

Agenda

- **Introduction, Features, and Benefits**
- **Architecture and Components**
- **Typical Call Flows**
- **Deployment in a Service Provider Environment**
- **Redundancy and Load Balancing**

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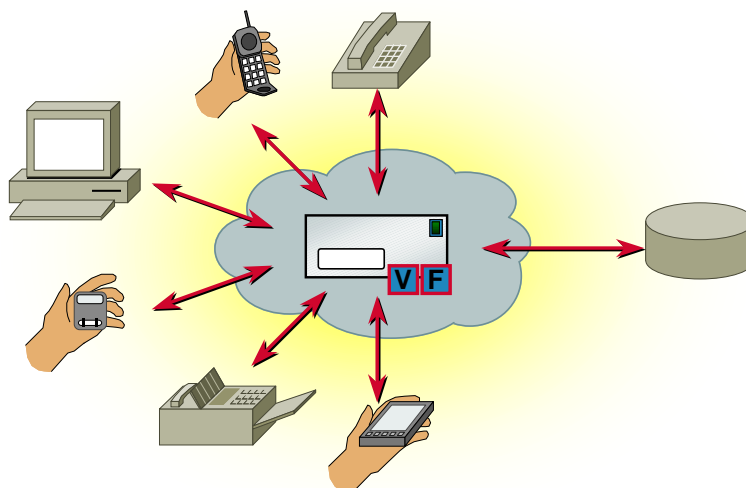
Unified Communications

Unified communications is an enhanced voice over IP solution that provides the ability to manage voice mail, e-mail and fax under a common message store, on an existing IP infrastructure.



Unified Communications

Multiple Device Types and Media



Non Real-Time Message Exchange

Unified Communications Features

VoiceMail

- Multiple personalized greeting
- Handle all messages with a single call
- Designate and prioritize messages
- Leave messages for multiple subscribers
- Forward Voice messages as e-mail attachments
- Locate subscribers using name or phone number
- Message waiting indication by pager, stutter dial tone or indicator light

Unified Communications Features

E-Mail Messaging

- Ability to identify voice, e-mail and fax messages in mailbox
- Play voice messages as streaming audio
- Listen to e-mail messages over the phone using text to speech processing (TTS)
- Respond to an e-mail message over the phone as an audio attachment to the original sender
- Message waiting indication on arrival of new e-mail messages
- Print e-mail to a local fax machine

Unified Communications Features

Fax Messaging

- Ability to redirect fax messages to a local fax machine when ready
- Determine the time of arrival and sender of a fax message using a telephone
- View faxes as a (.tiff) attachment to an e-mail message
- Forward faxes as e-mail attachments to other users
- Message waiting indication on arrival of new fax messages

Unified Communications Features

Single Number Reach

- Callers can dial one number to reach user at work, home or on mobile phone
- Callers can choose to locate subscribers or leave a message
- Subscribers can choose to accept the call based on the caller or transfer to voice mail
- Users can define different reach numbers based on the time of the call
- Users can choose to be notified of incoming calls

Service Provider Benefits

- **Brand services for greater recognition**
- **Drive minutes of use on the network, increasing total revenue per subscriber**
- **Reduce churn by strengthening customer relationships with value added services**
- **Reduce cost of ownership by utilizing a common platform to introduce new applications and services**

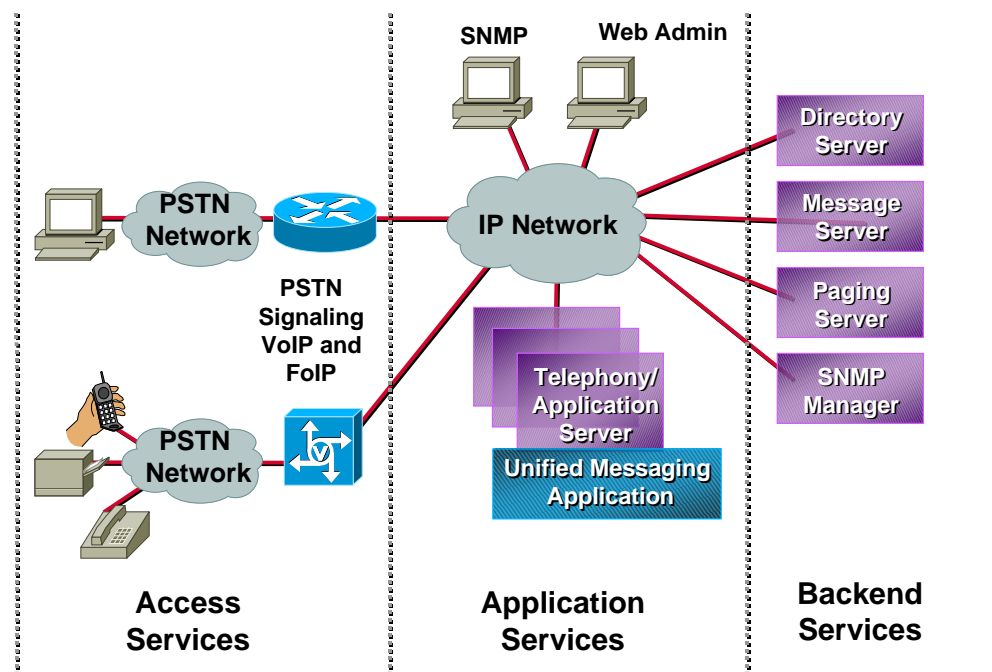
End User Benefits

- **Users can manage and access all of their messages regardless of the media type**
- **Remote users can access all of their messages with one phone call into their unified messaging system**
- **Voice mail, e-mail, and fax messaging are non-real-time means of communications, allowing users to access their messages at any time**
- **Media conversion allows users to access their messages in the media of their choice**

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Unified Communications Network Components



Network Components Access Services

- **Edge devices that provide telephony and data access to the network**

Cisco AS5300/5800 with Cisco IOS 12.0.5(T2) and vcw-vfc-mz.c542.4.04 as VoIP H.323 gateways which provide access to the network from traditional telephony devices

Cisco AS5300 Onramp and Offramp fax gateways that provide access to and from the network for group three fax machines

Access servers for dial in data access from PC's

Network components Application Services

- **Message management logic and H.323 call termination point**
- **Gateserver**

Sun Netra T 1125 Dual processor, 300 MHz, 512MB RAM, 9.1G hard drive with Solaris 2.6

uOne gateserver software version 4.2S

RadVision rel 2.1.2.3 H.323 Stack (Included with uOne)

L&H Telecom TTS (Text to Speech) V.100 for Solaris with American English, French and Spanish language sets

SNMP master agents (optional)—Solstice enterprise agents runtime V1.03

Network Components Backend Services

- **Netscape Directory server 4.0 (LDAP)**
- **Netscape Messaging server 4.1**
- **Hylafax paging server 4.0, patch 1**
- **Apache Web server 1.3.6**
- **Network management workstation**

Backend Services Directory server

- **Storage of user profile information in a hierarchical tree like structure based on organizational or geographic boundaries**
- **Tuned to give quick response to high volume search operations**
- **LDAP (lightweight directory access protocol) used to manage user information on directory. Uses TCP port 389**

Backend Services Messaging Server

- **Common message store for uOne with open access (IMAP4, HTTP, SMTP)**
- **Uses directory service for user account information/authentication**
- **Messages stored using SMTP in MIME format**
- **Retrieved using IMAP4, POP3 or HTTP (Web-based e-mail client)**

Backend Services Paging Server

- **HylaFax paging server—interfaces with uOne using SNPP (Simple Network Paging Protocol)**
- **Solaris 2.6 based**
- **Connects to a modem server using a single ended SCSI 2 cable**

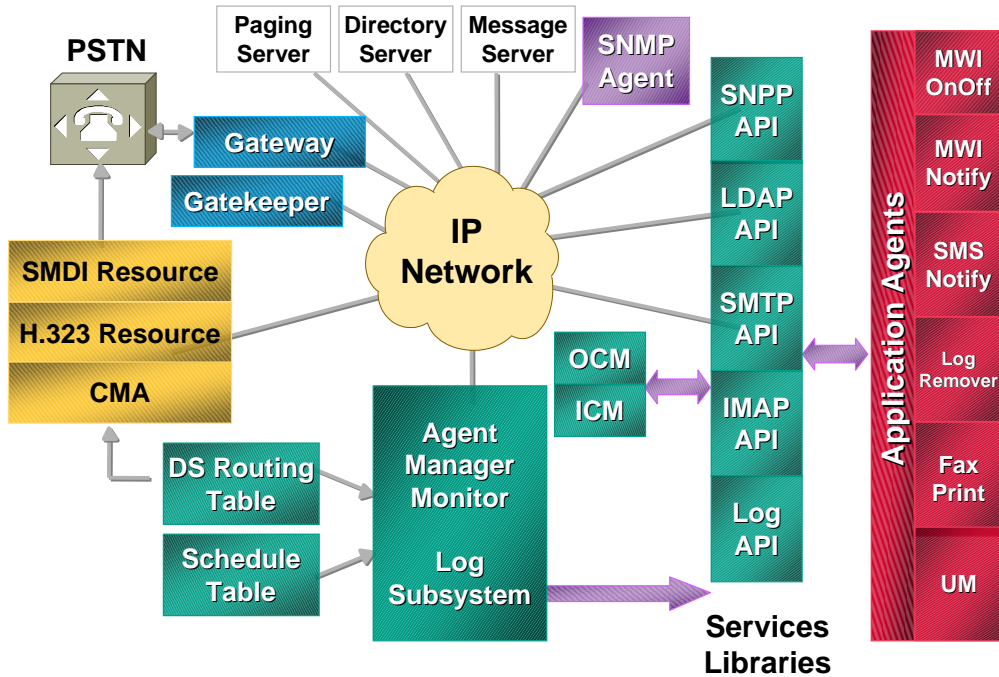
Gateserver Architecture

- **Distributed object-based framework**
- **Based on new and non-proprietary voice and information standards**
- **Several major components that can be distributed across multiple systems**

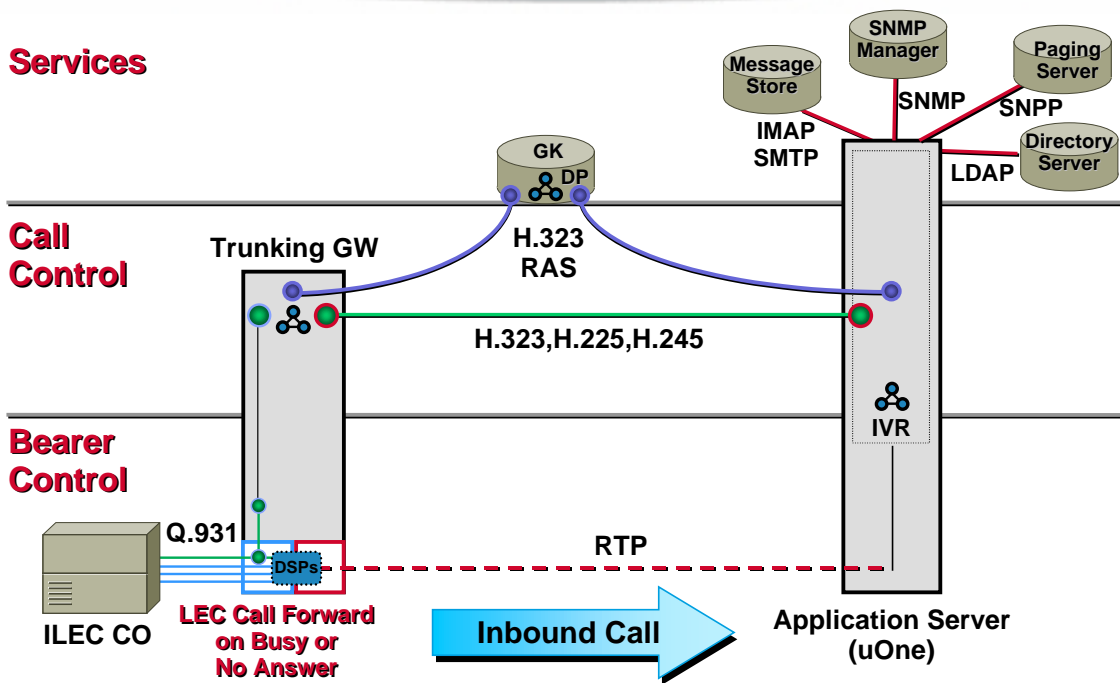
Gateserver Components

- **Agent Manager and Monitor (AMM)**
 - Scheduling, routing, launching, monitoring, and terminating services**
 - Service libraries to access non proprietary services (IMAP, SMTP)**
- **Call Control/Media Agent (CMA)**
 - Provides all H.323 services (H.225, RAS, H.245)**
 - Media services such as playing and recording messages**
- **Application agents**
 - Launched by AMM to provide specific tasks such as fax, notification**
 - Provide access to back-end servers by using service library APIs**

Gateserver Component Overview



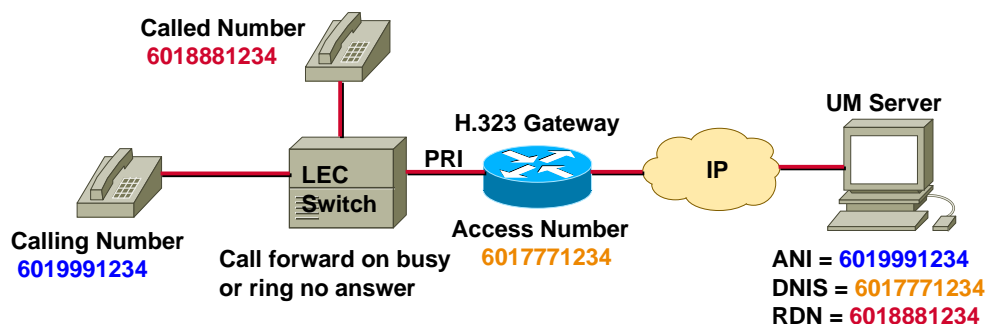
Unified Communications Protocol Overview



Agenda

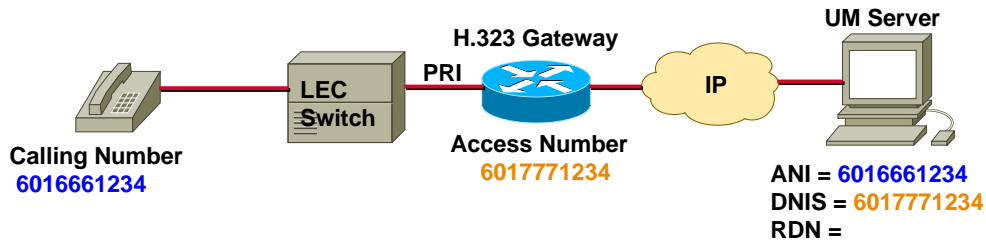
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- Architecture and Components
- **Typical Call Flows**
- Deployment in a Service Provider Environment
- Redundancy and Load Balancing

Call Flows Identifying Callers



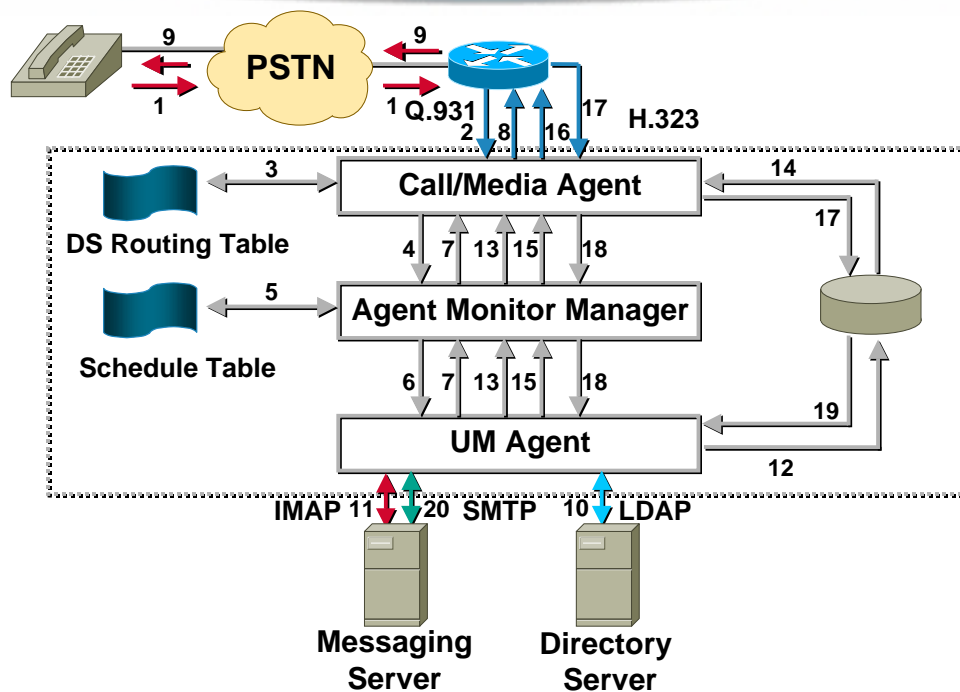
- **Presence of RDN (Redirected Number) indicates call to subscriber**
- **UM searches for subscriber profile using 6018881234, retrieves and plays personal greeting**

Call Flows Identifying Subscribers

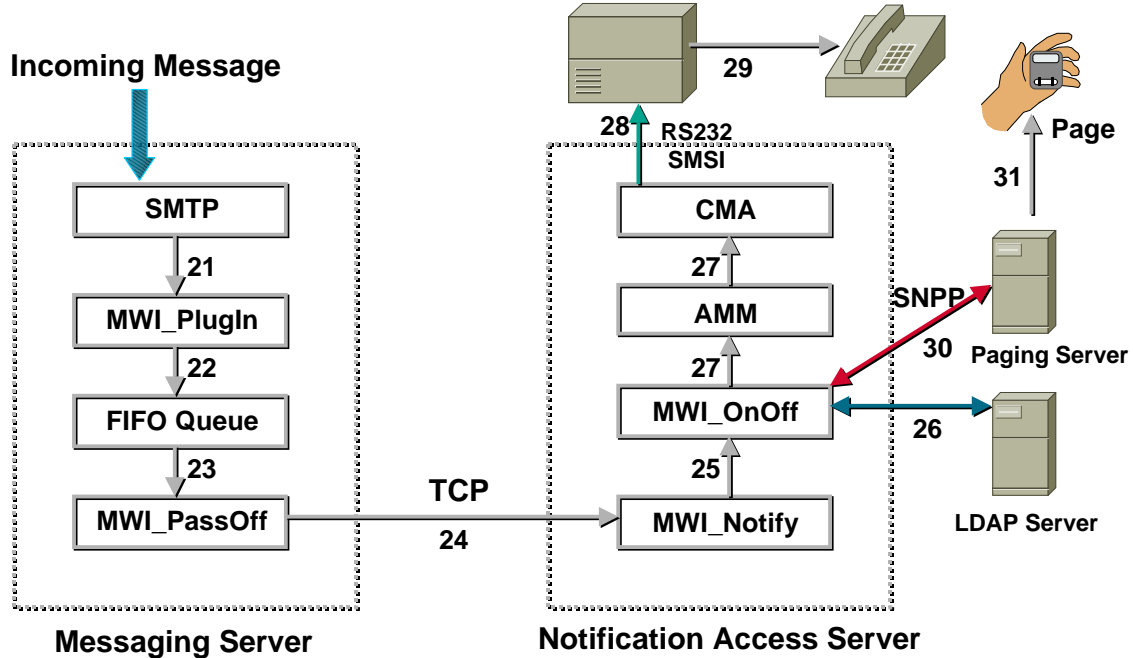


- Unpopulated RDN field indicates call from subscriber to retrieve messages
- UM requests subscriber to enter phone number or simply press #
- If subscriber enters phone number, it is used in directory search (LDAP)
- If subscriber enters # 6016661234 is used to search directory for profile

Call Flows Leaving a Message



Call Flows Notification



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Call Flows Inbound Fax

- **UM creates an alias on messaging server mapping assigned fax number to e-mail address**
- **UM does not participate in inbound fax to subscriber**
- **Fax delivered to subscriber mailbox by onramp fax gateway**

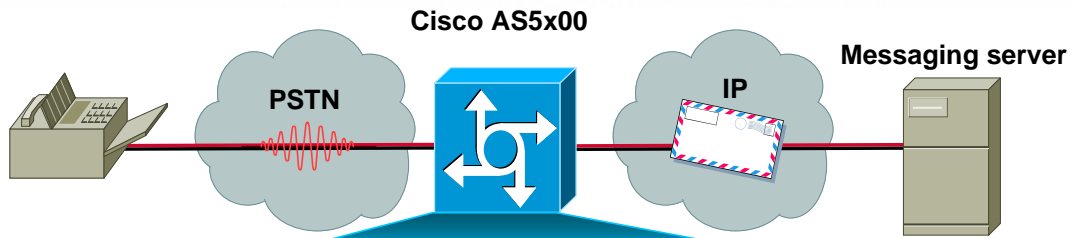
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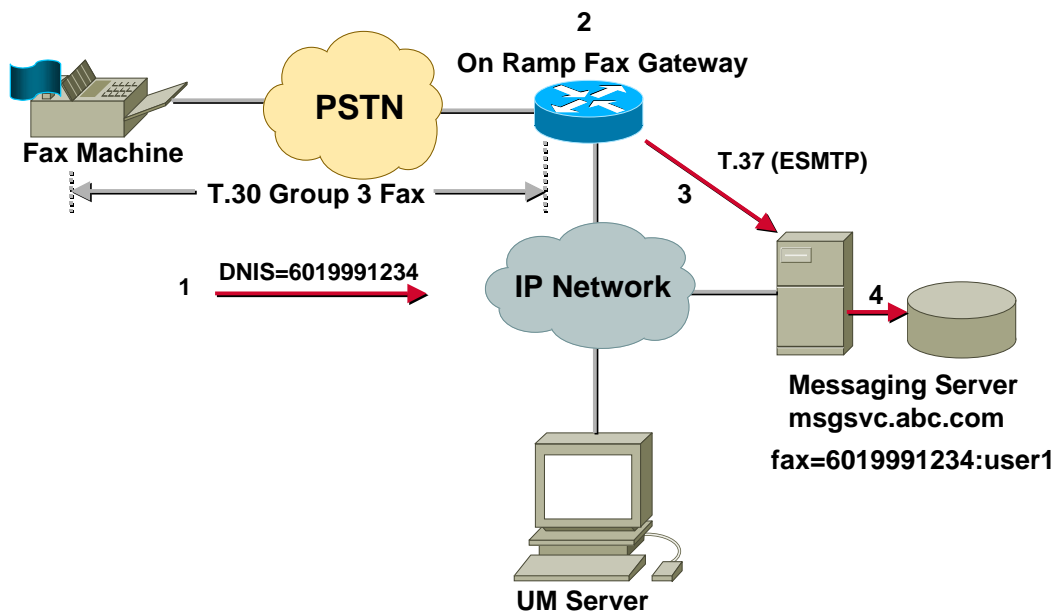
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Call Flows Onramp Function



- Demodulate fax call
- ITU-T T.30 fax protocol handling
- Turn fax image into TIFF file
- Create MIME message with TIFF attachment
- Optionally re-write to: address
- Create call history record
- Forward to ESMTMP mail server

Call Flows Inbound Fax



Call Flows Inbound Fax

1. User sends a fax to the subscribers telephone number (6019991234). The fax connects to a fax gateway (AS5300)
2. Incoming call is determined to be a fax call because the DNIS matches dial peer with information type set to fax. The gateway converts T.30 Group 3 fax to a .tif file
3. The gateway creates a mail message, attaches the .tif file and delivers it using ESMTP to the messaging server. Destination e-mail: **fax=6019991234@msgsvc.abc.com**

Call Flows Inbound Fax

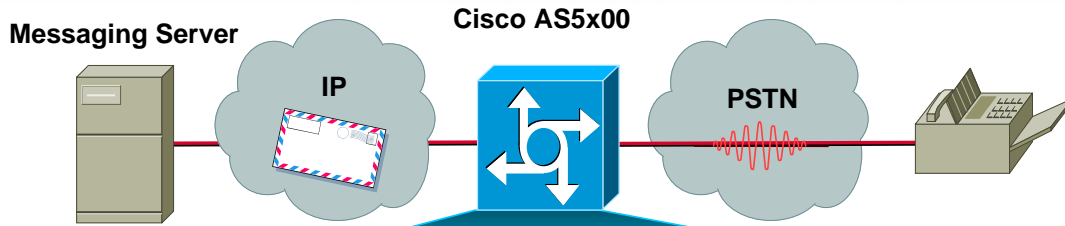
4. Messaging server deposits fax message in users mailbox

UM has created an alias on the messaging server that maps **fax=6019991234@msgsvc.abc.com** to **user1@msgsvc.abc.com** at setup time

The receipt to e-mail address is maintained as the alias **fax=6019991234@msgsvc.abc.com**

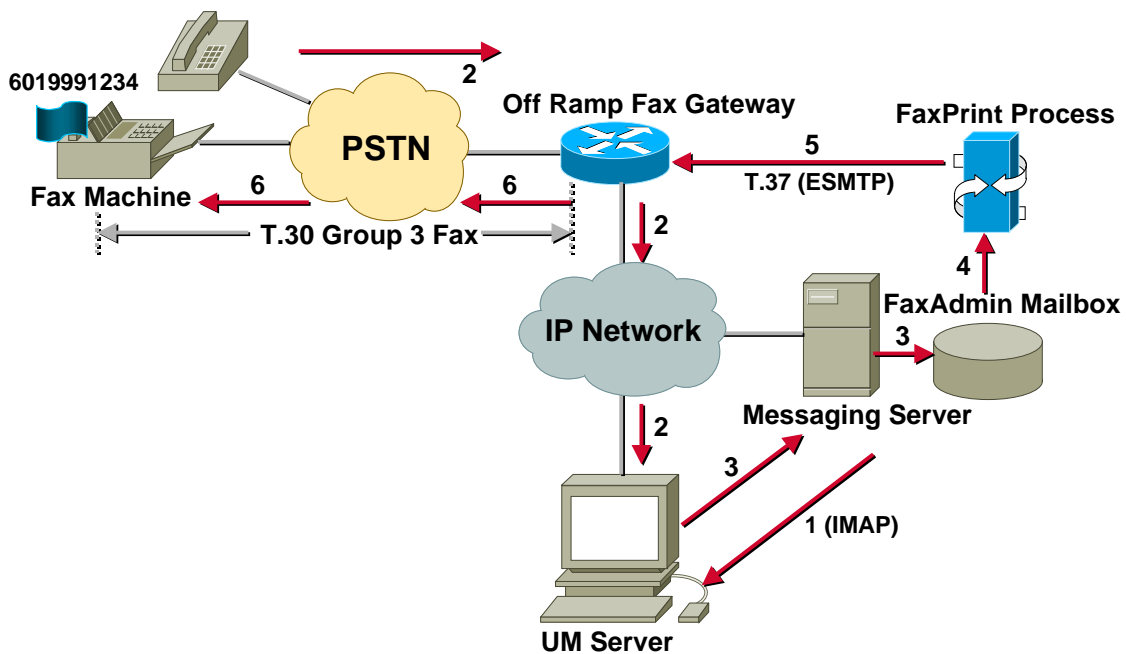
The “fax=” alias in the “to:” address defines this message to be a fax message at retrieval time

Call Flows Offramp Function



- Authenticate sender against AAA (optional)
- Rasterize text portions of e-mail (text->fax)
- Rasterize TIFF-F into fax pages
- Re-write fax destination number (optional)
- ITU-T T.30 fax protocol handling
- Modulate fax call
- Create call history record
- Delivery status notification

Call Flows Outbound Fax



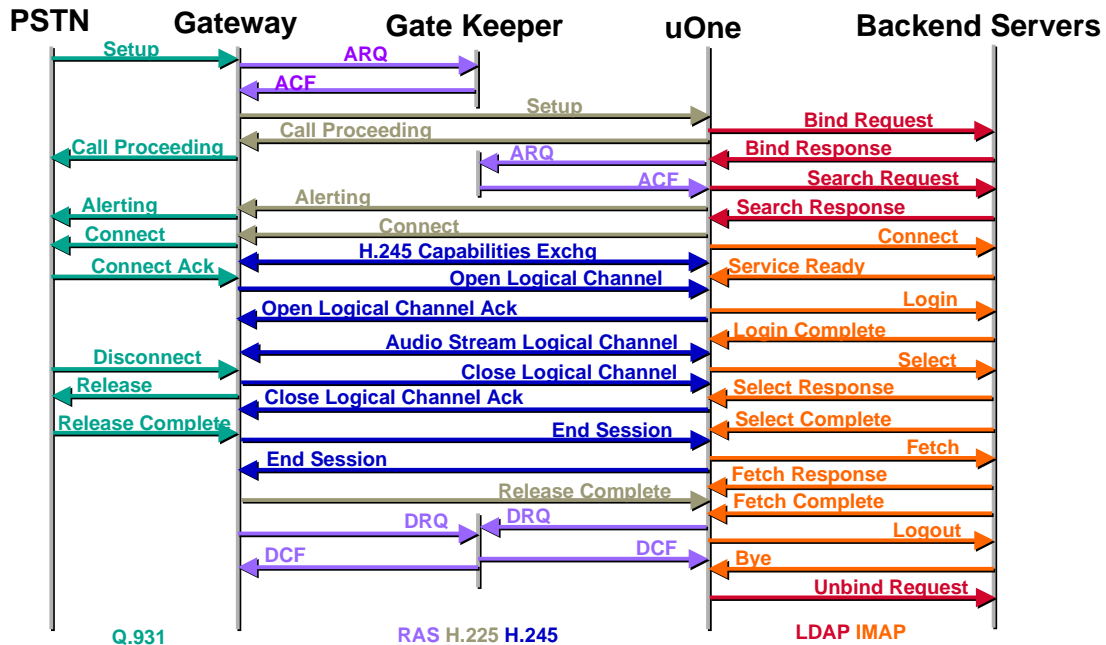
Call Flows Outbound Fax

1. **UM agent retrieves the fax or e-mail message from the messaging server using IMAP**
2. **Subscriber chooses the option to print the message and keys in the phone number of the fax machine where the message is to be sent, example 6019991234**
3. **UM agent adds destination fax information to the message and forwards it to subscriber's faxadmin e-mail account using SMTP**

Call Flows Outbound Fax

4. **FaxPrint application constantly monitors faxadmin's mailbox for new messages. It retrieves message sent in the previous step using IMAP**
5. **FaxPrint application sends the message to off Ramp fax gateway (ESMTP) addressed to (fax=6019991234@gw.abc.com)**
6. **Fax gateway extracts the destination phone number from e-mail address, converts any text to .tif format and sends the fax to the destination as T.30 Group 3 fax**

Call Flows Summary



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- **Deployment in a Service Provider Environment**
- Redundancy and Load Balancing

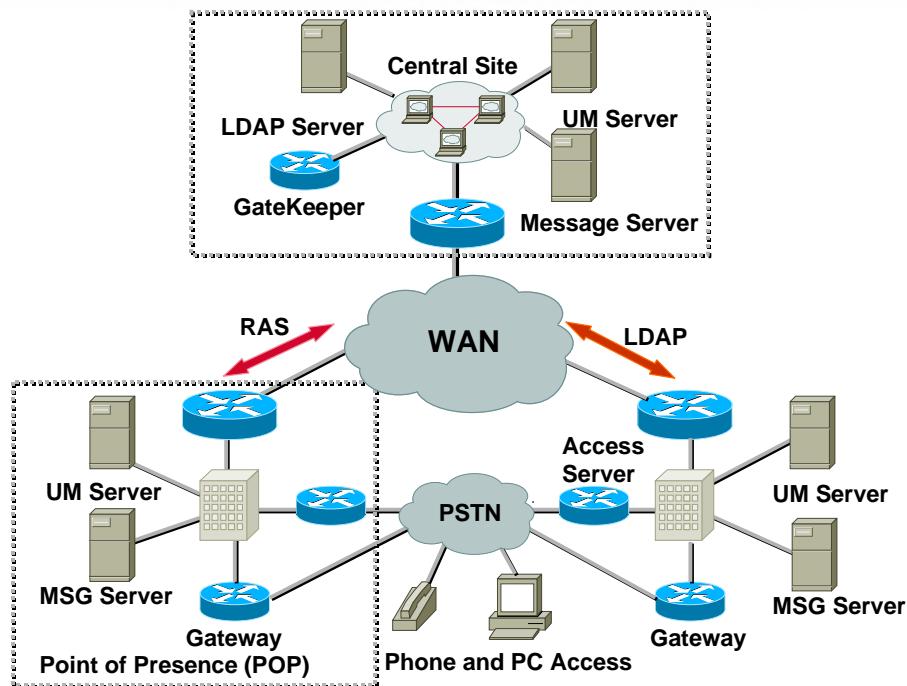
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Deployment Overview



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Deployment Overview

- **Service quality depends on where uOne components are placed in the network**
- **Inherent delays across WAN's**
- **Better quality and service by minimizing traffic across WAN's**

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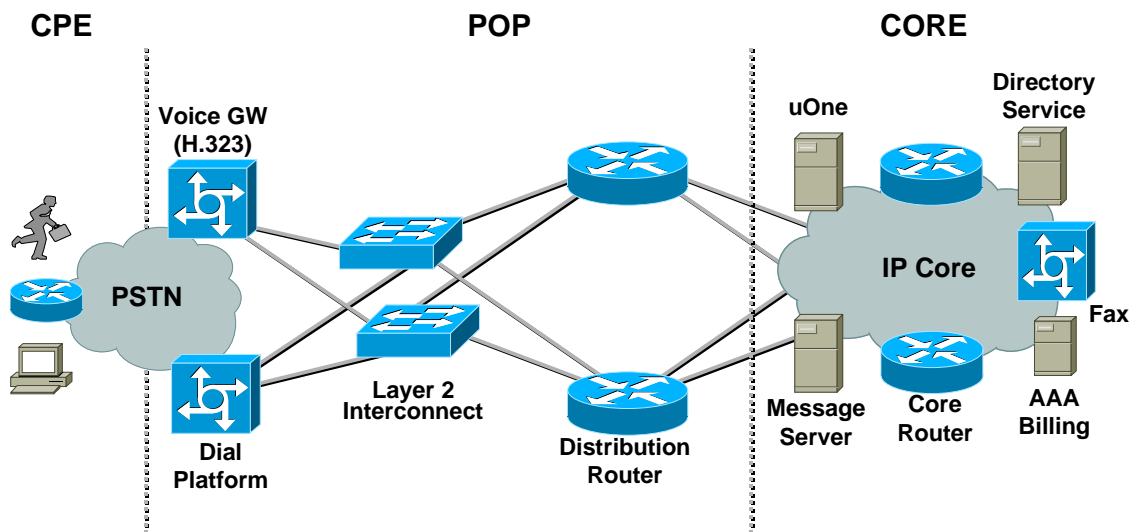
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Deployment Overview Service Quality

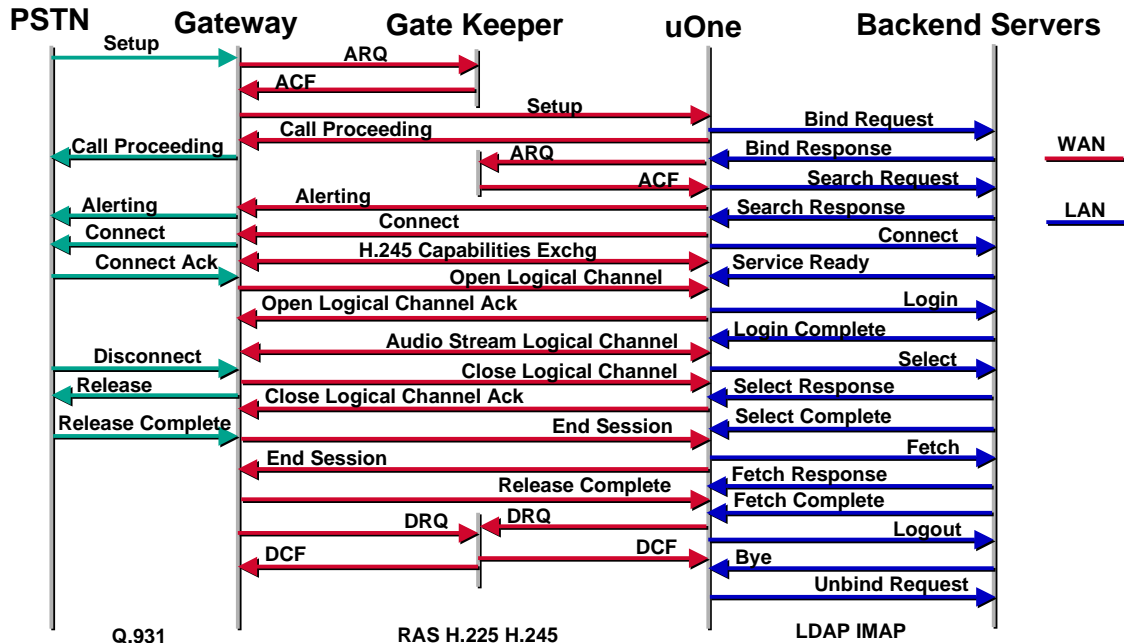
- **uOne server**
Call setup times, voice quality
- **Directory server**
Authentication, message response
(has to be centralized)
- **Messaging server**
Message retrieval and response times

Dial Internet Access Fully Centralized



No uOne Components at POP

Dial Internet Access Fully Centralized



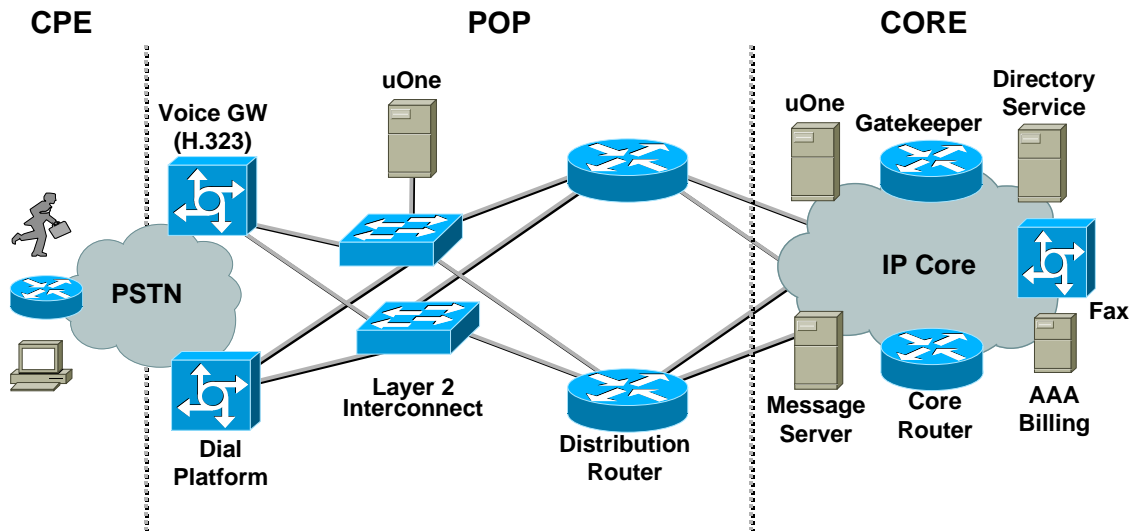
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Dial Internet Access Partially Centralized



Centralized Back End Services

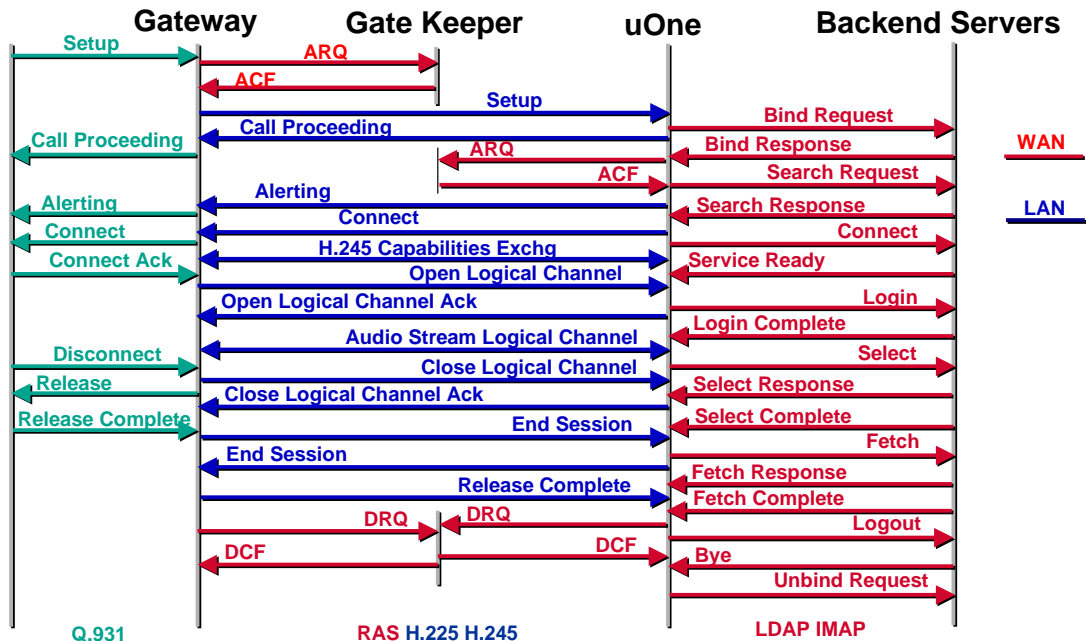
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Dial Internet Access Partially Centralized



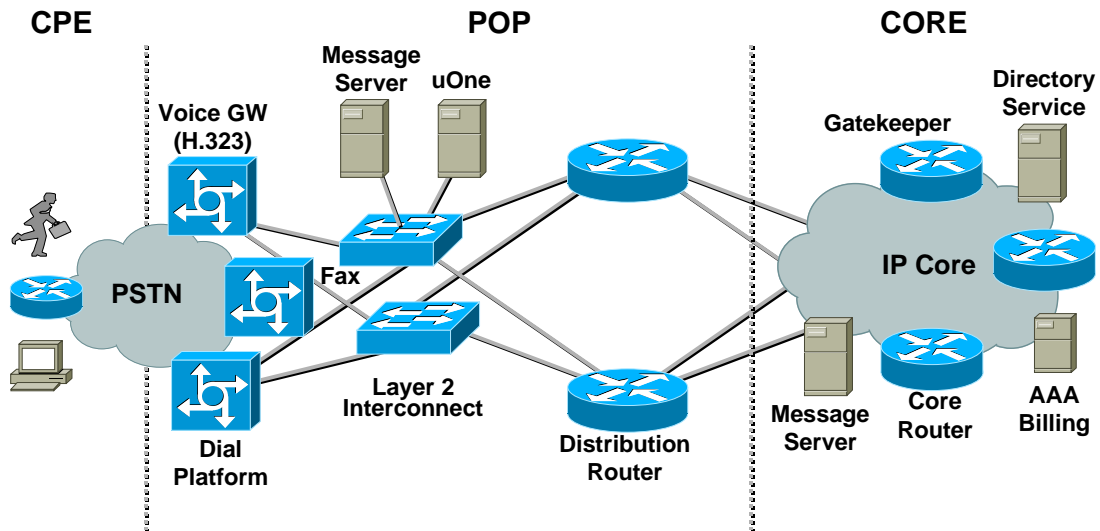
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Dial Internet Access Partially Distributed



uOne and Messaging Server at Each POP

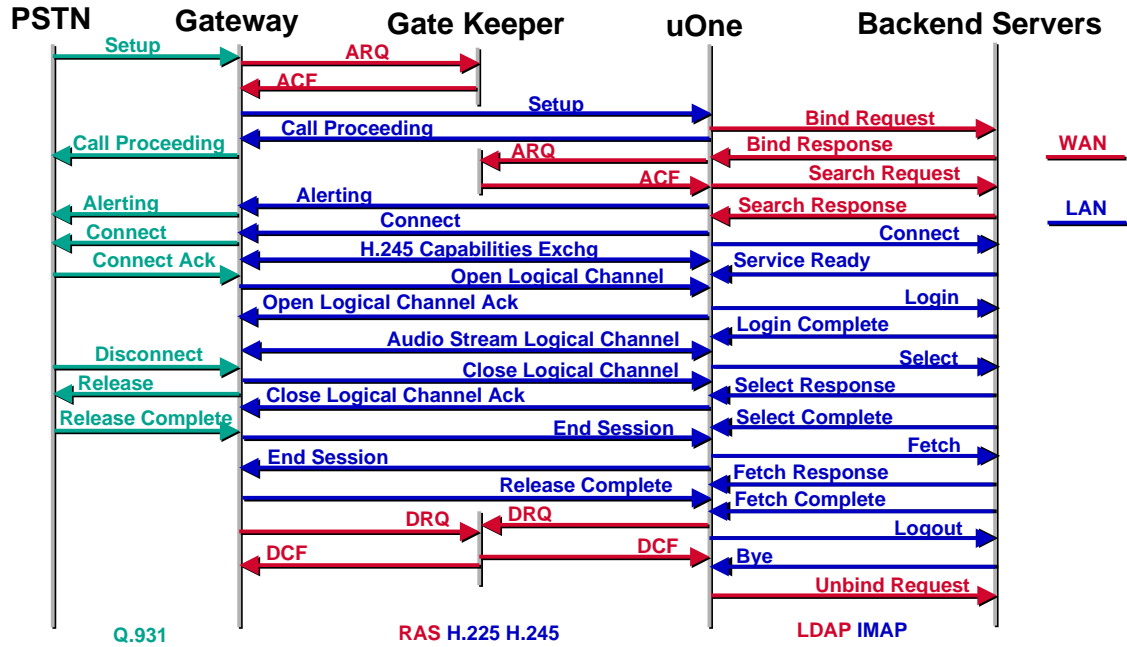
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Dial Internet Access Partially Distributed



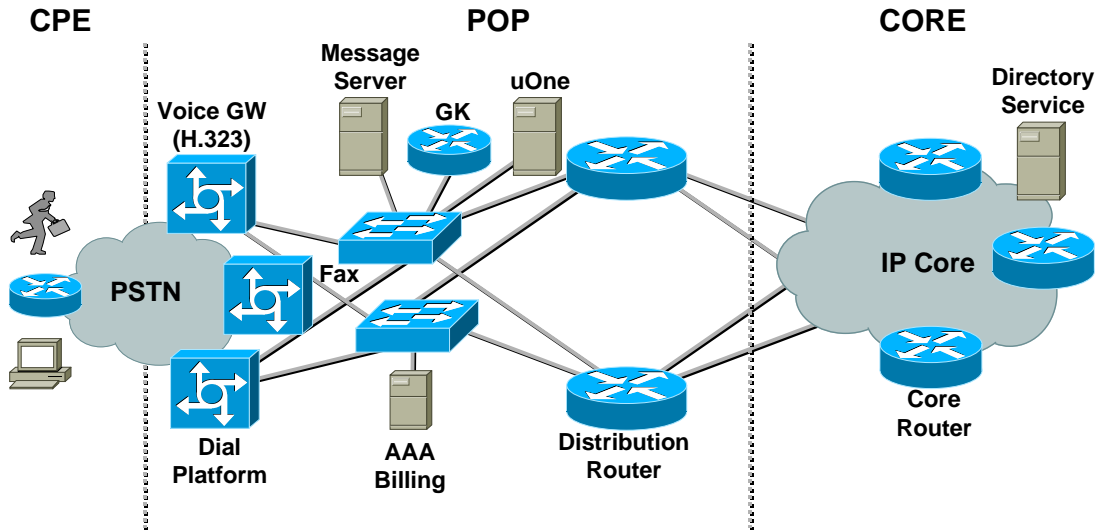
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Dial Internet Access Fully Distributed



Local GK Zone for Each POP

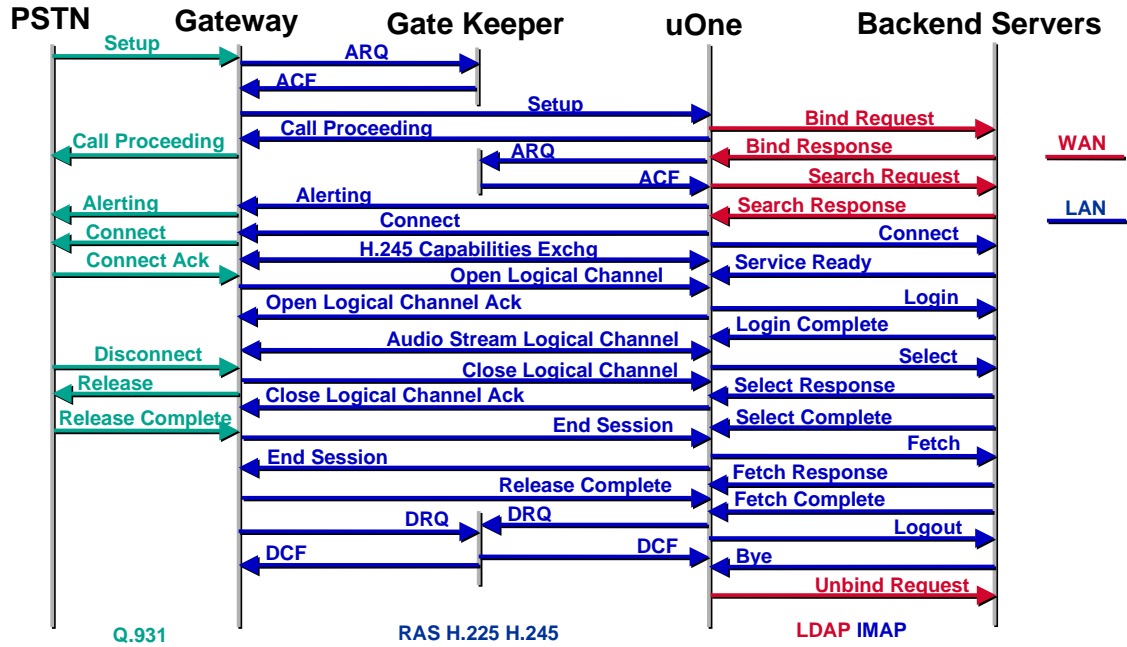
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Dial Internet Access Fully Distributed



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Dial Internet Access Deployment Summary

Quality Feature	Fully Centralized	Partially Centralized	Fully Distributed	Partially Distributed
Call Setup Time	Long	Good	Best	Good
Voice Quality	Average	Good	Good	Good
Authentication	Good	Good	Good	Good
Message Response	Acceptable	Acceptable	Good	Good

Call Setup Time: Time taken to setup call and hear ringing at the far end

Voice Quality: Quality of messages being played back from uOne

Authentication: Time subscriber has to wait for the system after entering user ID and pin

Message Response: Time subscriber has to wait to hear message after that message has been selected.

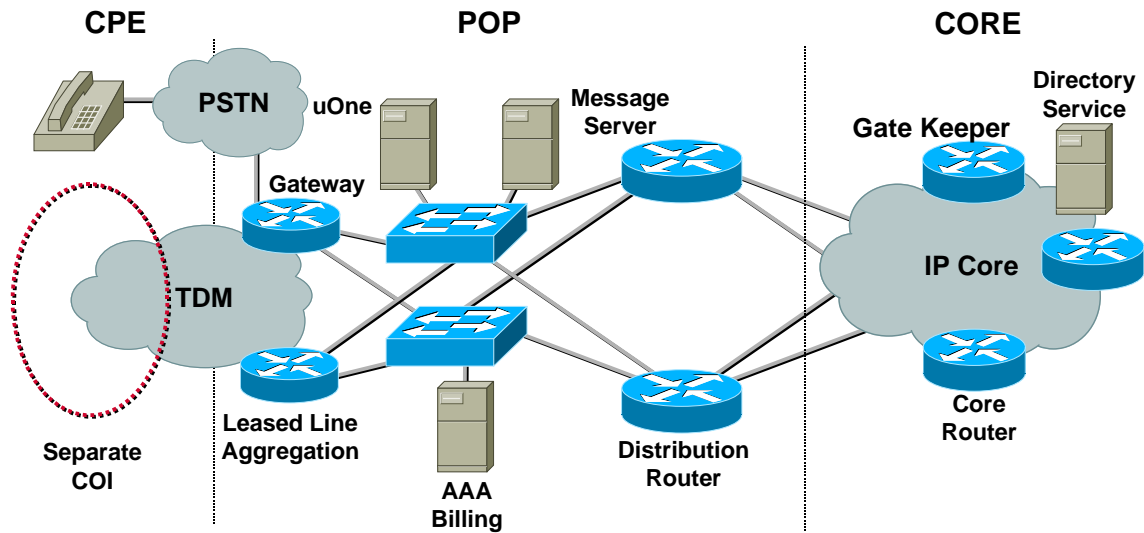
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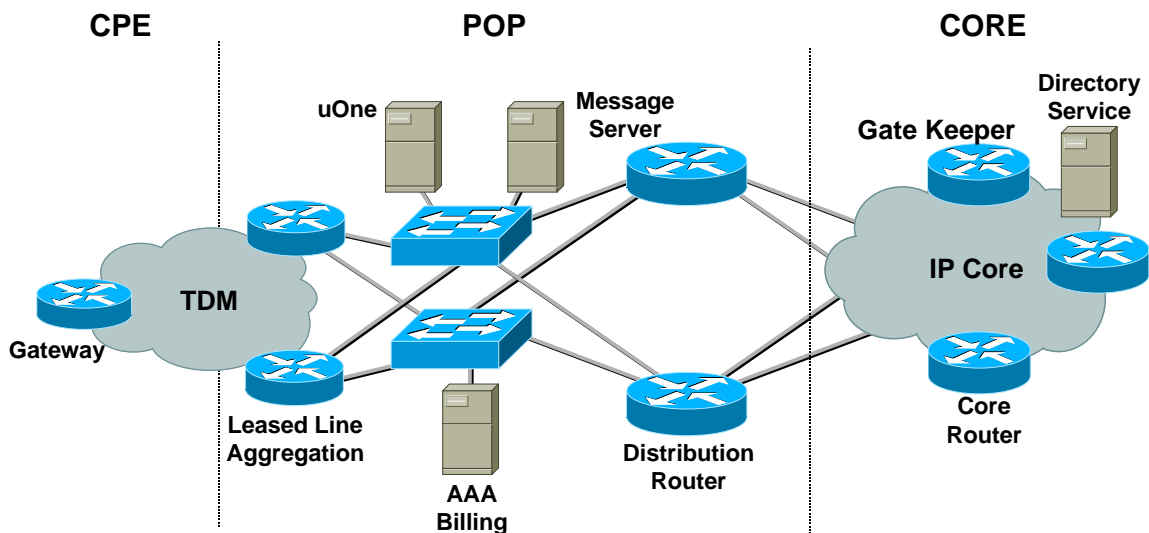
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Dedicated Internet Access



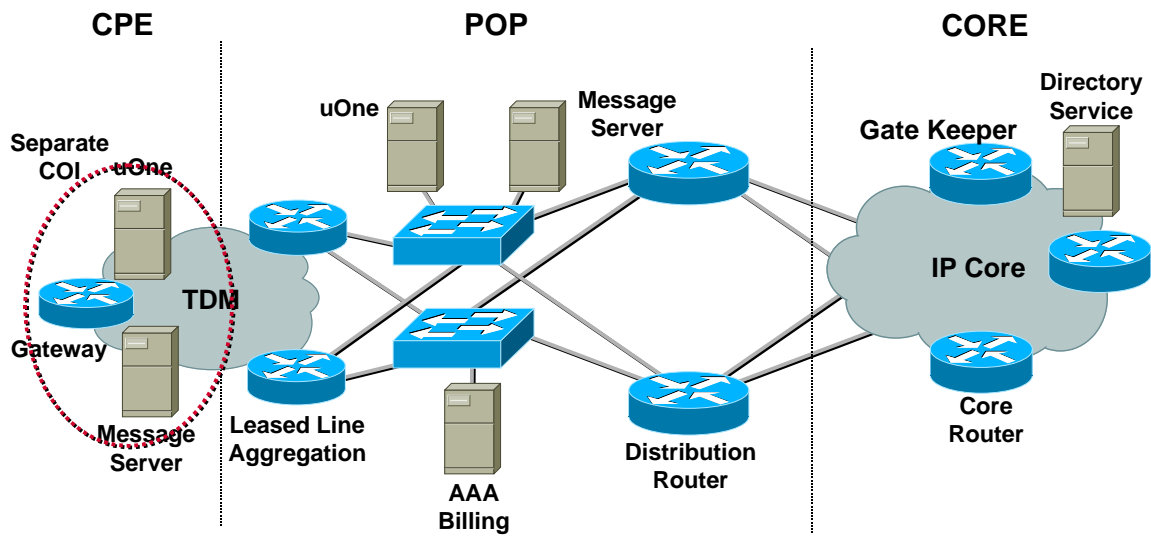
Corporation Share uOne and Gateway Resources in POP

Dedicated Internet Access



Corporation Share uOne Resources in POP and Has Local Number Access

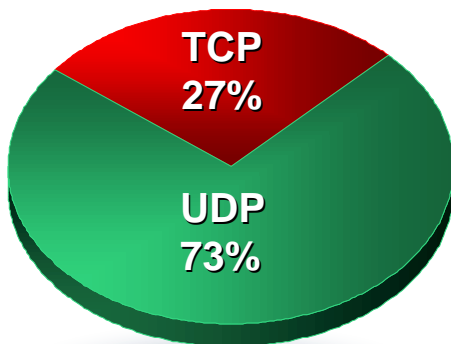
Dedicated Internet Access



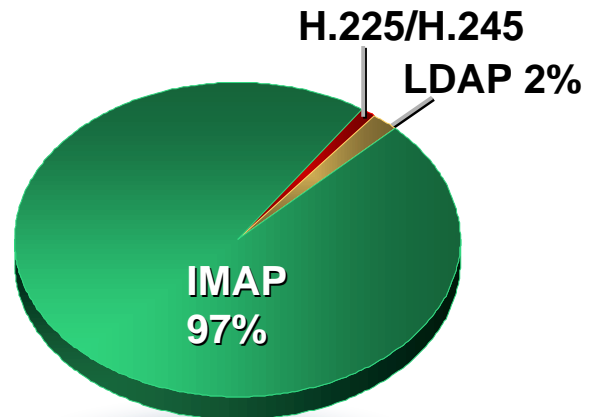
Corporation Has Dedicated uOne Resources

Traffic Analysis

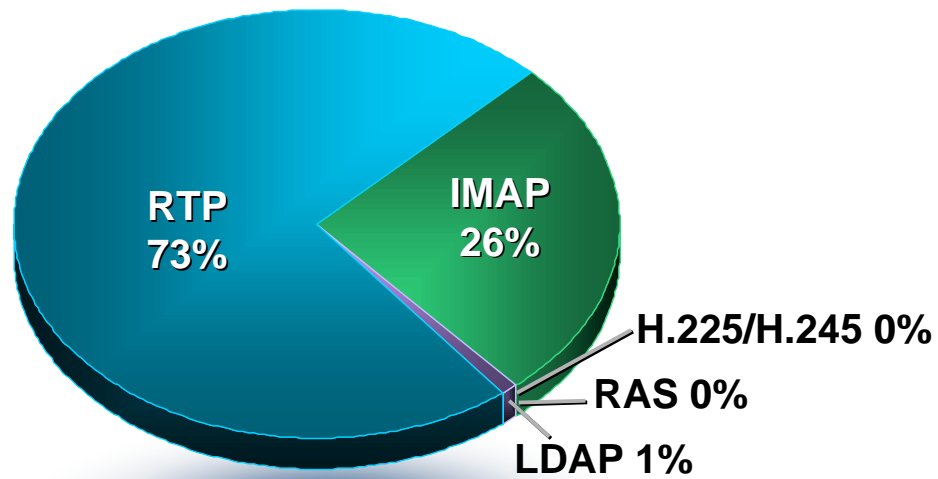
Traffic Distribution
Transport Layer



TCP Traffic
Distribution



Overall Traffic Distribution



Overall Traffic Distribution

- Traffic distribution based on retrieving a 30 second voice message listening to all menu prompts in full. Total call lasted 1 minute and 54 seconds.

Protocol	Bytes	Packets
RAS	4173	34
H.225/H.245	3034	39
LDAP	7889	39
IMAP	384421	391
RTP	1058052	4986

WAN Bandwidth Calculations

CASE1: uOne server at each POP with centralized backend services

Total traffic across WAN = IMAP+LDAP+RAS = 396483 bytes

Total traffic in bits = 3171864

Bandwidth to sustain 1 session = $3171864/114 = 27832$ bits/sec

For 30 simultaneous sessions, bandwidth = 834690 bits/sec or **835K**

CASE2: uOne server and messaging server at each POP with centralized gatekeeper and directory service

Total traffic across WAN = LDAP+RAS = 12062 bytes = 96469 bits

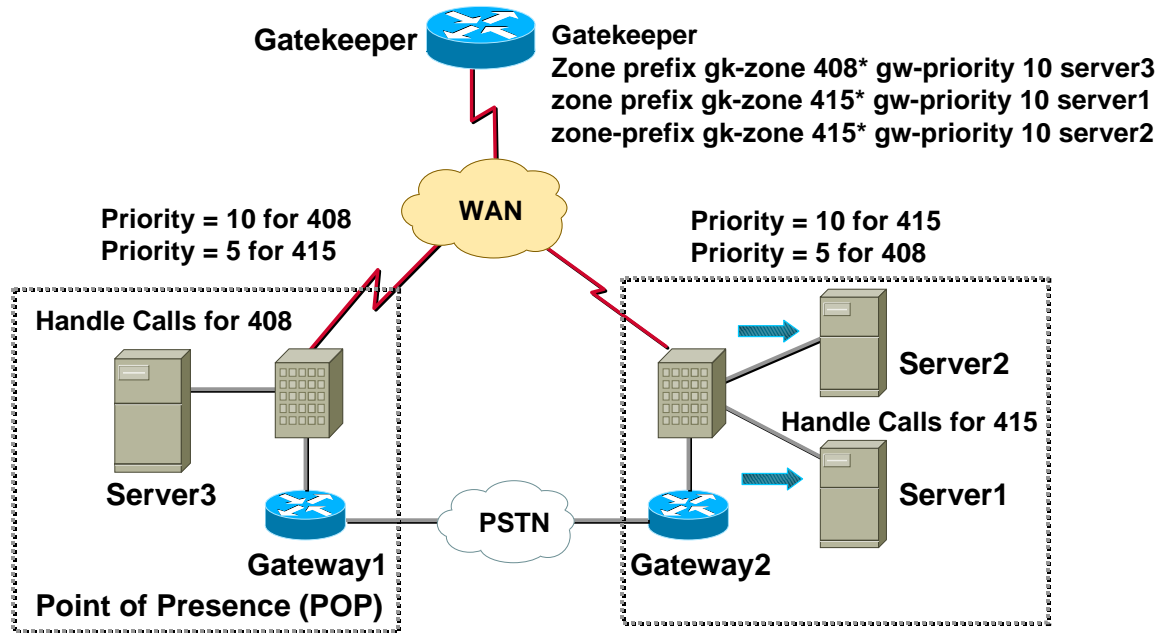
Bandwidth to sustain 1 session = $96469/114 = 846$ bits/sec

For 30 simultaneous sessions, bandwidth = 25380 bits/sec or **26K**

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Load Balancing and Redundancy



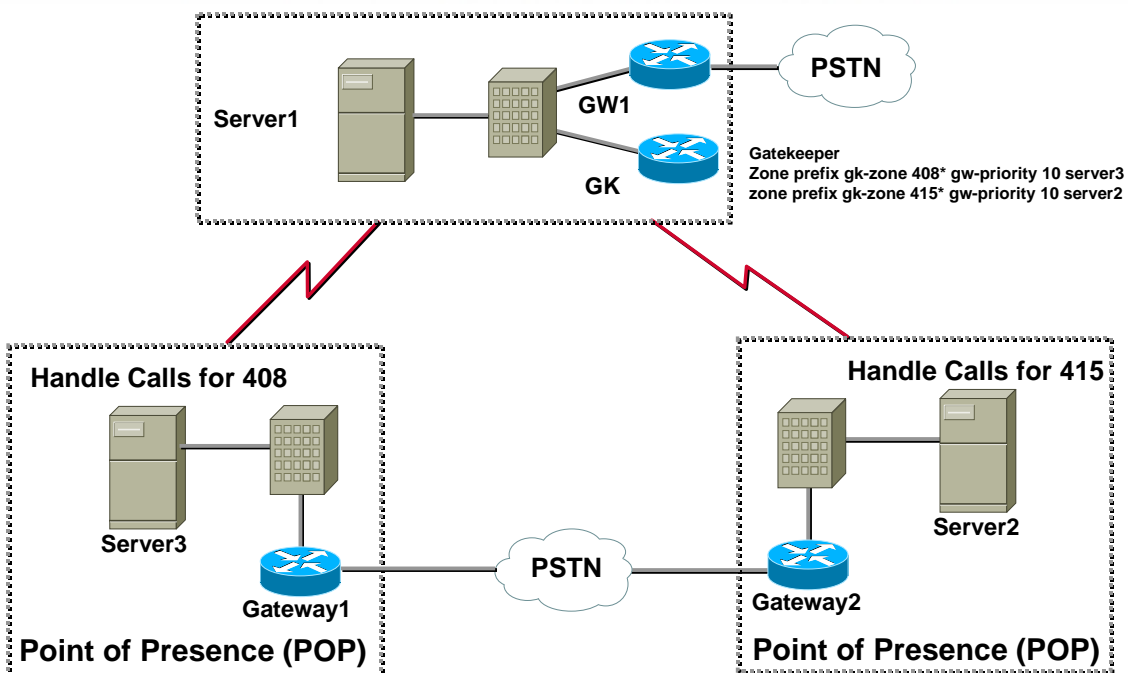
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Load Balancing and Redundancy



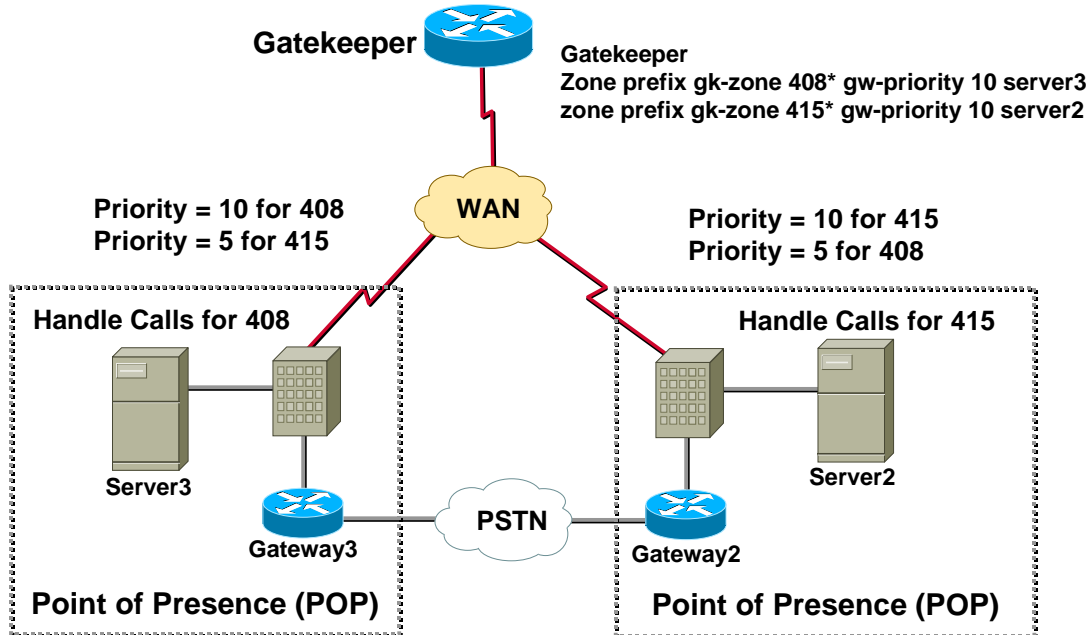
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uOne Redundancy Across POP's



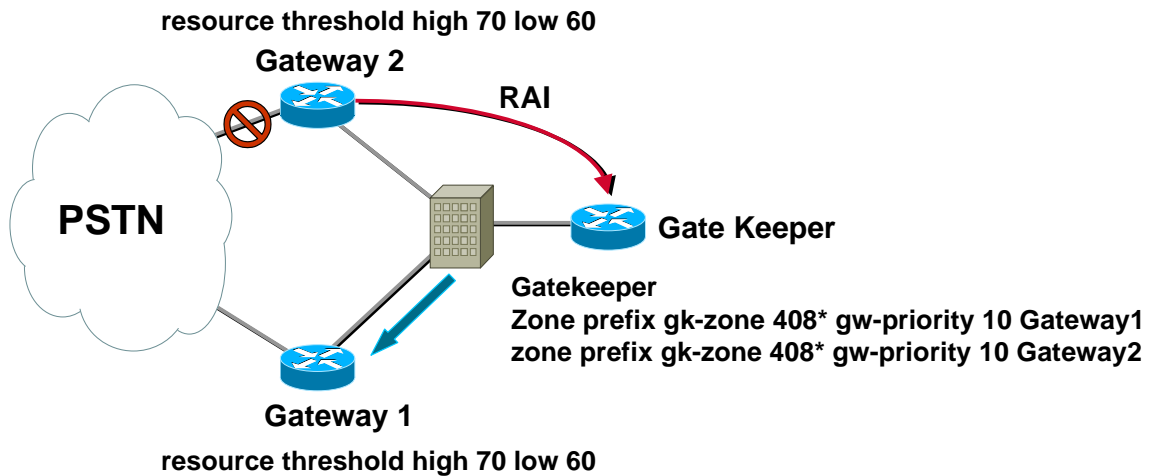
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Gateway Load Balancing and Redundancy



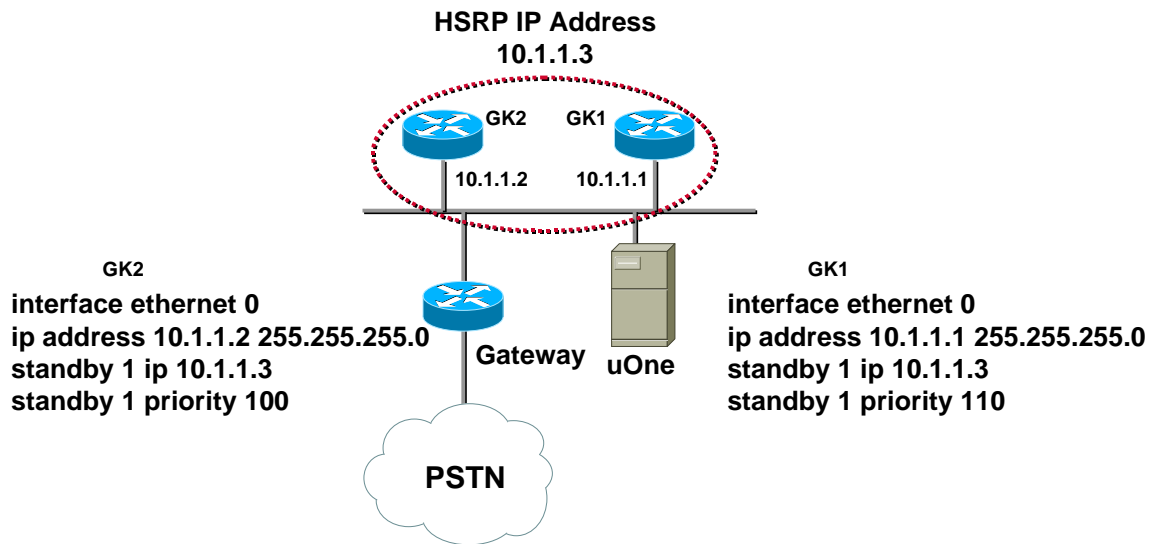
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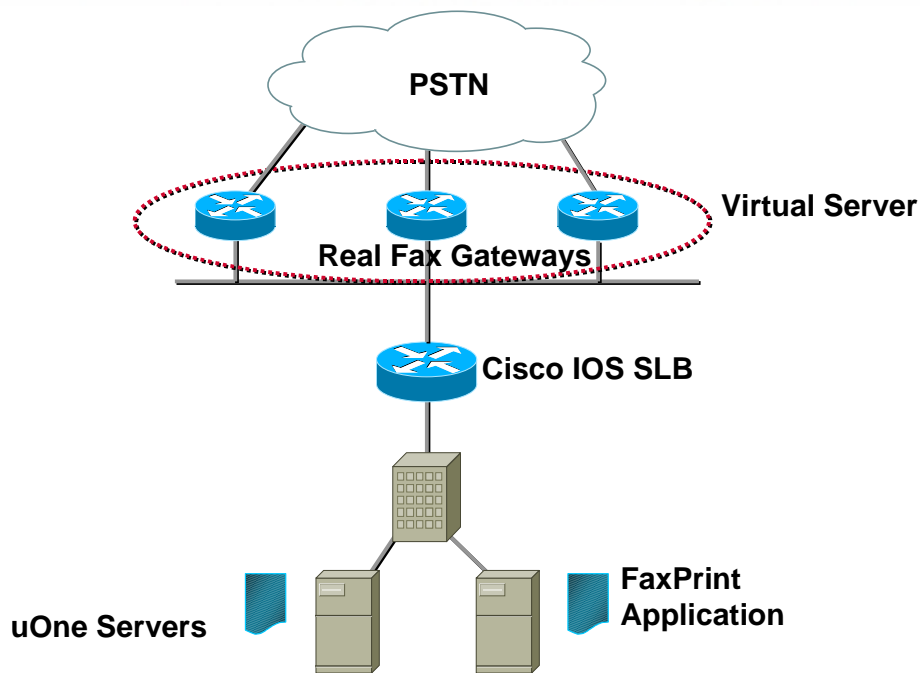
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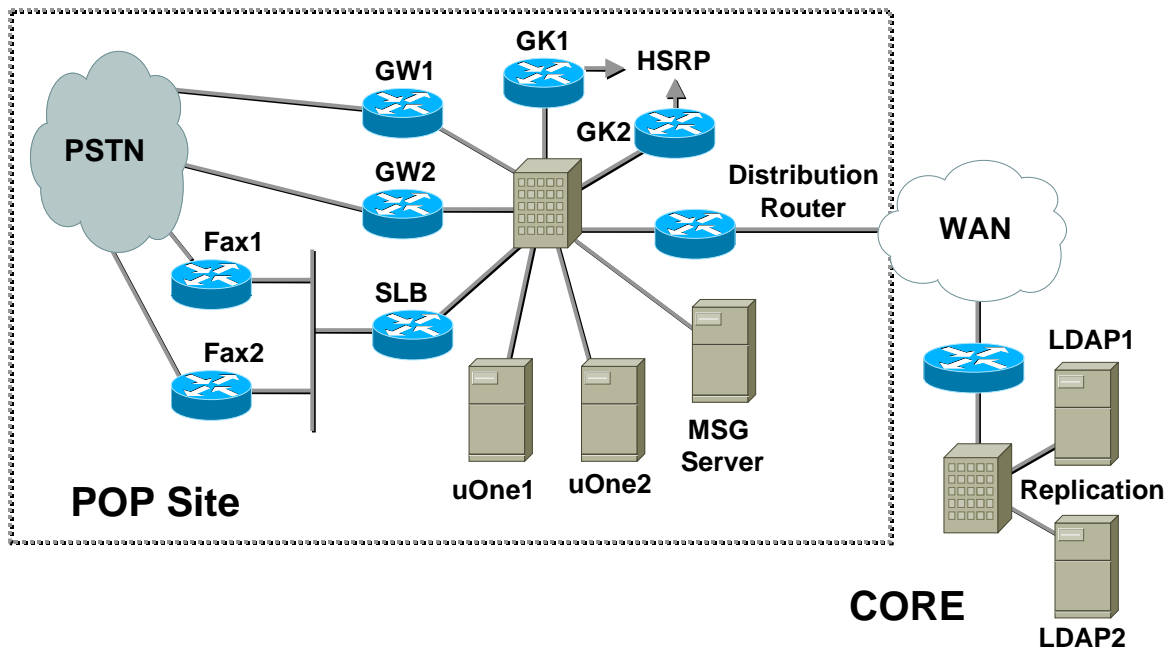
Redundant Gatekeepers with HSRP



Redundancy and Load Balancing with SLB



Fully Redundant Configuration



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Understanding Unified Communications for Service Providers

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CISCO SYSTEMS



EMPOWERING THE INTERNET GENERATIONSM

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