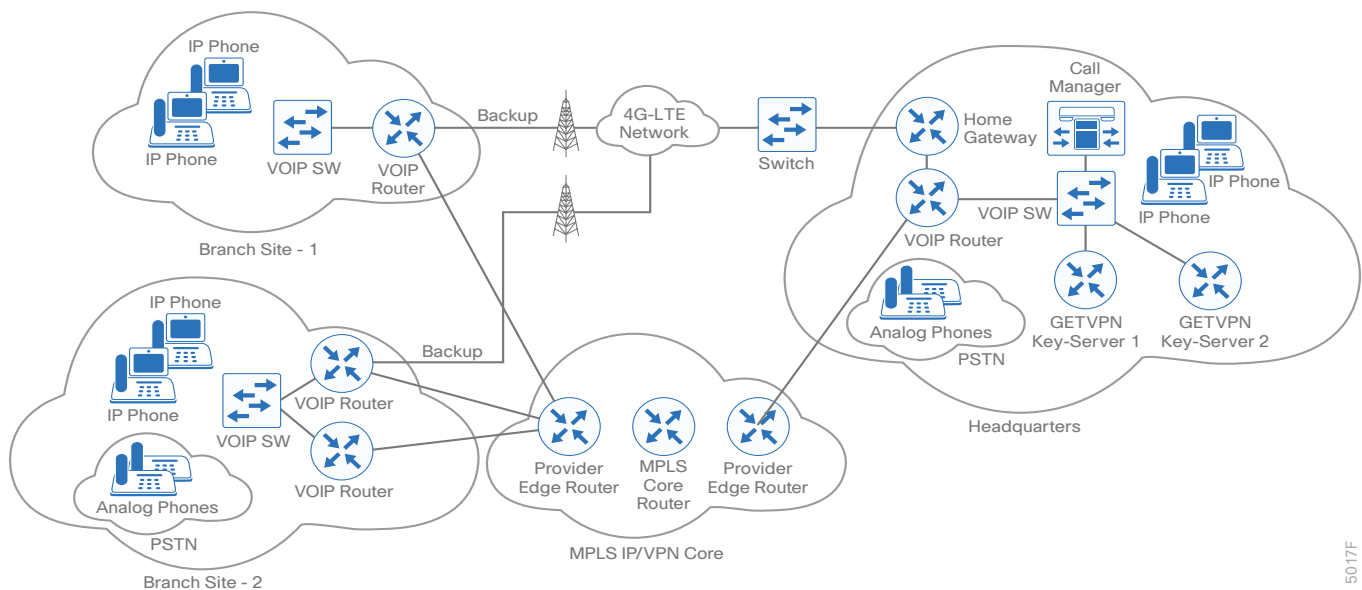
# Network Profile

Based on the research, customer feedback, and configuration samples, the profile is designed with a deployment topology that is generic and can easily be modified to fit any specific deployment scenario. This profile caters to Enterprise network deployments.

## TOPOLOGY DIAGRAM

Figure 1 show the topology that is used for the validation of the profile. The left portion of the topology represents the deployment where ISR4K is used as branch routers and voice gateways. The right portion of the topology represents a data center deployment with ASR1K along with CUCM, GETVPN, key servers, and root CA server.

*Figure 1 Topology overview*



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## HARDWARE & FEATURE SPECIFICATIONS

This section describes the 3-D feature matrix where the hardware platforms are listed along with their place-in-network (PIN) and the relevant Vertical deployment.

### Key Vertical Features

Table 2 defines the 3-D hardware, PIN, and the features deployed.

**Table 2** 3-D feature summary with hardware and PIN

| Deployment layer (PIN) | Platforms   | Critical vertical features  |
|------------------------|---|---|
| Key server             | Primary co-operative (COOP) KS- ISR3945e/ISR4451<br>Secondary COOP KS- ISR3945e/ISR4331 | Group Domain of Interpretation (GDOI) group<br>Traffic encryption key (TEK)/key encryption key (KEK) lifetime<br>COOP KS<br>GM registration<br>PKI-based authentication<br>Local ACL on GETVPN GM |
| Group member           | ISR4431<br>ISR4451<br>ISR4331<br>ISR4351<br>ISR3945<br>ISR2921                          | GDOI<br>PKI-based authentication<br>Local ACL/fail-close ACL<br>GM routing awareness  |
| MPLS-core              | PE1- ASR1002<br>PE2- ASR1002<br>P - ISR3945   | MPLS<br>Border gateway protocol<br>Open shortest path first protocol  |
| Certificate authority  | IOS CA Server - ISR4431<br>Microsoft Root CA Server                                     | PKI   |
| Voice                  | ISR4331<br>ISR4431<br>ISR4351<br>ISR4451<br>ISR2951<br>ISR3945                          | MGCP<br>SRST<br>H323<br>Digital signal processor farm   |

## Hardware Profile

Table 3 defines the set of relevant servers, test equipment, and endpoints that are used to complete the end-to-end deployment.

This list of hardware, along with the relevant software versions and the role of these devices, complements the actual physical topology shown in Figure 1.

**Table 3** *Hardware profile of servers and endpoints*

| HW and VM   | Software Version                      | Description  |
|---|---------------------------------------|--|
| Ixia  | IxNetwork and IxExplorer<br>Version X | Generate traffic streams   |
| Pagent  | Cisco IOS                             | Generate traffic streams   |
| CUCM  | Version 9.1.x                         | CUCM server for mapping IP phones and MGCP FXO/FXS analog phones |
| Windows Server                                    | Window Server 2012                    | Root CA  |
| Cisco Unified IP Phones<br>796x, 884x, 886x, 896x | Cisco Unified IP Phones               | Endpoints  |
| Analog phones                                     | –                                     | Plain old telephone service phones                               |

# Use Case Scenarios

## TEST METHODOLOGY

The use cases listed in Table 4 below are executed using the topology shown in Figure 1, along with the test environment shown in Table 3, previously explained in this document.

Images are loaded on the devices under test via tftp server using the management interface.

To validate a new release, the network topology is upgraded with the new software image with existing configuration composed of the use cases and relevant traffic profile. The addition of new use cases acquired from the field or customer deployment are added on top of the existing configuration.

With respect to longevity for this profile, setup, the CPU, and memory use/leaks are monitored during the validation phase. Furthermore, to test the robustness of the software release and platform under test, negative events are triggered during the use case execution process.

## USE CASES

Table 4 describes the use cases that were executed as a part of this profile testing. These use cases are divided into buckets of technology areas to show the complete coverage of the deployments scenarios.

These technology buckets are composed of system upgrade, security, network service, monitoring & troubleshooting, simplified management, and system health monitoring, along with system and network resiliency.

**Table 4** List of use case scenarios

| No             | Focus area     | Use cases  |
|----------------|----------------|--|
| System upgrade |                |  |
| 1              | Upgrade        | <p>Network administrator should be able to perform router upgrade and downgrade between releases seamlessly.</p> <ul style="list-style-type: none"> <li>All of the applied configurations should be migrated seamlessly during the upgrade/downgrade operation</li> </ul>  |
| Security       |                |  |
| 2              | ACL/policy     | <p>Network admin wants to have routing bases on the crypto status.</p> <ul style="list-style-type: none"> <li>Inspect traffic based on types of traffic or source/destination address</li> <li>Crypto policy is applied correctly, GMs registration is successful, and traffic passes through seamlessly.</li> </ul> |
| 3              | Fail-Close ACL | <p>Network admin wants to drop unencrypted traffic.</p> <ul style="list-style-type: none"> <li>Apply Fail-Close ACL on the WAN interface of the GM. Traffic between the GMs drops until the both GMs register successfully.</li> </ul>   |



Table 4 continued

| Network services |                  |  |
|------------------|------------------|--|
| 4                | 4G LTE           | <p>Network admin ensures that the 4G-LTE connectivity and services on top of LTE are functioning correctly.</p> <ul style="list-style-type: none"> <li>▪ Verify 4G/LTE connections on the DUT</li> <li>▪ Verify the chat script is defined for the data cell and applied to the async line</li> <li>▪ Verify dynamic NAT translation is functioning correctly</li> <li>▪ Verify NEMO functionality</li> <li>▪ Verification of PMIP routing over 4G LTE</li> </ul>  |
| 5                | Voice            | <p>Network admin wants to ensure that the voice call flow, conferencing, Call Manager features and basic VoIP features are functioning correctly.</p> <ul style="list-style-type: none"> <li>▪ Verify mediate gateway control protocol functionality</li> <li>▪ Verify H323 and session initiation protocol (SIP) call flow functionality</li> <li>▪ Voice gateways</li> <li>▪ Conference bridges</li> <li>▪ IP telephones with remote-site survivability</li> <li>▪ Session initiation protocol and skinny client control protocol signaling</li> <li>▪ Verify conferencing</li> <li>▪ Voice call manager</li> <li>▪ Basic call processing (dial plan)</li> <li>▪ CUCM features verification</li> </ul> |
| 6                | PMIP over 4G LTE | <p>Network admin wants to ensure that the PMIP over 4G LTE functionality is working correctly.</p> <ul style="list-style-type: none"> <li>▪ MAG binding is established correctly</li> <li>▪ Tunnel template is used to build PMIP tunnel</li> <li>▪ Mobile networks are being advertised correctly</li> <li>▪ Mobile network advertisement is updated automatically when PMIP configuration changes</li> <li>▪ PMIP statistics show correct registration information</li> </ul>  |

Table 4 continued

|    |                        |   |
|----|------------------------|---|
| 7  | NEMO over 4G LTE       | <p>Network admin to verify that network mobility functionality over 4G LTE is working correctly.</p> <ul style="list-style-type: none"> <li>▪ Mobile IP enabled on the router</li> <li>▪ Mobile networks are being advertised</li> <li>▪ Mobile router is registered</li> <li>▪ Cellular interface has a single tunnel collocated care-of-address for roaming</li> <li>▪ Mobile networks advertised by the mobile router are learned by the headend router</li> </ul> |
| 8  | NAT over 4G LTE        | <p>Network admin to verify NAT functionality over 4G LTE.</p> <ul style="list-style-type: none"> <li>▪ Inside local address should be translated to inside global address when the traffic from the LAN is going out to the Internet/WAN. The return traffic from WAN to LAN should always be directed to the inside global address of the inside hosts</li> </ul>  |
| 9  | QOS over 4G LTE        | <p>Network admin needs to enhance the user experience by ensuring traffic and application delivery using QoS policies over 4G LTE interface.</p> <ul style="list-style-type: none"> <li>▪ Traffic types: VoIP, Data</li> </ul>  |
| 10 | GETVPN GM Registration | <p>Network admin to verify GETVPN GM registration functionality.</p> <ul style="list-style-type: none"> <li>▪ Verify GM registration to KS</li> <li>▪ Verify GM registration to second KS in the list when first is not reachable</li> <li>▪ Verify TEK, KEK, ACL downloads</li> <li>▪ Traffic validation between GMs</li> </ul>  |
| 11 | GETVPN COOP KS         | <p>Network admin to verify KS COOP functionality.</p> <ul style="list-style-type: none"> <li>▪ Verify COOP roles and statuses on primary and secondary</li> <li>▪ Swap the roles of primary and secondary</li> <li>▪ Bring down COOP and bring it back up</li> <li>▪ Verify TEK, KEK, policy generation and policy sync between COOP KSs</li> <li>▪ Verify COOP failure with IKEv2 profile mismatch</li> </ul>  |

Table 4 continued

|   |                    |  |
|---|--------------------|--|
| 12                                      | PKI                | <p>Network admin wants to ensure PKI enrollment/authentication is functioning correctly.</p> <ul style="list-style-type: none"> <li>▪ Client authorization and enrollment directly to root-CA</li> <li>▪ Client authorization and enrollment via RA</li> <li>▪ Client authorization and enrollment directly to sub-CA</li> <li>▪ Client authorization and enrollment directly to Microsoft CA</li> <li>▪ Auto-enrollment to root-CA</li> <li>▪ Auto-enrollment to sub-CA</li> <li>▪ Auto-enrollment via RA</li> <li>▪ Enrollment retry with auto enrollment when CA not reachable</li> <li>▪ Verify GDOI registration failure when certificate is revoked</li> <li>▪ Verify GDOI registration failure when certificate is invalid</li> </ul> |
| Monitoring & troubleshooting            |                    |  |
| 13                                      | Wireshark          | <p>Network admin should be able to troubleshoot the network by capturing and analyzing the traffic.</p> <ul style="list-style-type: none"> <li>▪ Wireshark–data plane &amp; control plane capturing</li> </ul>   |
| 14                                      | Show CLI           | <p>Enable IT admins to determine network resource use and capacity planning by monitoring encrypted traffic flows using show CLIs.</p>   |
| Simplified management                   |                    |  |
| 15                                      | Manageability      | <p>Simplified network troubleshooting and debugging for IT admin.</p> <ul style="list-style-type: none"> <li>▪ Monitor network for alarms, syslog, and traps</li> </ul>  |
| System health monitoring                |                    |  |
| 16                                      | System health      | <p>Monitor system health for CPU use, memory consumption, and memory leaks during testing.</p>   |
| System & network resiliency, robustness |                    |  |
| 17                                      | System resiliency  | <p>Verify system level resiliency during the following events.</p> <ul style="list-style-type: none"> <li>▪ Online insertion and removal (OIR)</li> <li>▪ Power failure</li> <li>▪ WAN/LAN interface flaps</li> <li>▪ SIP/SPA reload/OIR</li> </ul>  |
| 18                                      | Network resiliency | <p>Verify that the system holds well during a network-level resiliency.</p> <ul style="list-style-type: none"> <li>▪ GETVPN KS aggressive rekey</li> </ul>   |

Table 4 continued

|    |                           |   |
|----|---------------------------|---|
| 19 | Negative events, triggers | <p>Verify that the system holds well and recovers to working condition after the following negative events are triggered.</p> <ul style="list-style-type: none"><li>▪ Configuration changes: add/remove configuration snippets, configuration replace</li><li>▪ Clear counters, clear routes</li><li>▪ Routing protocol interface flap</li><li>▪ IPsec, GDOI events such as clear gdoi session, clear sa counters, modify KS ACL on the fly</li></ul> |
|----|---------------------------|---|

# Appendix A: References

CCO Configuration Guides:

## GETVPN Deployment Guides

[http://www.cisco.com/c/dam/en/us/products/collateral/security/group-encrypted-transport-vpn/GETVPN\\_DIG\\_version\\_1\\_0\\_External.pdf](http://www.cisco.com/c/dam/en/us/products/collateral/security/group-encrypted-transport-vpn/GETVPN_DIG_version_1_0_External.pdf)

[http://www.cisco.com/c/en/us/products/collateral/security/group-encrypted-transport-vpn/deployment\\_guide\\_c07\\_554713.html](http://www.cisco.com/c/en/us/products/collateral/security/group-encrypted-transport-vpn/deployment_guide_c07_554713.html)

## Cisco 4G LTE Software Configuration and Deployment

[http://www.cisco.com/c/en/us/td/docs/routers/access/interfaces/software/feature/guide/ehwic-4g-ltesw-book.html#con\\_1427426](http://www.cisco.com/c/en/us/td/docs/routers/access/interfaces/software/feature/guide/ehwic-4g-ltesw-book.html#con_1427426)

<http://www.cisco.com/c/dam/en/us/td/docs/routers/access/interfaces/software/deployment/guide/c07-731484-00-ngewan.pdf>

## Cisco Voice Configuration Library

[http://www.cisco.com/en/US/docs/ios/12\\_3/vvf\\_c/cisco\\_ios\\_voice\\_configuration\\_library\\_glossary/vcl.htm](http://www.cisco.com/en/US/docs/ios/12_3/vvf_c/cisco_ios_voice_configuration_library_glossary/vcl.htm)

## MGCP Configuration

[http://www.cisco.com/c/en/us/td/docs/ios/voice/cminterop/configuration/guide/12\\_4t/vc\\_12\\_4t\\_book/vc\\_ucm\\_mgcp\\_gw.pdf](http://www.cisco.com/c/en/us/td/docs/ios/voice/cminterop/configuration/guide/12_4t/vc_12_4t_book/vc_ucm_mgcp_gw.pdf)

# Appendix B: Configuration Snippets

This appendix contains sample configuration snippets to give you a general idea about the configuration used in some of the use cases. Your actual configuration would require further customization for actual deployments. For detailed configuration options/best practices, refer to the CCO documentation.

## CERTIFICATE AUTHORITY

```
crypto pki server CISCO-IOS-CA
  database level complete
  no database archive
  issuer-name CN=CISCO-IOS-CA.cisco.local L=SanJose St=CA C=US
  grant auto
  lifetime certificate 730
  lifetime ca-certificate 1095
  enrollment url http://10.224.8.2:80
  database url crl nvram:
crypto pki server CISCO-IOS-CA
  no shutdown
```

## 4G LTE

```
chat-script lte "" "AT!CALL1" TIMEOUT 20 "OK"
!The chat script used to make a call!
!
interface GigabitEthernet0/1/0
switchport access vlan 18
!switch port part of LAN to connect local user
!
interface GigabitEthernet0/1/1
no ip address
!
interface GigabitEthernet0/1/2
no ip address
!
interface Cellular0/0/0
ip address negotiated
no ip unreachable
```

```
ip nat outside
! NAT enabled
load-interval 30
dialer in-band
dialer idle-timeout 0
dialer watch-group 2
dialer-group 2 !>>dialer group number must match the dialer list number
!
interface Vlan18
ip address 192.168.18.1 255.255.255.0
ip nat inside
!Vlan 18 is used as LAN interface and traffic from entering via this ! !inter-
face is NAT'ed
!
ip nat inside source list 2 interface Cellular0/0/0 overload
!NAT statement to match the NAT traffic as per access-list 2
ip route 0.0.0.0 0.0.0.0 Cellular0/0/0
!Default route pointing to the cellular interface
!
dialer watch-list 2 ip 5.6.7.8 0.0.0.0
dialer watch-list 2 delay route-check initial 60
dialer watch-list 2 delay connect 1
!
access-list 1 permit any
! define what traffic can trigger the dialer
access-list 2 permit 192.168.18.0 0.0.0.255
dialer-list 1 protocol ip list 1
!associate acl 1 to dialer-list 1
!
line 0/0/0
!line associated with cellular 0/0/0
script dialer lte
! "lte" matches to dialer string and the chat-script name
modem InOut
!
```

## MOBILE IP

```

!
hostname mobile-router
!
router mobile
!this commands turns on the mobile ip functionality on the router

ip route 192.171.187.187 255.255.255.255 Cellular0/1/0
ip route 223.255.0.0 255.255.0.0 1.3.0.1
!
ip mobile secure home-agent 66.174.185.193 spi decimal 256 key ascii NeMo algo-
rithm hmac-md5
!
!This statement defines the encryption details and authentication using !ascii
value. The ascii value must match to that of the HA configuration on !the HQ
side router

ip mobile router
  address 1.2.3.4 255.255.255.0
  collocated single-tunnel
  home-agent 66.174.185.193
  mobile-network Loopback1
  mobile-network Loopback2
  template Tunnel434
  register retransmit initial 2000 maximum 2000 retry 2
  register extend expire 40 retry 10 interval 4
  register lifetime 180
  reverse-tunnel
  tunnel mode gre
!

```

## PROXY MOBILE IP

```

! PMIP Domain and MAG Configuration
!
ipv6 mobile pmipv6-domain 4Gsystest
  replay-protection timestamp window 255
  encaps udptunnel
  lma pmip-lma

```



```
    ipv4-address 192.171.187.188
mobile-map MobileMAP 10
    match access-list HomeACL
    set link-type CELL-C4451 NULL
mobile-map MobileMAP 30
    match access-list LocalACL
    set link-type CELL-C4451 NULL
nai 4Gnai-C4451
    lma pmip-lma

ipv6 mobile pmipv6-mag mag3 domain 4Gsystest
tunnel-template Tunnel435
heartbeat interval 60 retries 2 timeout 60
heartbeat interval 300 retries 1 label CELL-C4451 timeout 300
address dynamic
    roaming interface Cellular0/2/0 priority 1 egress-att LTE label CELL-C4451
replay-protection timestamp window 255
interface Loopback0
lma pmip-lma 4Gsystest
    ipv4-address 192.171.187.188
logical-mn 4Gnai-C4451
    mobile network Loopback10 label LOOP10
    reverse-tunnel route ipv4 0.0.0.0 0 210
    reverse-tunnel route ipv4 10.224.200.14 32
! home interface Loopback0

! Tunnel template for PMIP
!
interface Tunnel435
description TEMPLATE FOR 4G CONFIGURATION
no ip address
ip mtu 1300
ip flow monitor FLOW-MONITOR-1 input
ip nat outside
ip virtual-reassembly in
ip tcp adjust-mss 1200
```

```

ip policy route-map clear-df
tunnel path-mtu-discovery
crypto map GETVPN-MAP-1
end

! LMA Configuration

ipv6 mobile pmipv6-domain 4Gsystest
replay-protection timestamp window 255
encap udptunnel
nai 4Gnai-C4451
network 4Gnet-C4451
ipv6 mobile pmipv6-lma pmip-lma domain 4Gsystest
address ipv4 192.171.187.188
heartbeat interval 300 retries 1 label CELL-C4451
heartbeat interval 60 retries 2
bce maximum 128000
replay-protection timestamp window ignore
dynamic mag learning
network 4Gnet-C4451
pool ipv4 v4pool-C4451 pfxlen 24
mobile-network pool 20.20.0.0 pool-prefix 16 network-prefix 32
mobile-network pool 221.221.0.0 pool-prefix 16 network-prefix 32
!
```

## VOICE

```

!
controller T1 0/0/0
cablelength long 0db
pri-group timeslots 1-24 service mgcp
!
interface Serial0/0/0:23
no ip address
encapsulation hdlc
isdn switch-type primary-ni
isdn incoming-voice voice
```

```
isdn bind-13 ccm-manager
no cdp enable
!
voice-port 0/0/0:23
!
!
!
!
!
mgcp
mgcp call-agent 10.224.10.2 service-type mgcp version 0.1
mgcp dtmf-relay voip codec all mode cisco
mgcp rtp unreachable timeout 1000 action notify
mgcp modem passthrough voip mode nse
mgcp package-capability rtp-package
mgcp package-capability sst-package
mgcp package-capability pre-package
no mgcp package-capability res-package
no mgcp timer receive-rtcp
mgcp sdp simple
mgcp validate domain-name
mgcp fax t38 inhibit
mgcp behavior rsip-range tgcp-only
mgcp behavior comedia-role none
mgcp behavior comedia-check-media-src disable
mgcp behavior comedia-sdp-force disable
!
mgcp profile default
!
!
ccm-manager music-on-hold
!
ccm-manager mgcp
no ccm-manager fax protocol cisco
ccm-manager config server 10.224.10.2
ccm-manager config
```

```
!  
dial-peer voice 1 pots  
  destination-pattern 2001  
!  
dial-peer voice 2 pots  
  destination-pattern 2002  
!  
dial-peer voice 3 pots  
  destination-pattern 2003  
!  
dial-peer voice 4 pots  
  destination-pattern 2004  
!  
dial-peer voice 5 pots  
  destination-pattern 1...  
  direct-inward-dial  
  forward-digits all  
!  
dial-peer voice 2000 voip  
  destination-pattern 1T  
  session target ipv4:10.224.6.1  
!  
!  
!  
call-manager-fallback  
  max-conferences 8 gain -6  
  transfer-system full-consult  
  limit-dn 7960 3  
  limit-dn 7962 3  
  limit-dn 8945 3  
  ip source-address 10.224.2.1 port 2000  
  max-ephones 50  
  max-dn 50  
  dialplan-pattern 1 .... extension-length 4  
  keepalive 20  
  default-destination 1001  
  time-format 24  
!
```

## GETVPN

### GETVPN Policy Configuration

```
crypto isakmp policy 11
  encr aes
  group 2
!
crypto gdoi group GETVPNGROUP
  identity number 11111
  server address ipv4 10.224.21.2
  server address ipv4 10.224.22.2
!
!
crypto map GDOIMAP local-address Loopback0
crypto map GDOIMAP gdoi fail-close
crypto map GDOIMAP 11 gdoi
  set group GETVPNGROUP
!
! Apply on Tunnel bound to 4G LTE Cellular Interface
!
interface Tunnel434
  no ip address
  crypto map GDOIMAP
!
```

### GETVPN key Server - Primary

```
!
crypto isakmp policy 11
  encr aes
  group 2
!
!
crypto ipsec transform-set AES128-SHA esp-aes esp-sha-hmac
  mode tunnel
!
crypto ipsec profile IPSEC_PROFILE
```

```
set security-association lifetime seconds 7200
set transform-set AES128-SHA
!
!
crypto gdoi group GETVPNGROUP
identity number 11111
server local
rekey authentication mypubkey rsa Cisco123
rekey transport unicast
sa ipsec 11
profile IPSEC_PROFILE
match address ipv4 getvpn-acl
replay counter window-size 64
no tag
address ipv4 10.224.21.2
redundancy
local priority 100
peer address ipv4 10.224.22.2
!
!
ip access-list extended getvpn-acl
deny  udp any eq 848 any
deny  udp any any eq 848
deny  tcp any eq bgp any
deny  tcp any any eq bgp
deny  eigrp any any
deny  ospf any any
deny  udp any eq rip any eq rip
deny  tcp any eq bgp any eq bgp
deny  tcp any eq 22 any eq 22
deny  tcp any eq 22 any
deny  udp any eq snmp any eq snmp
deny  udp any eq snmptrap any eq snmptrap
deny  esp any any
deny  udp any eq isakmp any eq isakmp
permit ip any any
!
```

## GETVPN Key Server - Secondary

```
crypto isakmp policy 11
  encr aes
  group 2
crypto isakmp key COOPKEY address 10.224.21.2
crypto isakmp keepalive 10 periodic
!
!
crypto ipsec transform-set AES128-SHA esp-aes esp-sha-hmac
  mode tunnel
!
crypto ipsec profile IPSEC_PROFILE
  set security-association lifetime seconds 7200
  set transform-set AES128-SHA
!
!
crypto gdoi group GETVPNGROUP
  identity number 11111
  server local
  rekey authentication mypubkey rsa Cisco123
  rekey transport unicast
  sa ipsec 11
  profile IPSEC_PROFILE
  match address ipv4 getvpn-acl
  replay counter window-size 64
  no tag
  address ipv4 10.224.22.2
  redundancy
  local priority 10
  peer address ipv4 10.224.21.2
!
!
ip access-list extended getvpn-acl
  deny  udp any eq 848 any
  deny  udp any any eq 848
  deny  tcp any eq bgp any
```

```
deny tcp any any eq bgp
deny eigrp any any
deny ospf any any
deny udp any eq rip any eq rip
deny tcp any eq bgp any eq bgp
deny tcp any eq 22 any eq 22
deny tcp any eq 22 any
deny udp any eq snmp any eq snmp
deny udp any eq snmptrap any eq snmptrap
deny esp any any
deny udp any eq isakmp any eq isakmp
permit ip any any
!
```





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