Introduction to Unified Messaging and Design for Voice
Session 2003
Agenda

• Why Consider Unified Messaging?
• Unified Messaging Technologies
• Unified Messaging Infrastructure
• Sample Call Flow
• Deployment Examples

Modern Communications Challenges

• 900 million voice mails a day!
• 5 million e-mails a minute!
• 30% of your long distance is fax!
• 200 million voice, 100 million e-mail, and 150 million fax users
• Mobile workforce/cell phones
• The Internet revolution
• All of the above are separate islands
Messaging Today

Parallel Infrastructures to Maintain

- Different User Databases
- Different Storage Media
- Multiple User Interfaces

Converging the Messaging Infrastructure

- Single User Database
- Single Data Storage
- Multiple User Interfaces

Voice Mail, E-Mail, Fax
What Are the Benefits of Unified Messaging?

Employee productivity
- Message access anywhere, any way, anytime
- One-stop message management
- Prioritization of messages by user

Customer satisfaction
- Increases speed of communication
- Allows for flexible communication flow

Cost reductions
- Moves/adds/changes are faster
- Single infrastructure to manage
- Single transport infrastructure for all media: Data/voice/video

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  - Single, Integrated Directory—LDAPv3
  - Unified Message Storage—IMAP/SMTP
- Unified Messaging Infrastructure
- Sample Call Flow
- Deployment Examples
What Technologies Does Unified Messaging Use?

Leverage the Internet Standards

Needs to Converge

- LDAPv3 Compliant Directory
- SMTP and IMAP Enabled Message Store
- Existing Access Technology

What Is a Directory

A Directory Can Be Thought of As a Specialized Database

**Strengths**
- Highly distributed, replicable, scalable
- Optimized for read access and searches
- Extensible
- Open, standard API (LDAP)

**Weaknesses**
- Not optimized for writes
- No support for transactions
- No support for change notification
Multiple Enterprise Directory Support

- Problem: different directory implementations from vendors
  - Different schemas
  - User models
  - Security models
- Solution: write to least common denominator...LDAPv3 compliance
  - Use core LDAPv3 user attributes
- Extend these attributes using standard classes

Supporting Multiple Enterprise Directories (Cont.)

Different User Models!

- Netscape inetOrgPerson
  - objectclass inetOrgPerson
  - oid 2.16.840.1.113730.3.2.2
  - superior organizationalPerson
  - allows
  - cn,
  - sn,
  - givenName,
  - mail,
  - uid,
  - userPassword

- AD User
  - objectclass User
  - oid 1.2.840.113556.1.5.9
  - superior organizationalPerson
  - auxiliary mailRecipient
  - auxiliary securityPrincipal
  - allows
  - cn,
  - sn,
  - givenName,
  - mail,
  - sAMAccountName
  - userPassword
Directory Structure of Information

DITs May Be Subdivided between Many Directory Servers, Each With a Piece of the Namespace (Referrals Point to Information a Server Does Not Have)

Typical LDAPv3 Directory Information Tree (DIT)

dn: uid=ttruitt, ou=people, o=cisco.com
objectClass: top person
cn: Todd Truitt
e: Truitt
telephoneNumbers: +14085251000
Example: Cisco Directory

ldapv3.cisco.com

Directory Search

ou=people

ou=people

truitt

gueary

cspan

gracely

dn: uid=ttruitt, ou=people, o=cisco.com
objectClass: top person

cn: Todd Truitt
sn: Truitt
telephoneNumber:+14085251000

WWW
directory.cisco.com

Cisco Directory

Contact Information

Mail Shop: EHS4P

Personnel Address: 5155 Foothills Avenue, Suite 400

Office: Rengness

State: COC-CHUFO

Country: United States

City: Denver


Organizational Information

Title: Senior Director Engineering Services

Department: Engineering Services

Manager: Senior Director Engineering Services

Employee Type: Regular

Employee Number: 22179

Cisco.com
Cisco Application Model

- Applications require a few basic attributes about a person which are basic attributes already defined in LDAPv3
  - Name, user ID, password, telephone number, etc.
- Directory-enabled applications require additional attributes that are application specific
  - E-mail server, v-mail disk quota, etc.
- Define application-specific attributes in an application profile
- Extend native user schema using auxiliary classes to support user and application profiles

Cisco Directory Deployment Model

Integrating Cisco DIT with Customer DIT
**Example: Unified Messaging**

```
ldapv3.cisco.com
```

**Directory Search**

```
ums.cisco.com
```

```
ou=people
```

```
truit	gearanto
cspain\nbgacely
```

```
dn:uid=truit, ou=people, o=cisco.com
objectClass: top person
cn: Todd Truitt
sn: Truitt
telephoneNumber:+14085251000
```

**Cisco Directory Deployment Example**

```
Cisco LDAP Partition with ou=cisco Directory Information Tree (DIT)
```

```
Enterprise Directory
```

```
ou=people
```

```
truit
gearanto
cspain\nbgacely
```

```
dn:uid=truit, ou=people, o=cisco.com
objectClass: top person
cn: Todd Truitt
sn: Truitt
telephoneNumber:+14085251000
```

```
ciscoatUserProfile:cn=truit-profile, ou=CiscoUserProfiles, ou=CiscoProfiles, ou=Cisco, o=cisco.com
```

**Integrating Cisco DIT with Customer DIT**
Cisco Directory Information Tree

Provides Class of Service Info:
- vmail-quota: 22.5MB
- length-greeting: 30 seconds
- length-msg: 120 seconds

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**POP vs. IMAP**

**POP**
- Post Office Protocol
- Messaging Server
- E-Mail
- Pulls All Messages to PC and Deletes from Server (Efficient on Server Storage Space)
- Check Messages
- TCP 110
- PC User

**IMAP**
- Internet Message Access Protocol
- Messaging Server
- Voice Mail
- Fax Mail
- E-Mail
- Pulls Messages to PC and Leaves on Server Until "Expunge" Command (Large Storage Space Required)
- Check Messages
- TCP 143
- PC User
- Messages Need to Stay on Server Because Users May Be Accessing From Multiple Points

**IMAP Impact: Unified Messaging Deployments**
- Used by clients to access messages
- All messages are left on the server
- Cisco IT plans for 200 MB per user
  - 30 minutes of voice-mail messages (750 KB per minute of voice message)
  - 177.5 MB leftover for e-mail
- Two TB of disk space for a 10,000 user deployment
- Significant user education needed
IMAP—I/O Bottleneck

- Typically sendmail uses a storage format called /var/mail or berkeley format
  Also known as the bezerkley format because it’s so inefficient
- User e-mail is stored in a flat file; new messages are appended to the end of the file
- Many corporations still use Sendmail

Berkley Mail and POP

- System starts at the top of the file and reads through the entire file to see if there are new messages
- It must do this every time a check is done for new messages
- Most Cisco employees check for new messages every two minutes!
- This storage format causes I/O bottlenecks on the server
Solution: Modern E-Mail Servers

- Use a modern mail system
  
  Netscape, SIMS, Mirapoint, Exchange, etc.

  Database storage format avoids the I/O bottlenecks
Simple Mail Transfer Protocol

- Standard method of transferring e-mail between hosts
- Used by clients to send messages across the Internet
- Also used by UMS systems to exchange all message types

UMS Networking: Forwarding a Voice Message

1. User enters extension
2. UMS queries LDAP with number
3. LDAP responds
4. UMS SMTPs message to um-server
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IP Telephony Infrastructure

- Layer 2 CoS Policy using 802.1p
- Layer 3/Layer 4 CoS Policy using IP Prec/DSCP
- Layer 3 QoS: Queue Traffic Flows Based Layer 3/Layer 4 Information
- Layer 3/Layer 4 CoS Policy using IP Prec/DSCP
- Layer 2/Layer 3/Layer 4 CoS/QoS Marking, Prioritization, and Queuing based on Traffic Types

Layer 2 Access

Layer 3 Distribution

Core Layer 3

WAN

PSTN

Server Farm

Layer 2/Layer 3/Layer 4 CoS/QoS Marking, Prioritization, and Queuing based on Traffic Types
Unified Messaging Infrastructure

Server Farm

CallManager Cluster

Switching Connectivity

LDAP

Voice/E-mail

uOne GateServers

Voice/E-mail

Redundant LDAP Infrastructure

master.cisco.com

ger replica-1.cisco.com

replica-2.cisco.com

Load Balanced LDAP Requests
Message Store Infrastructure

- Message store servers should be connected to UMS GateServers via high-speed media
  
  One-minute voice mail (750 KB) takes ~ four seconds to serialize on a T1 link

- A modern e-mail application should be utilized

- Evaluate needed disk space

- A regimented backup plan should be implemented for the message stores

UMS GateServer Infrastructure

- uOne GateServers must use a single LDAP directory in order to network

- uOne GateServer and QoS
  
  Voice VLAN, IP Prec = 5, DSCP = EF and UDP ports within 16384-32767 range
CallManager Connectivity

- uOne GateServer registers with CCM using the Skinny Station Protocol
- uOne GateServer should be configured to failover to a redundant CCM in a 3.0 cluster
- IP phones configured to forward to voice mail pilot number via CFNA/CFB

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Phone 1 Calls Phone 2; There Is No Answer

The Call Is Transferred to Voice Mail
Leave a Message
Call Flow

Phone 1
Phone 2
x2001
x2002

GateServer Plays WAV Greeting; Voice Mail Recorded

uOne
GateServer

LDAP

Message Store

Leave a Message
Call Flow

Phone 1
Phone 2
x2001
x2002

GateServer Sends the E-mail Using SMTP to the Messaging Server

uOne
GateServer

LDAP

Message Store
Leave a Message Call Flow

Phone 1
Phone 2
x2001  x2002

CallManager

Gateserver Instructs CallManager to Light the MWI

7

uOne GateServer

LDAP

Message Store

Leave a Message Call Flow

Phone 1
Phone 2
x2001  x2002

CallManager

CallManager Instructs IP Phone to Light the MWI Light

8

uOne GateServer

LDAP

Message Store
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Design Scenario: Campus

- uOne GateServers can connect to all of the CCMs and message stores
- SSP for uOne CCM failover
- G.711 voice everywhere
- All users have a single Voice mail pilot number
- Customer’s enterprise directory with the Cisco subtree as a partition
Design Scenario: Multisite with Centralized Voice Mail

• Scenario details
  DSP resources for compressed voice across the WAN or use G.729 only or G.711 only everywhere
  Centralized directory model: all LDAP look-ups traverse WAN

Design Scenario: Multisite with Distributed Voice Mail

• Scenario details
  Synchronized directory which contains entire enterprise user data
  Distributed directory model: Only LDAP replications and limited referrals traverse the WAN
  DSP Resources for compressed voice across the WAN or use G.729 everywhere
Legacy Voice Mail System Integration: AMIS-A Call Flow

1. Denver uOne 5.0E signals CCM to call the San Jose Octel System
2. CCM signals H.323 GW to call SJ PBX; Uses DTMF to send a “C” denoting an AMIS-A connection
3. San Jose responds with a “D”
4. Denver sends a START SESSION, SYSTEM NUMBER, MESSAGE and END of MESSAGE
5. Each transmission from Denver is acknowledged (RESPONSE frame) by San Jose

Summary

So What Did We Cover?

- Key ingredients and requirements of unified messaging
- How to build it...
  - Leverage existing Internet technologies and standards
  - Synchronized enterprise LDAP directory
  - Integrated or unified message storage
- IP services enabled infrastructure must exist
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