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Acknowledgments

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Internet2 Middleware Architects (MACE) and Video Middleware (VidMid) Working Groups

SURA Southeastern Universities Research Association

RADVISION, Cisco

NSF ANI-022710 “ViDe.Net: Middleware for Scalable Video Services for Research and Higher Education” (Gemmill (PI), Chatterjee, Johnson)


NSF EPS-0091853 via UA-01-016 “Alabama Internet2 Middleware Initiative”, NSF EPSCoR (Shealy, Gemmill (co-PI))

Any opinions, findings or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.
Outline

• Motivation – Why would you need directory services for multimedia?
• Design Goals and Architecture
• Use
  – White Pages
  – Single Sign On
  – Management
• Standards-Based
  – ITU-T Recommendation
  – IETF informational RFC
• Video Middleware Cookbook
Video/Vo-IP is Growing
CH National Gatekeeper (0041)
CY National Gatekeeper (00357)
CZ National Gatekeeper (00420)
DE National Gatekeeper (0049)
DK National Gatekeeper (0045)
ES National Gatekeeper (0034)
GR National Gatekeeper (0030)
HR National Gatekeeper (00385)
HU National Gatekeeper (0036)
IT National Gatekeeper (0039)
Ireland National Gatekeeper (00353)
LT National Gatekeeper (00370)
NL National Gatekeeper (0031)
NO National Gatekeeper (0047)
PL National Gatekeeper (0048)
PT National Gatekeeper (00351)
RU National Gatekeeper (007)
SE National Gatekeeper (0046)
SI National Gatekeeper (00386)
UK National Gatekeeper (0044)
The Hardest and Most Expensive Part of Video / VoIP

- Managing Users and Workflow becomes the biggest issue once deployment scales up.
  - Requesting gatekeeper/proxy server entry
  - Getting configuration information right in endpoints
  - Maybe you write some scripts to request these things ....now you’re handling password resets....
Non-Standard Credential Storage Means Multiple Logins/Password

H.323

Videoconferencing

Credentials

SIP

Videoconferencing

Credentials

UserName=Jill
Password=XYZ

UserName=Jill
Password=XYZ

UserName=Jill
Password=XYZ

OK

UserName=JPG
Password=ABC

UserName=JPG
Password=ABC

UserName=JPG
Password=ABC

OK

UserName=Jill
Password=XYZ

UserName=Jill
Password=XYZ

UserName=Jill
Password=XYZ

H.323 Gatekeeper

SIP Proxy

H.323 Endpoint

SIP

Non-Standard Storage
Technology Silos ➔ Redundant Processes and Confusion

Enterprise Tools
HR, Email, Billing, Parking, SSO, Web, Data Storage, VPN...

White Pages

University Directory

Tools
Populate, Billing, Web, Data Storage, VPN...

SIP Managers

SIP White Pages

SIP, database, directory

SIP IP-PBX

H.323 Managers

H.323 White Pages

H.323 Database, directory

H.323 Video Call Server

Tools
Populate, Billing, Web, Data Storage, VPN...

IM Managers

IM White Pages

Messaging Database, directory

Unified Messaging

USERS

My listing is wrong!
How do I call X?
H.350 DESIGN GOALS and ARCHITECTURE
H.350 Design Goals

- Associate endpoints with people
- Enable online searchable "white pages"
- Store all data in central directory (not call server); draw from authoritative source & avoid duplication
- Support global white pages “portals”
- Multiple endpoints/user; multiple protocols/endpoint
- Provide or auto-load per-user configuration
- Extensible
- “Lightweight” impact on enterprise directory
Operational Requirements

- Universities are building central, authoritative user directories – Use this identity management system, don’t replicate into vendor’s (often proprietary) directory
- Standardize storage of protocol-specific data to ease updates and migrations; one central data store for multiple protocols
- Leverage identity management for reliable USER (not device) authentication
The Enterprise Directory

- Central stores of information about people associated with an institution
- Authoritative (eg: Human Resources, Registrar; Telecommunications)
- ONE consolidated list – duplicate identities resolved
- Benefits:
  - Correct and current
  - Single location to disable account
  - Single location to reset password
- Video/VoIP manager – reinvent this wheel?
What Is H.350?

• H.350 *is*
  – An LDAP schema
  – Standardized way to store information
  – Simple, basic elements are defined
  – Extensible – can include proprietary elements
  – Multi-protocol

• H.350 *is not*
  – A protocol
  – Just for H series protocols
An ITU-T Standard

- Adopted as ITU-T Recommendation H.350 in August 2003
- Driven by university (Internet2, Educause, SURA) requirements
H.350 Series Recommendations

- **H.350** - Directory services architecture for multimedia conferencing
  - Base architecture
- **H.350.1** - Directory services architecture for H.323
- **H.350.2** - Directory services architecture for H.235
- **H.350.3** - Directory services architecture for H.320
- **H.350.4** - Directory services architecture for SIP
- **H.350.5** - Directory services architecture for non-standard protocols
- **H.350.6** – Directory services architecture for call forwarding and preferences
- **H.350 Implementers Guide**
LDAP?

- Lightweight Directory Access Protocol
- A protocol describes messages used to access certain types of data
- LDAP provides a data model (schema) that standardizes data naming and organization for global unique naming
- Derived from OSI X.500
- LDAP V3 (IETF RFC 3377) includes important security enhancements (SSL, SASL …)
Directory-Enabled Video / VoIP

“Sanity”

Directory Managers

Enterprise Directory

H.350 Directory

White Pages

SIP IP-PBX

Service Managers

H.323 Video Call Server

Unified Messaging

Enterprise Tools
HR, Email, Billing, Parking, SSO, Web, Data Storage, VPN...

Workflow Management

USERS
A Peek Inside H.350

**H.350 Directory**

commObject

commUniqueId

commOwner

commPrivate

h323Identity

h323IdentityGKDoman

h323IdentityDialedDigits

h323IdentityEmail-ID

……

h323IdentityEndpointType

h323IdentityServiceLevel

h235Identity

h235IdentityUid

h235IdentityPassword

userCertificate

**Enterprise Directory**

inetOrgPerson

name (dn)

address

telephone

email

organization

organizational unit

commURI

RFC 1274

userPassword
Flexible Architecture

One person can be associated with more than one commURI (ie, device)

One person can be associated with multiple protocols, eg. both H.323 and SIP
Flexible Deployment

- Enterprise and H.350 directories can be two branches of a single DIT, or
- May be implemented as two separately administered directories
- Enterprise entry needs only commURI
H.350.6 Call Forwarding and Preferences

• URI + Label
  – URI: where to find call forwarding address
  – Label: type of forwarding and wait time

• Potential Targets
  – Another number
  – Unified messaging number
  – CPL script
  – mailto:diego@ecole.edu
  – video game
What about Rooms?

• Depends on Object classes available
• Interesting authentication questions:
  – Who should authenticate? The room or a participant or ALL participants?
  – Nothing in H350 prohibits listing rooms in a directory or associating rooms with devices
• Room-based systems (VRVS, AG) REQUIRE use of a room
What About Presence?

• Call forwarding and Call preference is not presence
• sip.edu (an Internet2 project) uses presence and didn’t think much of H.350 until they scaled up their service and decided configuration storage and autoconfiguration were “good things”
• H.350 for XMPP (Jabber) in progress
H.350 USE FOR WHITE PAGES
Example Entry in ViDeNet Directory

<table>
<thead>
<tr>
<th>Name</th>
<th>Jill Gemmill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>University of Alabama at Birmingham (UAB)</td>
</tr>
<tr>
<td>Department</td>
<td>Academic Computing</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:jgemmll@uab.edu">jgemmll@uab.edu</a></td>
</tr>
<tr>
<td>Title</td>
<td>Assistant Director</td>
</tr>
<tr>
<td>Phone</td>
<td>205-975-2850</td>
</tr>
<tr>
<td>Street address</td>
<td>701 20th Street South</td>
</tr>
<tr>
<td>City</td>
<td>Birmingham</td>
</tr>
<tr>
<td>State/Province</td>
<td>Alabama</td>
</tr>
<tr>
<td>Country</td>
<td>us</td>
</tr>
<tr>
<td>Postal Code</td>
<td>35294</td>
</tr>
<tr>
<td>Endpoint</td>
<td>My Desktop AB 7th Floor Room Unit</td>
</tr>
</tbody>
</table>

http://www.vide.net
“Enter ViDeNet”
‘Non-Standard’ Protocols

- H.350.5 GenericIdentity

- http://<Your instructions here>
Other Queries Are Possible

![ViDeNet Search Engine](image-url)
Global Directory Services

- commObject (video dir.)
- Enterprise dir.
- commObject & Enterprise dir.
- Combined video/Enterprise dir.

- Ldif file
- Config. file
- Export

- Crawler
- TAGS (TIO Indexer)
- Ldif file
- Config. file

- TAGS (TIO Indexer)
- Export

- TIO Pool
- LIMS
- LDAP v3 server
- LDAP v3 client

- Client / browser
About the Global Directory

• http://directory.vide.net/
• Built by SURFnet using
  – TIO = "Tagged Index Object ", RFC 2654
  – CIP = “Common Indexing Protocol”, RFC 2653
  – LIMS = “LDAP Index Metadata Server” (Catalogix)
H.350 USE IN SINGLE SIGN ON
Security Credential Storage
(H.235 and SIP)

H.350 Directory

Enterprise Directory

H.350 Endpoint Object

- commObject
- commUniqueId
- commOwner
- commPrivate
- h235Identity
  - h235IdentityEndpointID
  - h235IdentityPassword
- h323Identity
  - h323IdentityGKDomain
  - h323Identityh323-ID
  - h323IdentitydialedDigits
  - h323Identityemail-ID
  - h323IdentityURL-ID
  - h323IdentitytransportID
  - h323IdentitypartyNumber
  - h323IdentitymobileUIM
  - h323IdentityEndpointType
  - h323IdentityServiceLevel

Enterprise 'Person' Object

- commURLObject
- commURL
- person
  - sn
  - cn
  - userPassword
  - ...
- organizationalPerson
  - title
  - telephoneNumber
  - street
  - ...
- inetOrgPerson
  - mail
  - uid
  - userCertificate
  - ...

Visual representation of the H.350 Directory and Enterprise Directory, showing the structure and relationships of each object.
H.350 (Standard) Credential Storage

H.350 Standard Storage

h323Identity
User Name=Jill
Password=XYZ

sipIdentity
Username=JPG
Password=ABC
Enterprise Authentication with H.350

Enterprise Credentials

Videoconferencing Credentials

University LDAP Directory

eduPerson
dn=jgemmill
Pwd=1234567

commURI

sipIdentity
Username=JPG
Password=ABC

h323Identity
UserName=Jill
Password=XYZ

H.350 Standard Storage

commURI
H.350 COOKBOOK

“Steal This Code”
What’s Inside?

• Discussion of Architecture
• Discussion of Implementation Choices
• Step by Step Installation and Configuration instructions for
  – SunOne, OpenLDAP, Active Directory
• Platform-specific LDIFs for eduPerson and commObject
• Example management scripts
ViDe H.350 Cookbook
http://lab.ac.uab.edu/vnet/

<table>
<thead>
<tr>
<th>Quick Links</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cookbook for Videoconferencing Middleware</strong></td>
</tr>
<tr>
<td><strong>H.350 Brochures</strong></td>
</tr>
<tr>
<td><strong>H.350 LDIF Files</strong></td>
</tr>
<tr>
<td><strong>CGDip Client v1.1</strong></td>
</tr>
<tr>
<td><strong>Search the ViDeNet proof of concept H.350 directory</strong></td>
</tr>
<tr>
<td><strong>Register in the ViDeNet proof of concept H.350 directory</strong></td>
</tr>
<tr>
<td><strong>Search the ViDeNet global video directory of directives prototype</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Announcement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>May 27, 2004</strong></td>
<td>Version 1.0 of the ViDe H.350 Cookbook has been released!</td>
</tr>
<tr>
<td><strong>April 08, 2004</strong></td>
<td>Presentations for the 6th Annual SURA/VIde Workshop and the H.350 Workshop are now available on the presentations page.</td>
</tr>
<tr>
<td><strong>December 15, 2003</strong></td>
<td>The Video Middleware Cookbook 0.5 has been released for National Science Foundation Middleware Initiative (NsfM)</td>
</tr>
<tr>
<td><strong>March 19, 2003</strong></td>
<td>Press releases are now featured on the links page.</td>
</tr>
<tr>
<td><strong>March 19, 2003</strong></td>
<td>The CGDip Client v1.1 is now available.</td>
</tr>
</tbody>
</table>

Questions and Comments: Jason L. W. Lynn
Last updated Thursday, May 27, 2004 13:05
Example Scripts

- **Videoconferencing Endpoint Request**
  - This application allows any authenticated user to request that a videoconferencing endpoint be associated with their white pages information at UAB.
Some of Our Applications

- **Instant Messaging Account Provisioning**
  - This application allows any authenticated user to provision a UAB instant messaging account

- **Videoconferencing Endpoint Request**
  - This application allows any authenticated user to request that a videoconferencing endpoint be associated with their whitepages information at UAB.
Coming Soon as a Book

- HTML web version will remain freely available
- PDF and printed versions will be available by end of 2004
- Watch [www.lulu.com/vide/](http://www.lulu.com/vide/) or project web site for announcement
- Proceeds will benefit ViDe
So, does any of this work and exist in the real world?
Prototypes Developed

• ViDeNet and “early adopter” directory entries
• H.350-aware H.323 endpoint
• H.350-aware gatekeeper
• H.350-aware SIP user agent
• H.350-aware SIP Proxy server
• Automated configuration for endpoints
• Enterprise authentication used to obtain protocol-specific password
• White pages and “Directory of directories”
Jill B Gemmill

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University job title: **Asst Dir Academic Computing**
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   **BIRMINGHAM AL 35294-0107**
Office telephone number: **(205) 975-2850**
Office hours: 9-6
Current project(s): **Internet2, Secure Internet videoconferencing, ViDe**
Other colleges attended: **Antioch College**
URL for WWW use: **http://www.dpo.uab.edu/~jgemmill/**
Fraternity or sorority: **never have liked them much**
Degrees earned: **B.A. M.S. MSEE**

**Multimedia contact info:**
- **[H323] My Desktop**
- **[H323] AB 7th Floor Room Unit**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>commOwner</td>
<td>jgemmill</td>
</tr>
<tr>
<td>h323IdentitydialedDigits</td>
<td>00115490000</td>
</tr>
<tr>
<td>h323IdentityEndpointType</td>
<td>Terminal</td>
</tr>
</tbody>
</table>
Industry Uptake? Yes!

- RADVISION ECS
- VCON MXM (Q2 2004)
- Tandberg TMS 8.0
- HCL SIP Proxy
- Aethra
H.350 REVIEW
Endpoints Implementing H.350 can…

- Lookup correct configuration information and load it.
- Do white pages search via LDAP (standard address book)
- ‘click to dial’ if supported
- Locate authentication credentials
Call Servers Implementing H.350 can…

- Pull user name and configuration from standardized storage
- Locate user’s authentication credentials and verify configuration
- Use XIdentityServiceLevel attribute to provide levels of authorization
- Locate call forwarding preferences
Users can....

• Locate dialing information easily
• Have correctly configured endpoints
• Easily specify call-forwarding preference
Managers can…

- Manage all protocols and brands in an organized way.
- Avoid vendor lock; use multiple brands of equipment together
Conclusions

• Videoconferencing Services are growing
• Managing these services well provides scalability and ease of use
• H.350 plus cookbook are valuable tools