



INDEX

A

- access control list (ACL) [4-33, 4-49](#)
- aggressive VAD [4-8](#)
- arbitration algorithm [2-15](#)
- ARP commands [8-6](#)
- Assured Forwarding [4-44](#)
- assured forwarding 31 (AF31) [4-32](#)
- Asynchronous Transfer Mode (ATM) [7-3](#)
- Asynchronous Transfer Mode Peak Cell Rate (ATM PCR) [4-4](#)
- ATM and Frame Relay Service Inter-Working (SIW) [7-3](#)
- audio quality [4-2](#)

B

- bandwidth
 - codec affect on [4-5](#)
 - consumption [4-5, 4-6](#)
 - for unicast connection trunk [7-21](#)
 - issues [4-4](#)
 - leased lines [4-42](#)
 - modifying consumption [4-7](#)
 - multicast over GRE [7-12](#)
 - over-provisioning [4-34](#)
 - planning [4-4](#)
 - PMC consumption of [4-6](#)
 - point-to-point lines [4-42](#)
 - provisioning [4-2](#)
 - usage [4-5, 4-6](#)
 - voice payload [4-7](#)
- bidirectional PIM [4-2, 4-3, 4-39](#)

bridging channels

See also mixing

- broadcast queue [4-36](#)
- buffering [4-35](#)
- burst [4-4, 4-34](#)

C

- cabling, for VIC2-2E/M interface card [3-2](#)
- call flow [2-26](#)
- call leg [5-1, 5-4](#)
- Carrier Operated Relay [3-10](#)
- Carrier Operated Relay (COR) [4-8](#)
- carrier operated relay (COR) [3-8](#)
- Carrier Operated Squelch [3-10](#)
- Carrier Operated Squelch (COS) [3-8, 4-8](#)
- central site server solution [8-1, 8-2](#)
- Cisco Hoot ‘n’ Holler
 - channel mixing [2-15](#)
 - use with LMR [3-1](#)
- Cisco IOS
 - arbitration algorithm [2-15](#)
 - configuration for LMR gateway [3-7](#)
 - queuing techniques [4-33](#)
- Cisco IPICS
 - benefits [1-1](#)
 - codec [4-4](#)
 - components
 - Cisco IPICS server [1-3](#)
 - Cisco Unified IP Phone gateway [1-4](#)
 - LMR gateway [1-4](#)
 - networking components [1-4](#)
 - overview [1-2](#)

- PMC [1-4](#)
 - RMS [1-4, 2-1](#)
- deployment models [7-1](#)
- markets [1-1](#)
- multiple site model [7-2](#)
- overview [1-1](#)
- RMS configuration for mixing [2-16](#)
- single site model [7-1](#)
- voice streams supported [2-10](#)
- WAN deployment issues [4-2](#)

Cisco IPICS capacity [6-2](#)

Cisco IPICS server [1-3](#)

Cisco IP Interoperability and Collaboration System

- See* Cisco IPICS

Cisco Multicast Manager (CMM) [4-50](#)

Cisco Security Agent (CSA) [4-49](#)

Cisco Unified Communications Manager [2-41](#)

Cisco Unified Communications Manager Express [2-41, 2-42](#)

Cisco Unified IP Phone

- Cisco Communications Manager Express configuration for [2-41](#)
- Cisco Unified Communications Manager configuration for [2-41](#)
- configuring for Cisco IPICS [2-41](#)
- overview [1-4](#)
- services [2-41](#)

Class-Based Weighted Fair Queuing (CBWFQ) [4-33](#)

codec

- bandwidth use [4-5](#)
- choosing [4-4](#)
- considerations [4-4](#)
- delay [4-4](#)
- G.711 [4-4](#)
- G.729a [4-4](#)
- types in Cisco IPICS [4-4](#)
- voice quality [4-5](#)

Committed Information Rate (CIR) [4-4, 4-34, 4-35](#)

compressed RTP (cRTP) [4-6](#)

connection trunk [7-13](#)

cRTP [4-7](#)

Customer Edge Router (CE) [7-4](#)

D

Data MDT [7-5, 7-9](#)

Data Multicast Distribution Tree (MDT) [7-4](#)

Default-MDT [7-4, 7-5](#)

delay [4-2, 4-32, 4-35](#)

dense mode (SM) [4-2](#)

deployment scenario

- central site server solution [8-1, 8-2](#)
- remote locations solution [8-1, 8-3](#)
- remote PMC solution [8-1](#)

destination pattern [5-3](#)

dial peer

- associated with RMS [2-13](#)
- call leg [5-1, 5-4](#)
- configuration example [2-25](#)
- destination pattern [5-3](#)
- inbound [5-2](#)
- inbound call leg [5-4](#)
- matching inbound call leg [5-4](#)
- matching outbound call leg [5-4](#)
- outbound [5-2](#)
- outbound call leg [5-4](#)
- overview [5-1](#)
- POTS [5-2](#)
- session target [5-3](#)
- VoATM (Voice over ATM) [5-2](#)
- VoFR (Voice over Frame Relay) [5-2](#)
- voice-network [5-2](#)
- Voice over IP (VoIP) [5-2](#)

dial pool [6-4](#)

dial port, usage [6-4](#)

digital signal processor (DSP) [4-8](#)

discard eligible (DE) [4-35, 4-44](#)

DS0

- allocation [2-2](#)

- channel optimization [2-9](#)
- conserving resources [6-2](#)
- loopback channels [2-2](#)
- remote location requirements [2-9](#)
- resource allocation [2-9, 2-24](#)
- resource consumption [2-7, 2-22](#)
- resources [2-21](#)
- resources not required [2-21](#)
- sizing considerations [6-2](#)
- usage [6-2](#)
- use in mixing channels [2-12](#)

DSCP per-hop behaviors (Fibs) [4-43](#)

DSP

- channel optimization [2-9](#)
- signal detection [4-8](#)

dspfarm [2-9](#)

duplicate packets [2-21](#)

E

E1 interface [2-12](#)

ear and mouth (E&M)

- analog signaling types [3-4](#)
- interface [3-1](#)
- interface card [3-4](#)
- port [4-37](#)
- Type III interface [3-5](#)
- Type II interface [3-4](#)
- Type V interface [3-6](#)

egress policing [4-44](#)

egress shaping [4-43](#)

endpoints

- communication between [2-7, 2-11](#)
- duplicate packets [2-21](#)

expedited forwarding (EF) [4-32](#)

F

feedback tones, for trunked radios [3-51](#)

firewall [4-49](#)

following [2-3](#)

Frame Relay

- broadcast queue [4-36](#)
- Committed Information Rate (CIR) in [4-35](#)
- connection with E&M port [4-37](#)
- in WAN [7-3](#)
- IP RTP Priority [4-33](#)
- LLQ [4-33](#)
- QoS [4-34](#)

Frame Relay Traffic Shaping (FRTS) [4-35](#)

FRF.12 fragmentation and reassembly technique [4-42](#)

G

G.711 [4-4, 7-2](#)

G.729a [4-4](#)

GRE tunnel [7-11](#)

H

high latency low bandwidth connection [8-1](#)

High-Level Data Link Control (HDLC) [4-42](#)

hootie

- See Cisco Hoot 'n' Holler*

I

Internet Explorer, adjusting browser settings [8-7](#)

Internet Group Management Protocol (IGMP) [2-17](#)

interoperability and collaboration [1-2](#)

IP precedence [4-32](#)

IP RTP Priority [4-32, 4-33](#)

IPSSec VPN [7-13](#)

J

jitter [4-2](#), [4-32](#), [4-35](#)

L

land mobile radio

See LMR

LEAF [7-4](#)

leased line [7-3](#)

licences

for Cisco IPICS [6-1](#)

usage [6-1](#)

Link Fragmentation and Interleaving (LFI) [4-42](#)

LMR

audio connection to Cisco IPICS [3-2](#)

channel [2-16](#)

communication with endpoints [2-16](#)

endpoints in [2-9](#)

gateway

Cisco IOS configuration for [3-7](#)

overview [3-1](#)

radio interface [3-2](#)

integration with Cisco IPICS [3-1](#)

interface with Cisco IPICS [3-2](#)

recording multicast traffic [3-56](#)

use with Cisco Hoot 'n' Holler [3-1](#)

loopback [2-1](#), [2-2](#), [2-11](#), [2-12](#)

loopback interface [4-39](#)

Low-Latency Queuing (LLQ) [4-32](#), [4-33](#), [4-35](#)

M

M1:U12:M2

connection trunk [7-16](#), [8-3](#)

description [7-13](#)

unicast connection trunk [4-6](#), [7-18](#)

with multicast singularities [7-22](#)

markets, for Cisco IPICS [1-1](#)

mixing

arbitration algorithm [2-15](#)

audio [2-17](#)

channels in VTG [2-11](#)

channels using Cisco Hoot 'n' Holler [2-15](#)

DSP function [4-8](#)

example [2-15](#)

unicast streams [2-24](#)

voice streams [2-17](#), [4-8](#)

MPLS

in multiple site model [7-2](#)

VPN [7-3](#)

with multicast VPN [7-3](#)

multicast [2-24](#), [4-6](#), [7-2](#)

address for VTG communication [2-11](#)

address pool [2-2](#), [2-9](#)

bandwidth [7-12](#)

bidirectional PIM [4-39](#)

call flow to unicast [2-28](#)

endpoints, communication between [2-7](#)

GRE tunnel [7-24](#)

island

overview [7-10](#)

topology [7-10](#)

M1:U12:M2 connection trunk [7-24](#)

output stream [2-15](#)

over GRE [7-11](#)

singularity

GRE tunnel [7-22](#)

M1:U12:M2 connection trunk [7-22](#)

overview [7-21](#)

multicast address, guidelines for using [4-48](#)

multicast domain [7-2](#), [7-4](#), [7-5](#)

Multicast Virtual Route Forwarding (MVRF) [7-4](#)

multicast VPN (MVPN) [7-4](#)

provider network configuration for [7-5](#)

provider network verification [7-7](#)

routing [7-5](#)

Multilink Point-to-Point Protocol (MLPPP) [4-42](#)

multiple site model

- connectivity options [7-3](#)
- overview [7-2](#)
- topology [7-3](#)

Multiprotocol Label Switching

See MPLS

N

network

- management [4-50](#)
- security in [4-48](#)

networking components, overview [1-4](#)

O
over-detection [4-8](#)over-provisioning [4-34](#)

P

packet

- buffering [4-35](#)
- delay [4-32](#)
- discard-eligible (DE) [4-35](#)
- drop [4-35](#)
- errors [4-2](#)
- loss [4-2, 4-32, 4-35](#)

packet rate [4-36](#)Permanent Virtual Circuit (PVC) [4-3](#)PIM-SSM [7-4](#)ping-pong effect [3-51](#)Plain Old Telephone Service (POTS), for unicast connection [2-26](#)

PMC

- bandwidth consumption [4-6](#)
- overview [1-4](#)
- remote location [2-24, 4-2, 4-45](#)
- remote user [2-24](#)

PMC upload log frequency, disabling [8-7](#)point-to-point connection [4-42](#)Point-to-Point Protocol (PPP) [4-42](#)policing [4-44](#)policy engine SIP provider [2-38](#)

Protocol Independent Multicast (PIM)

- bidirectional [4-2, 4-3](#)
- dense mode (DM) [4-2](#)
- overview [4-2](#)
- sparse mode (SM) [4-2](#)

Provider Edge Router (PE) [7-4, 7-5](#)Provider Router (P) [7-4](#)proxy channel [7-15](#)

Push-to-Talk Management Center

See PMC

Q

QoS

- at WAN edge [4-43](#)
- factors affecting [4-32](#)
- in enterprise [4-44](#)
- in Frame Relay network [4-34](#)
- in LAN [4-43](#)
- in multiple site model [7-3](#)
- overview [4-32](#)
- policing [4-44](#)
- queuing [4-44](#)
- recommendations for networks [4-32](#)
- trust boundary [4-44](#)
- WAN, use in [4-2](#)
- with point-to-point connections [4-42](#)

Quality of Service

See QoS

queuing

- overview [4-44](#)
- techniques [4-32, 4-35](#)

queuing techniques [4-33](#)

RRADIUS [4-49](#)Real-time Transport Protocol (RTP) [4-6](#)

recording

 multicast LMR traffic [3-56](#) Tap Cisco IOS configuration [3-56](#)redundant RMS configuration [4-9](#)remote location [2-2, 2-9, 2-24, 4-2, 4-45](#)remote locations solution [8-1, 8-3](#)remote PMC solution [8-1](#)remote PMC user [2-24](#)rendezvous point (RP) [4-2, 4-39](#)Reverse Path Forwarding (RPF) [4-3](#)

RMS

 active [4-9](#) bridging [2-15](#) configuration example [2-3](#) configuration for central site deployment
 scenario [8-5](#) configuration for remote locations deployment
 scenario [8-5](#) dial peers associated with [2-13](#) DS0 [2-2, 2-7, 2-9](#) DS0 resources [2-21, 2-22](#) failover [4-9](#) fall back [4-9](#) function [2-1](#) function in Cisco IPICS [2-7](#) installation options [2-2](#) in WAN that is not multicast enabled [4-6](#) mixing [2-15, 2-16, 2-17](#) overview [1-4](#) redundancy [4-9](#) resource allocation [2-9](#) resource consumption [2-7, 2-9](#) standby [4-9](#) voice port configuration [2-15](#) voice ports associated with [2-13](#)RMS comparator [8-6](#)

router media service

See RMSRTP, header compression [4-7](#)**S**satellite link [8-1](#)Secure Socket Layer (SSL) [4-49](#)

security

 access control list (ACL) [4-49](#) Cisco Security Agent (CSA) [4-49](#) firewall [4-49](#) for Cisco IPICS [4-48](#) RADIUS [4-49](#) recommendations [4-49](#) Secure Socket Layer (SSL) [4-49](#) spanning tree (STP) attack mitigation [4-50](#) TACACS+ [4-49](#)serialization [4-32](#)service access point (SAP) broadcast [4-36](#)session target [5-3](#)

shared tree

 bidirectional [4-2](#) forwarding traffic [4-3](#) in PIM SIM [4-2](#) unidirectional [4-2](#)

single site model

 benefits [7-2](#) best practices [7-2](#) design characteristics [7-1](#) overview [7-1](#) topology [7-2](#)

SIP

 connection to RMS using [2-24](#) in remote location [4-2](#) signaling flow [2-27](#) unicast call, set up [2-26](#)

SIP provider

- configuring for Cisco IPICS [2-38](#)
- description [2-38](#)
- for policy engine [1-4](#)

spanning tree (STP) attack mitigation [4-50](#)

sparse mode (SM) [4-2](#)

Sustained Cell Rate [4-4](#)

T

T1 interface [2-12](#)

TACACS+ [4-49](#)

Time to Live (TTL) [2-29](#)

tone control

- 2-wire configuration for single frequency [3-39](#)
- 4-wire configuration for single frequency [3-40](#)
- channel configurations in Cisco IPICS [3-51](#)
- configuration for two-ten frequencies [3-42](#)
- considerations [3-12](#)
- frequencies [3-16](#)
- manual tone configuration [3-14](#)
- native functionality [3-12](#)
- overview [3-1](#)
- phases [3-15](#)
- signaling [3-8, 3-15](#)

topology

- MPLS with multicast VPN [7-4](#)
- multicast island [7-10](#)
- multiple site model [7-3](#)
- single site model [7-2](#)

trunked radio

- feedback tones [3-51](#)
- hybrid configuration [3-52](#)

trust boundary [4-44](#)

U

UDP port [4-33](#)

under-detection [4-8](#)

unicast

- call flow to multicast [2-28](#)
- connection set up [2-27](#)
- connection trunk [7-18](#)
- in WAN that is not multicast enabled [4-6](#)
- POTS use for connection [2-26](#)
- stream mixing [2-24](#)

V

VIC2-2E/M interface card

- cabling [3-2](#)
- overview [3-2](#)

virtual interface (VIF) [2-15](#)

Virtual Private Network (VPN) [7-3](#)

virtual talk group

- See* VTG

voice activation detection (VAD)

- aggressive [4-8](#)
- conventional [4-8](#)
- enabling [4-8](#)
- overview [4-8](#)
- use with LMR [3-8](#)

Voice and Video Enabled IP Security Protocol (IPSec) [7-3](#)

voice packet [4-7](#)

voice payload [4-7](#)

voice port

- associating IP address with [2-15](#)
- configuration example [2-25](#)

voice quality [4-5, 4-8, 4-32, 4-36](#)

voice stream mixing

- See* mixing

voice streams, supported in Cisco IPICS [2-10](#)

VoIP bearer traffic [4-45](#)

VoIP traffic, transmission rate [4-5](#)

VPN [7-4](#)

VTG

- about [2-11](#)
- communication between channels [2-11](#)
- creation [2-11](#)
- LMR endpoints in [2-9](#)
- members [2-11](#)
- mixing channels in [2-15](#)
- mixing of channels [2-11](#)
- multicast address [2-11](#)
- multicast address requirements [2-9](#)
- participants speaking simultaneously [2-15](#)
- restricting access [2-23](#)
- RMS resource consumption [2-9](#)

W

- Weighted-Fair Queuing (WFQ) [4-33](#)