ENUM in Cisco Products

Jaroslav Martan

jmartan@cisco.com

featured by Tomáš Ošťádal

tostadal@cisco.com

Current Cisco ENUM support

Cisco CallManager
Unified Communication Manager

Cisco Voice Gateways, SRST,
Cisco CallManager Express

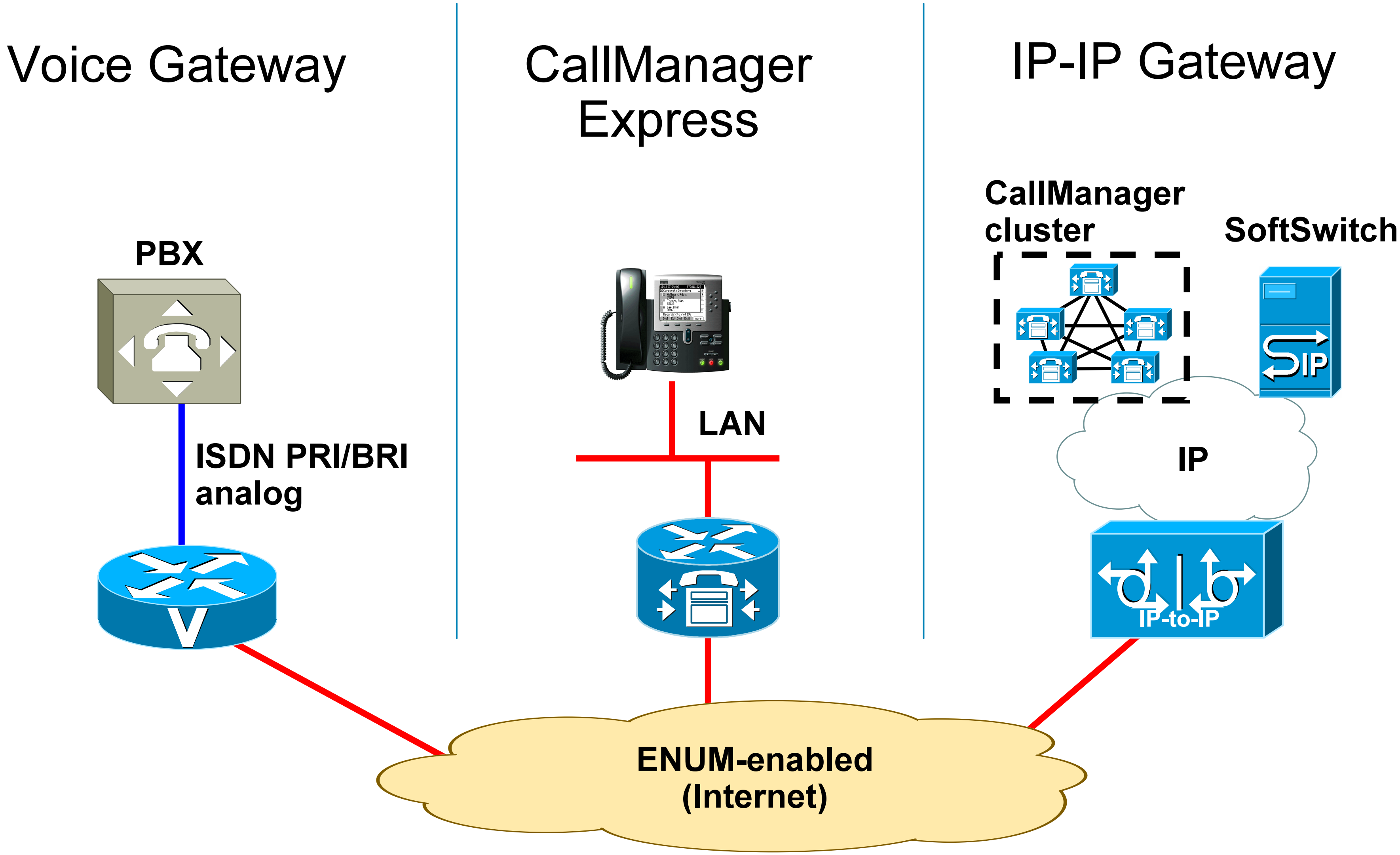
Cisco ASA/PIX Firewall

IP phones

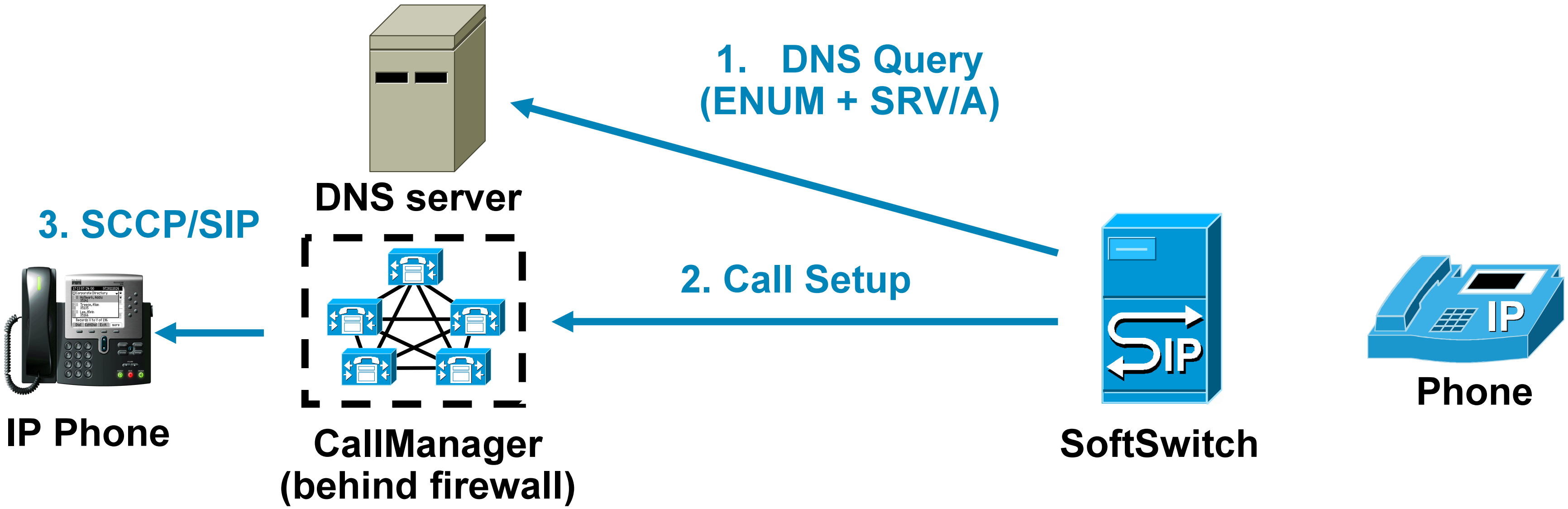
Cisco Softswitch
BTS-10200 & PGW2200

Cisco SIP Proxy Server

Cisco IOS ENUM support

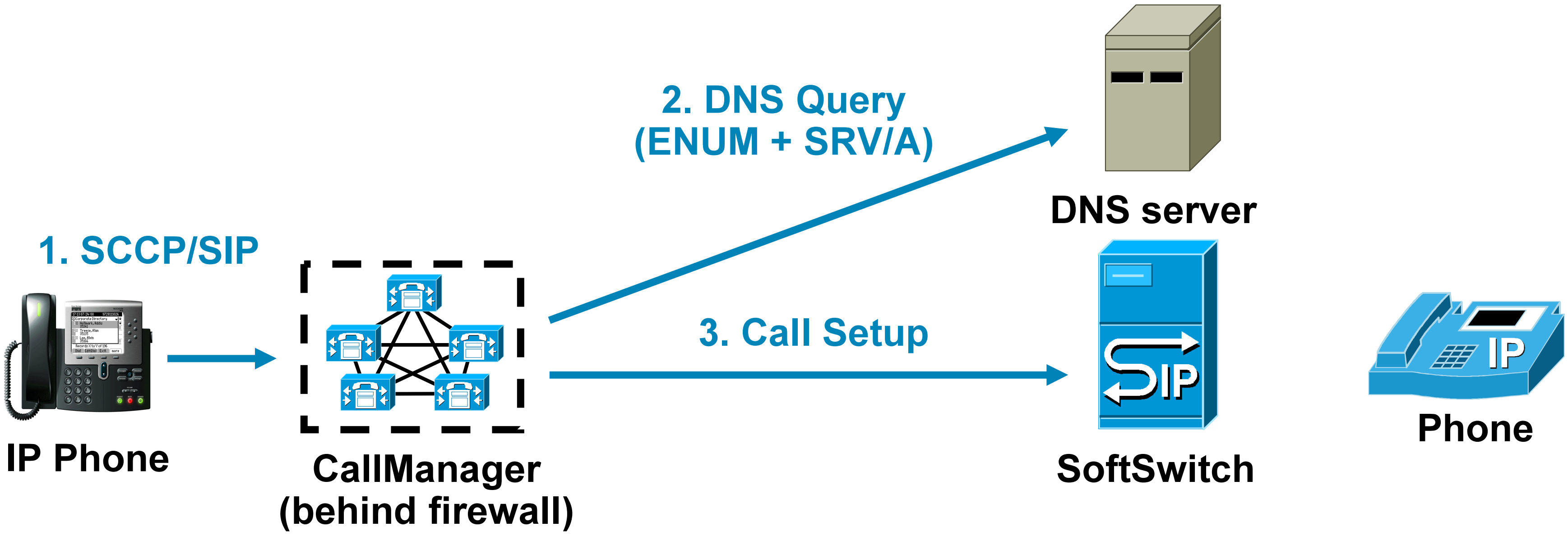


ENUM Challenges – Incoming Call



- Caller has to respect my (DNS-propagated) signaling protocol choice
- Interoperability:
  - DTMF Relay (in-band/out-of band)
  - Media Setup (early/delayed)
  - Codec Negotiation (iLBC, G.711, G.729,...)

ENUM Challenges – Outgoing Call



- I have to respect signaling protocol choice (H.323, SIP), and I don't know in advance what it will be
- Interoperability:
  - DTMF Relay (in-band/out-of band)
  - Media Setup (SIP early/delayed, H.323 slow-start/fast-start)
  - Codec Negotiation (iLBC, G.711, G.729,...)

ENUM Challenges – Security

- Do I want to...

  open my IP PBX to any anonymous incoming call?

  TOLL FRAUD / MALICIOUS CALL

  open my IP PBX to unlimited number of incoming calls?

  DENIAL OF SERVICE

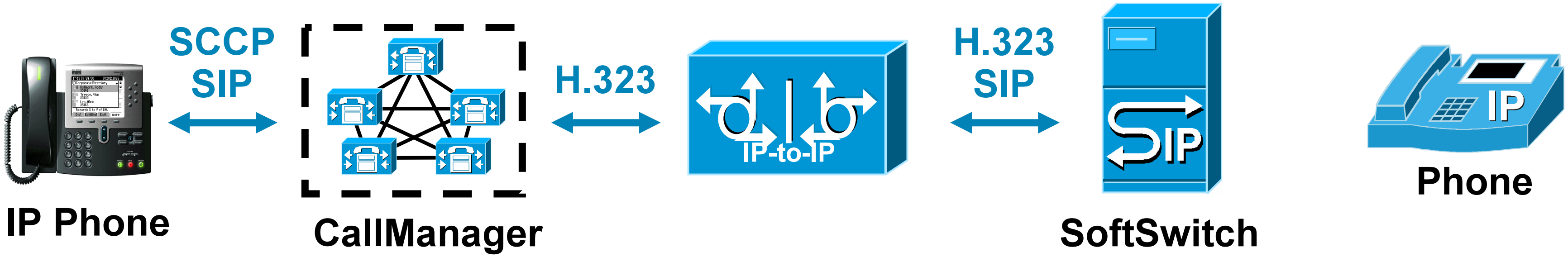
  expose my IP PBX directly to the internet?
  If firewall (with NAT) is used does it support all possible signaling protocols and its nuances?

  ENDPOINT SECURITY

ENUM Challenges - Summary

- Interoperability
  - Protocol support (SIP, H.323)
  - DTMF relay (RFC2833, SIP INFO, SIP NOTIFY, H.245-alpha, ...)
  - Media setup (SIP early/delayed media, H.323 fast/slow start)
  - Codec negotiation (G.711, G.729, iLBC, G.723, G.726, G.722, ...)
- Security
  - Denial of service
  - Endpoint/IP PBX protection
- Call Quality
  - Call Admission Control – controlling maximum number of calls
- Accounting/Traffic Monitoring
  - CDR
- How to transparently provide ENUM service to a VoIP system that does not support it?

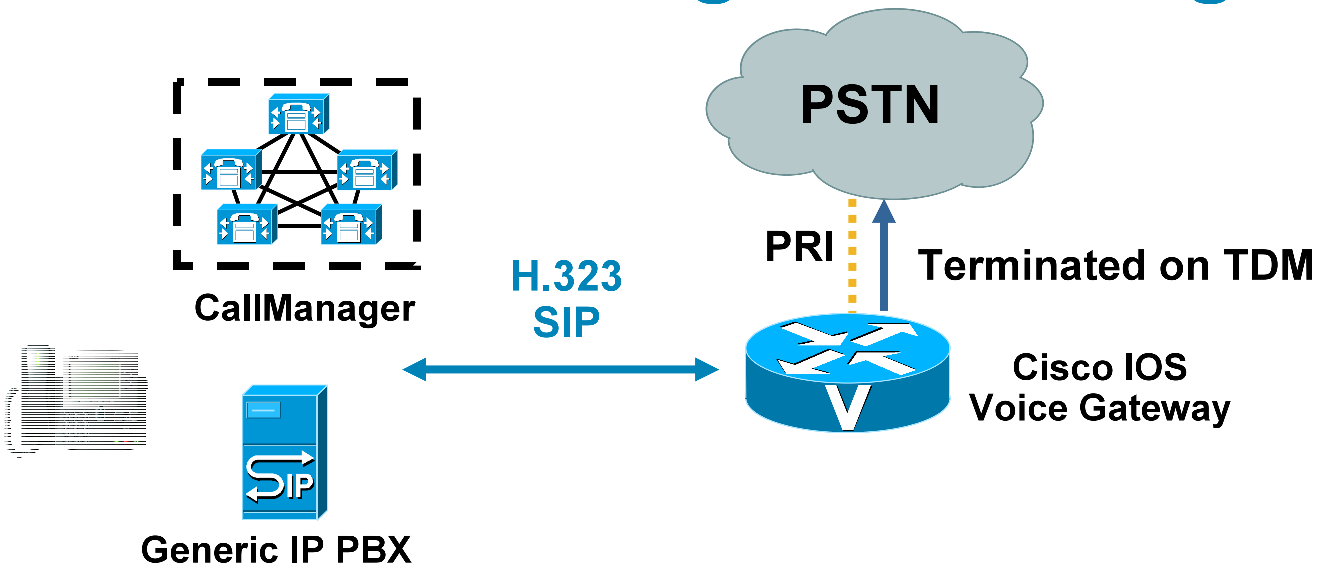
Cisco IP-to-IP Gateway as ENUM Proxy

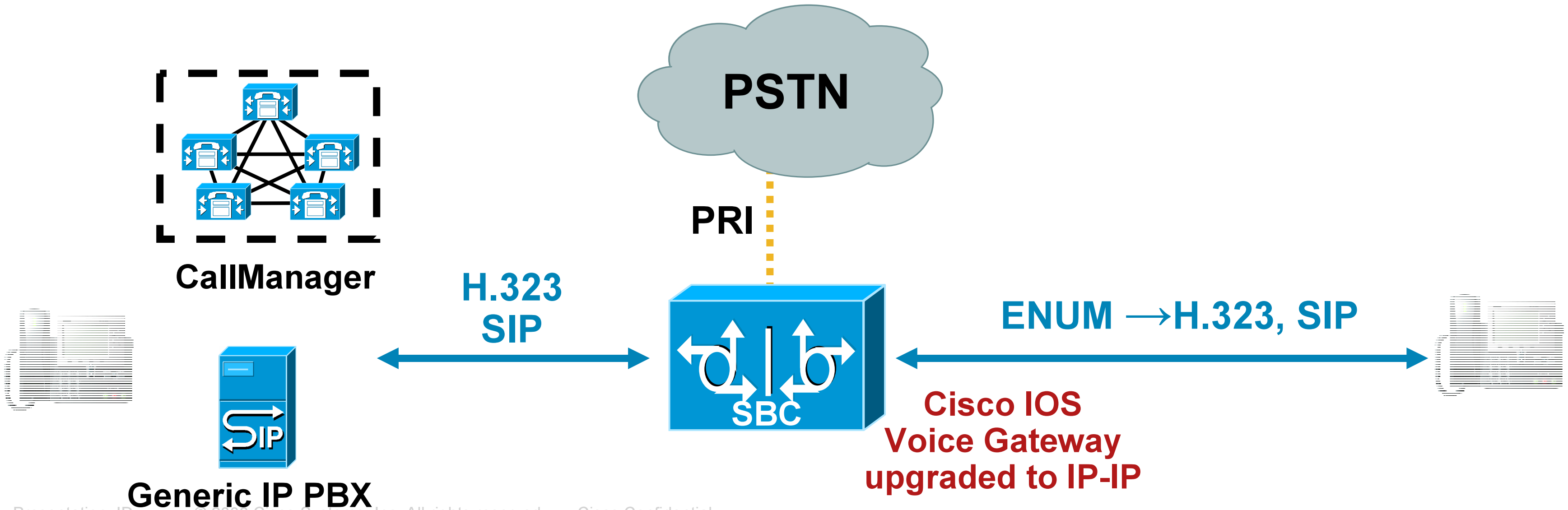


- Network/Topology Hiding for Voice and Video Calls (Media Proxy)
- Protocol Support - H.323 and SIP
- Voice Codecs – G.711,G.729,G.726,G.723,G.728,Transparent
- Video Codecs – H.261,H.263 and H.264
- Codec Filtering
- Media - Media Flow Through and Media Flow Around
- DTMF Interworking – H.245 Alphanumeric,Signal,RFC2833,SIP NOTIFY
- Fax/Modem – T.38,Passthrough,Cisco Fax Relay, Modem Passthrough
- Security – TLS, IPSec with SRTP
- ENUM

- Signaling Interworking
- Supplementary Services
- Transcoding – G.711, G.729, iLBC
- Transport Mode - TCP, UDP
- Number Translation
- Quality of Service
- Call Admission Control
- Call Detail Records
- TCL/VXML Support
- Rotary Support (dial-peer selection)

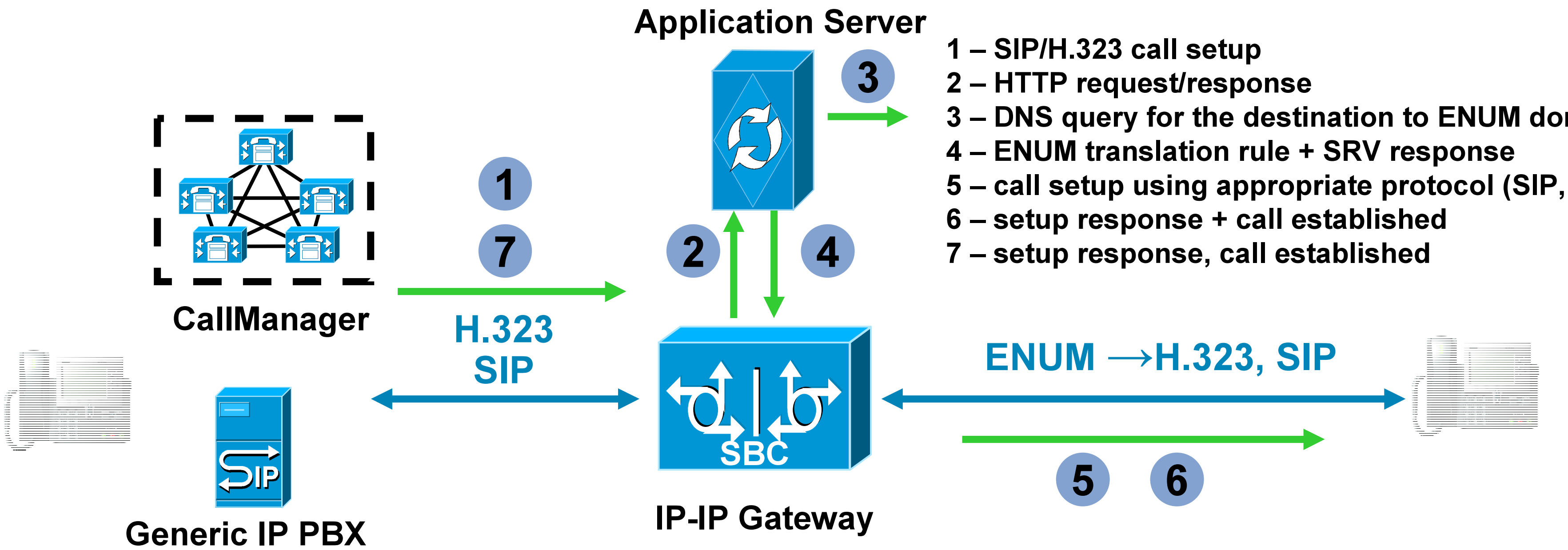
ENUM-enabling the existing solution





ENUM with IP-IP Gateway Practical Example

- ENUM implementation in IOS
  http://www.cisco.com/en/US/products/sw/iosswrel/ps1839/products_feature_guide09186a00800b5dbf.html#wp1061771
  is bound to dial-peers, i.e. does not allow dynamic protocol choice based on ENUM response
- TCL script in IP-IP gateway and external ENUM-query server can solve it



1 – SIP/H.323 call setup
2 – HTTP request/response
3 – DNS query for the destination to ENUM domain
4 – ENUM translation rule + SRV response
5 – call setup using appropriate protocol (SIP, H.323)
6 – setup response + call established
7 – setup response, call established

Summary

- ENUM supported in IOS (TDM gateways, CallManager Express, IP-IP gateway)
- Add-on to existing rich VoIP features in IOS
- IP-IP as proxy for non-ENUM clients/IP PBXs

Voice Call Support

H.323-H.323

In Leg	Out Leg	Support
Fast Start	Fast Start	Bidirectional
Slow Start	Slow Start	Bidirectional
Fast Start	Slow Start	Bidirectional

H.323-SIP

In Leg	Out Leg	Support
Fast Start	Early Offer	Bidirectional
Slow Start	Delayed Offer	Unidirectional

SIP-SIP

In Leg	Out Leg	Support
Early Offer	Early Offer	Bidirectional
Delayed Offer	Delayed Offer	Bidirectional

Delayed Offer to Slow Start Support in Future

Transcoding

Codec	Codec
G.711 a-law/µ-law	G.729, G.729A, G.729B, G.729AB

- Supports conversion from one codec type to another for the voice call (e.g. from G.729 to G.711 or vice versa)

Support for iLBC < > G.711 in 12.4(15)T

- Packetizations supported:

  G.711: 10ms, 20ms and 30ms

  G.729: 10ms, 20ms, 30ms, 40ms, 50ms and 60ms

- Same Codec different packetizations is not supported
- Transcoding requires a dedicated DSP

H.323—SIP DTMF Interworking

H.323	SIP
H.245-Alphanumeric	NOTIFY
H.245-Signal	NOTIFY
RFC2833	NOTIFY
H.245-Alphanumeric	RFC2833
H.245-Signal	RFC2833
RFC2833	RFC2833
Voice InBand*	RFC2833

*** Requires Transcoder**

H.323—H.323 DTMF Interworking

H.323	H.323
H.245-Alphanumeric	H.245-Alphanumeric
H.245-Signal	H.245-Signal
RFC2833	RFC2833
H.245-Alphanumeric	H.245-Signal
H.245-Alphanumeric	RFC2833
H.245-Signal	RFC2833
Voice InBand*	RFC2833

*** Requires Transcoder**

SIP—SIP DTMF Interworking

SIP	SIP
NOTIFY	NOTIFY
RFC2833	RFC2822
Voice InBand*	RFC2833

*** Requires Transcoder**

Call Admission Control Mechanisms

1. Total calls
2. CPU
3. Memory
4. RSVP
5. IP call capacity
6. Max-connections

