Secure real-time audio/video communication – H.350, Encryption & Gatekeeper/Proxy – using H.323 (…and a bit SIP)

Tutorial/workshop session

- H.350 directory services -

19th APAN Meeting
Bangkok, Thailand
January 2005

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The Problem

- Managing Users and Workflow becomes the biggest issue once deployment scales up.
  - Requesting gatekeeper/proxy server entry
  - Requesting white pages listing for dialing info
  - How to do reliable billing
  - How to implement classes of service
  - Getting configuration information right in endpoints
- The Hardest and Most Expensive Part of Video / VoIP

Resource Discovery

- How do I find people and endpoints?
- How do I find MCUs and gateways?
- Do I discover or ‘register’ resources?

What Operational Needs?

- Universities are building central, authoritative user directories – Use this identity management system, don't require 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

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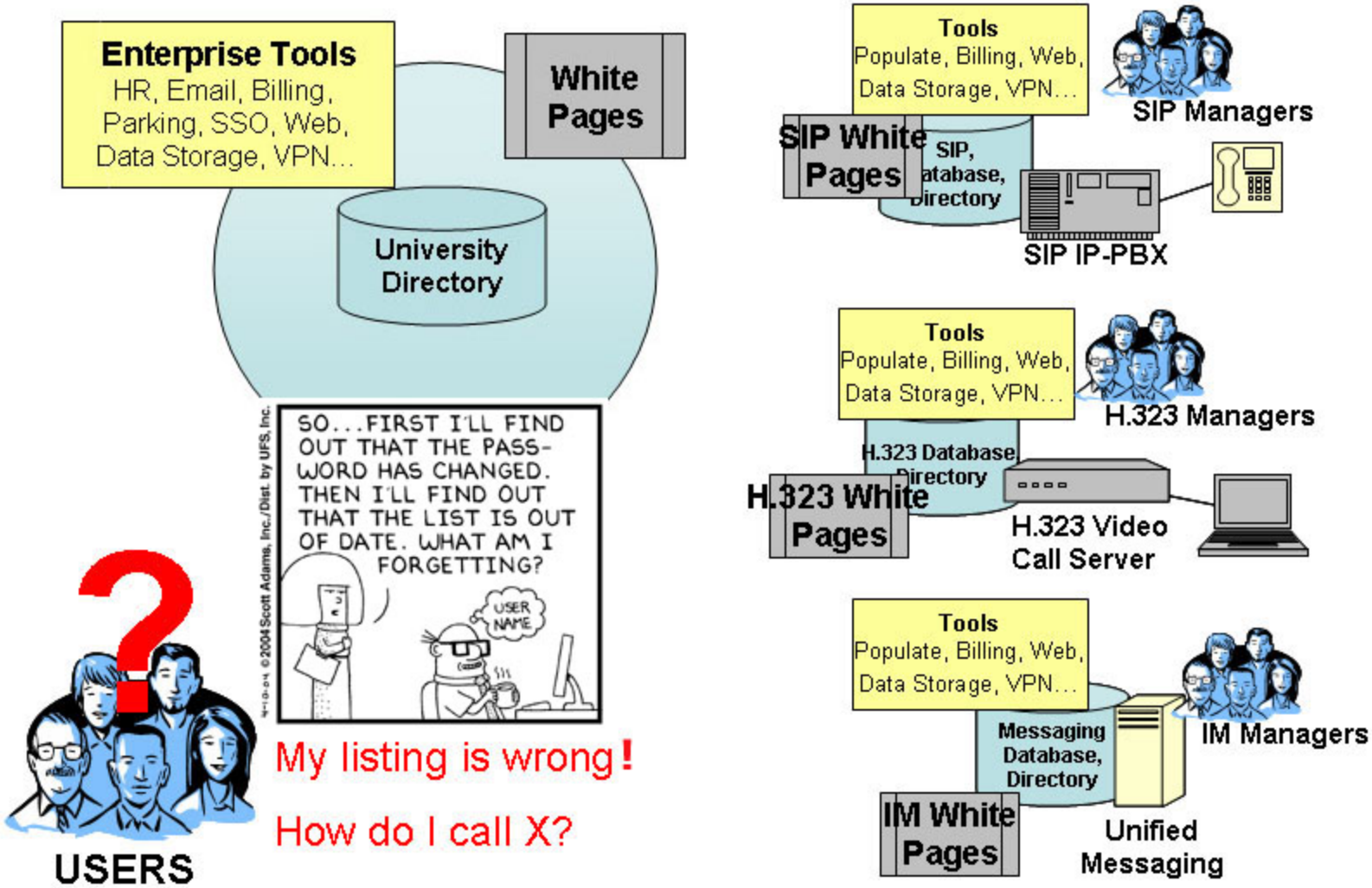
Technology Silos ➡ Redundant Processes & Confusion



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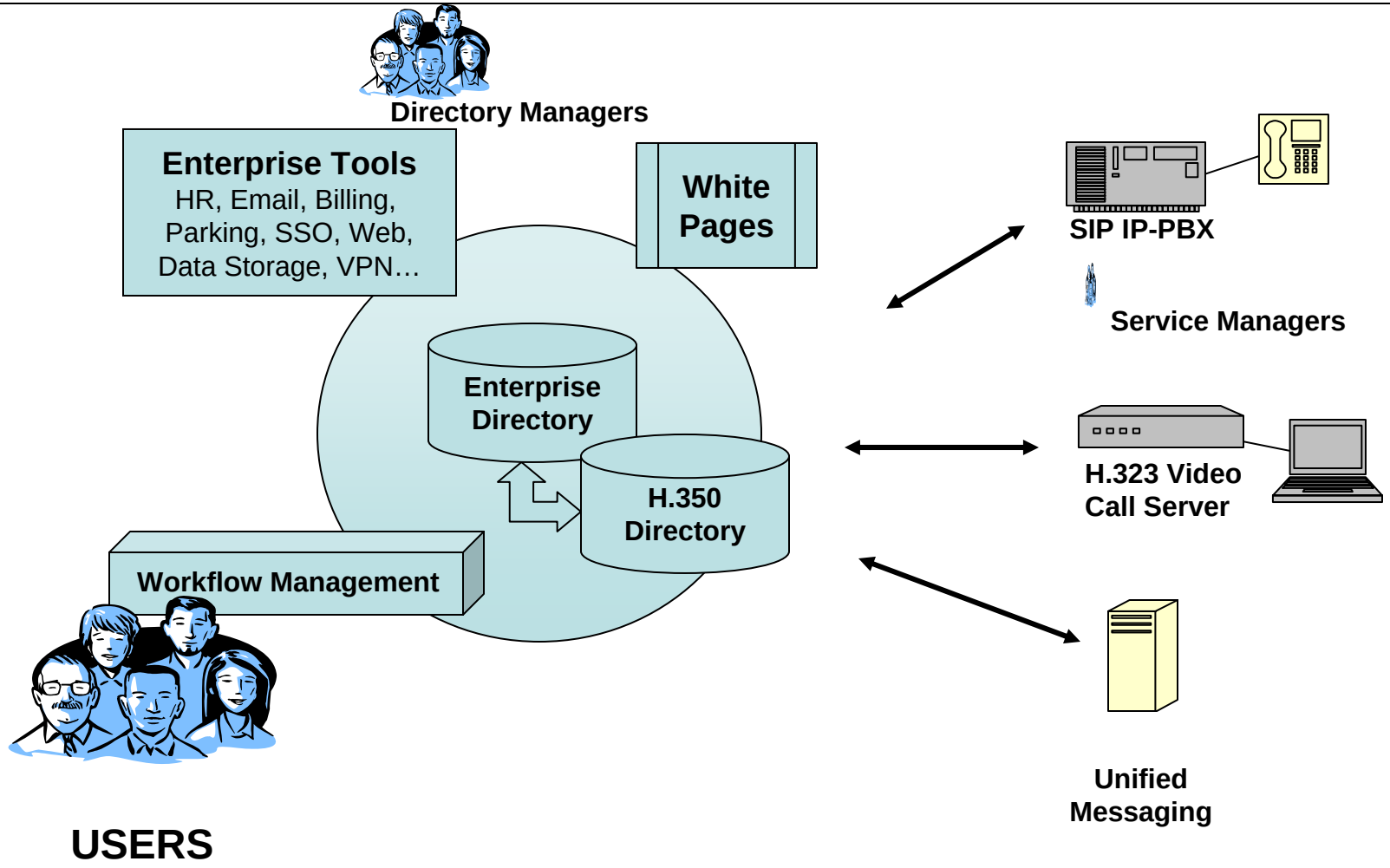
The Solution: Directory-Enabled Video / VoIP



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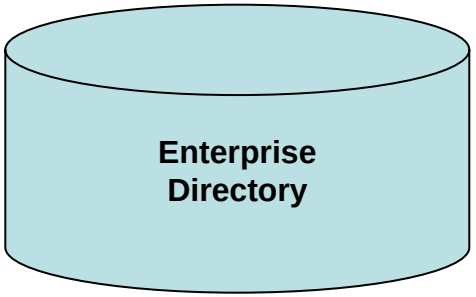
The Solution: Video Conferencing Directory Services

- Directories emerged as a key element of VC services
  - E.g. in ViDeNet
- White Pages function is critical
- Directory as canonical data source is essential for large scale enterprise deployments
  - Can't afford separate organizational unit to manage video 'accounts'
  - Rely on existing HR data management

Using: 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?



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Using: LDAP

- **L**ightweight **D**irectory **A**ccess **P**rotocol
- 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…)
- Features: Central Name Space & Identity Mgmt
- Highly flexible architecture
- Fast database, but specialized
- Can Enable: White Pages, Authentication, User / account management, Endpoint management

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Benefits From Standardized Identity Management for Video / VoIP

- Without re-working business process, you can
  - Change vendor platforms
  - Have multi-vendor services
  - Integrate more than just video/voice (e.g. email, web)
- Leverage existing identity management tools
  - Most call server manufacturers not expert at identity management
  - LDAP tools are mature, secure, flexible, open

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The Start

- Operational need for directory-enabled video/voice led to Video Middleware working group "vidmid-vc" (Internet2 Middleware and ViDe joint initiative) http://middleware.internet2.edu/video/
- Project with NSF grant to UAB with partners CGU, SURFnet, UNC, and RADVISION
- Architecture proposed to ITU-T, accepted and ratified as H.350 in August 2003, also IETF informational

Video middleware

- Room for improvement. Today's VC apps:
  - No resource discovery – need to already know address of gatekeeper/proxy, target, gateway
  - Non-existent or unreliable authentication (who is calling?)
  - No authorization (all users have same access)
  - No security (eavesdropping)

- Develop Middleware Strategies and Prototype Working Code for
  - **FEDERATED** (No Root Authority; multiple policy)
  - **SECURE** (Authenticated Users; Ability to apply Usage policies; no eavesdropping)
  - **VIDEOCONFERENCING** (H.323 and SIP) Services

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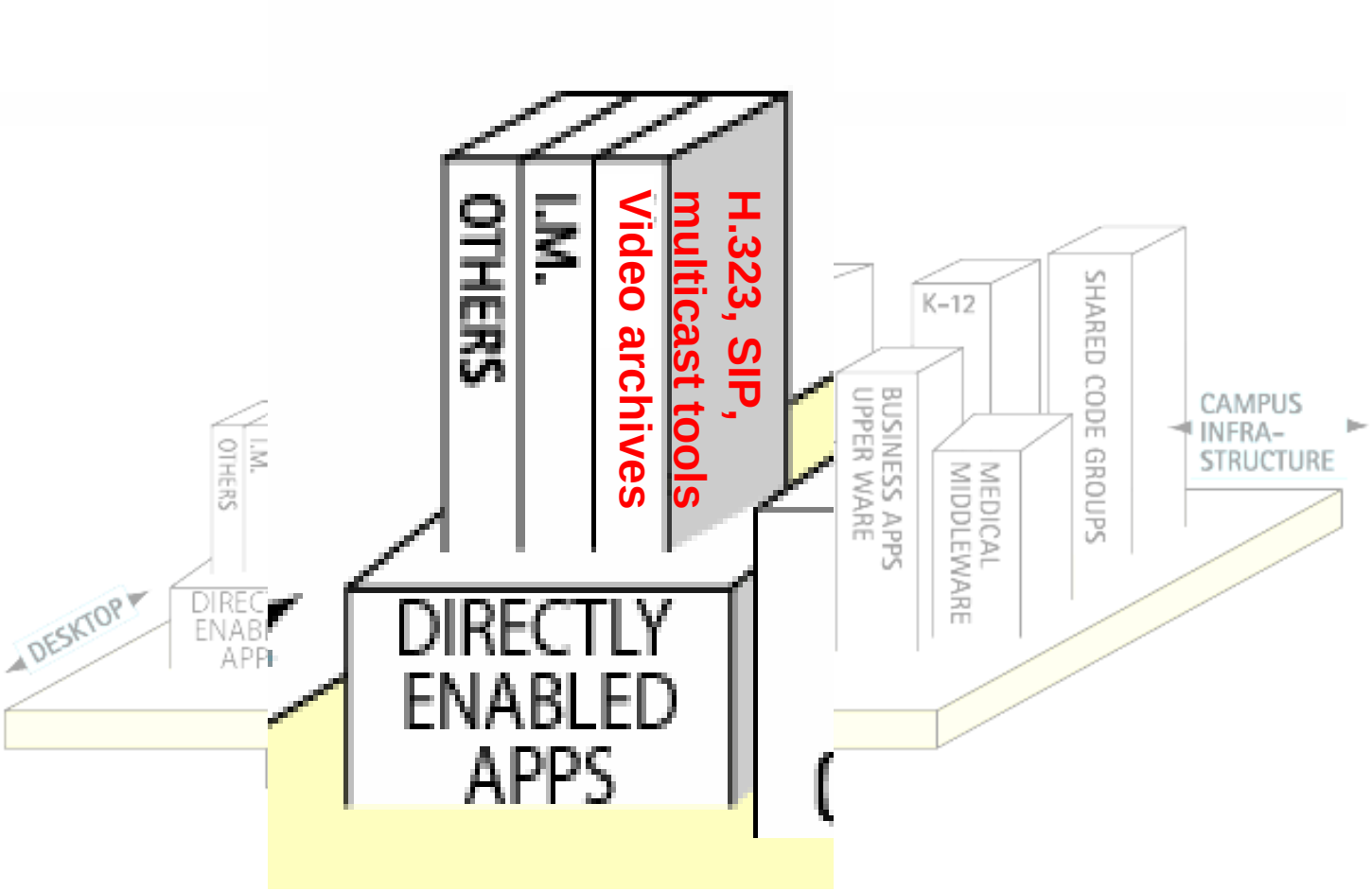
Where are we?



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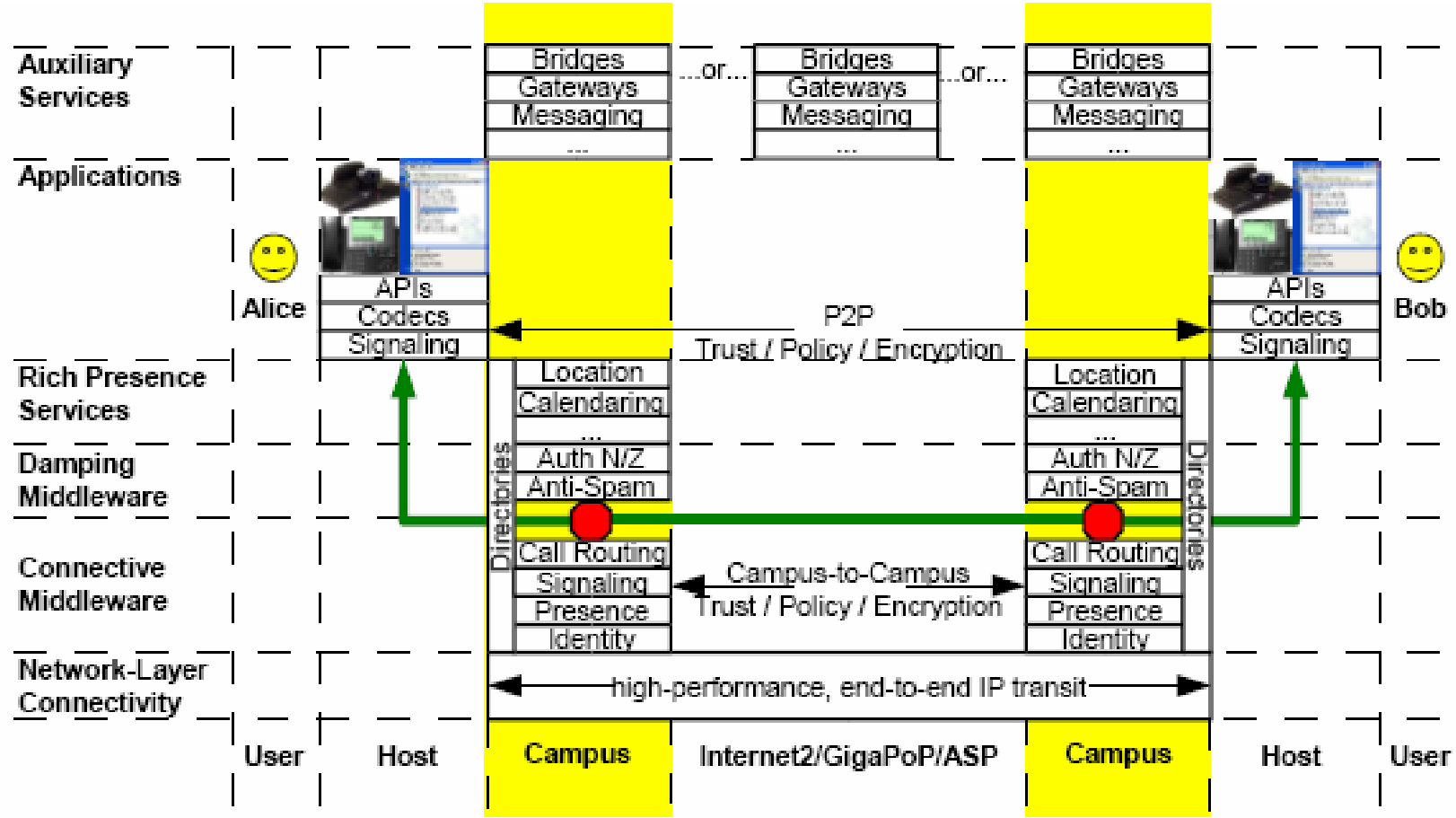
Communication middleware



- Learn from "*Connective Middleware for Voice and Integrated Communications*" *[Ben Teitelbaum, Internet2]*

VC Directory Services 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
- Multiple endpoints/user; multiple protocols/endpoint
- Provide or auto-load per-user configuration
- Extensible
- “Lightweight” impact on enterprise directory
- Support global white pages “portals”

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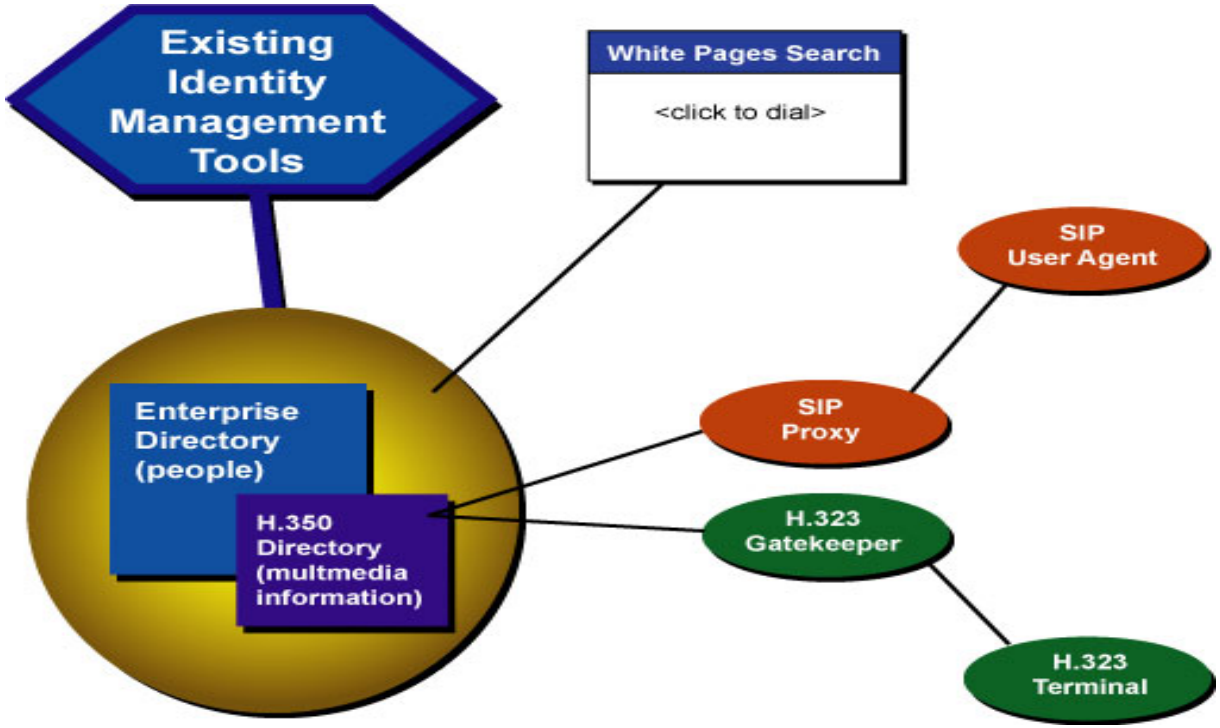
The Outcome

H.350 Architecture Components



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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

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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.350.7 – Directory services architecture for Presence Information (XMPP)
- **H.350 Implementers Guide**

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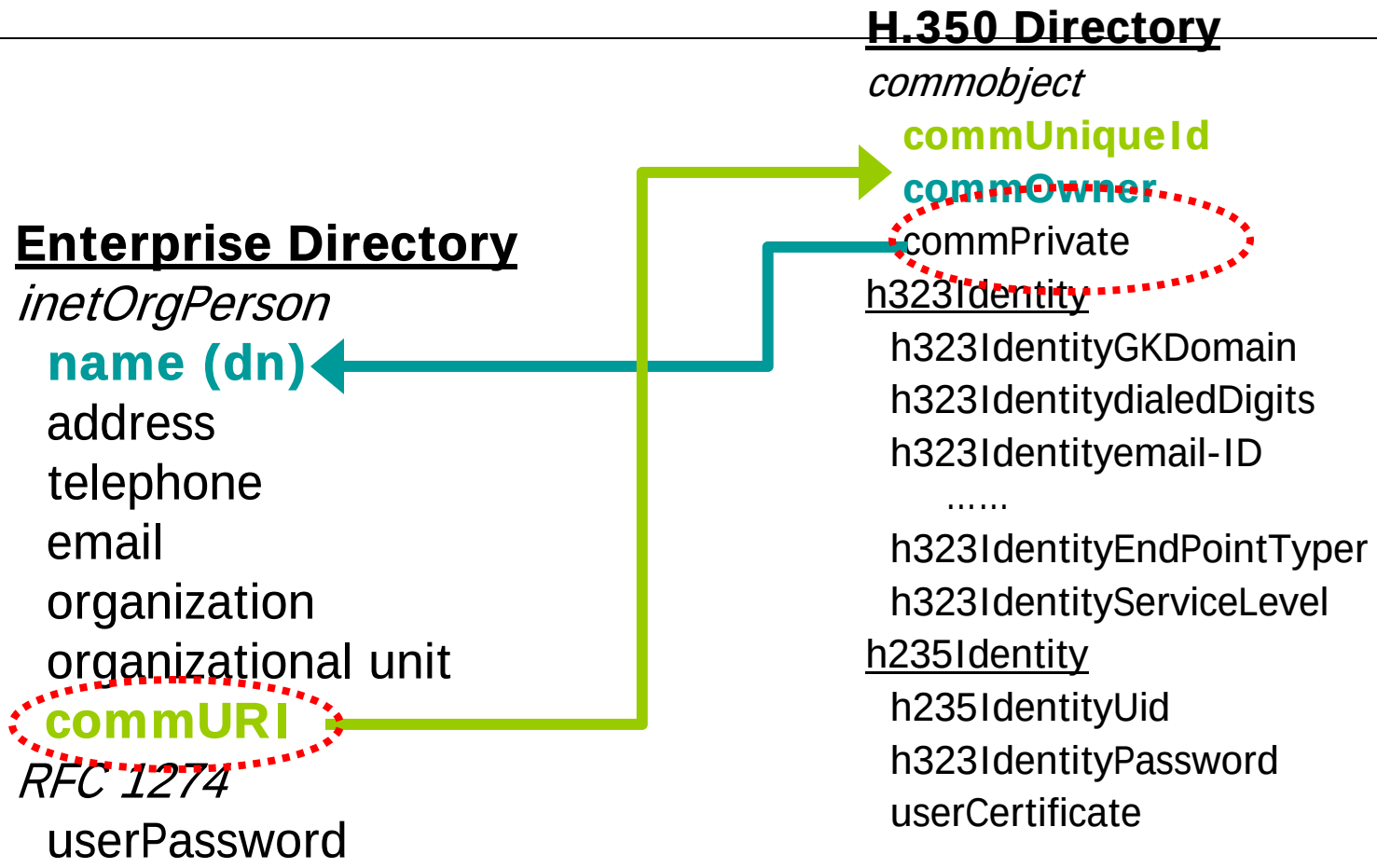
What About Presence?

- 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".

A Peek Inside H.350



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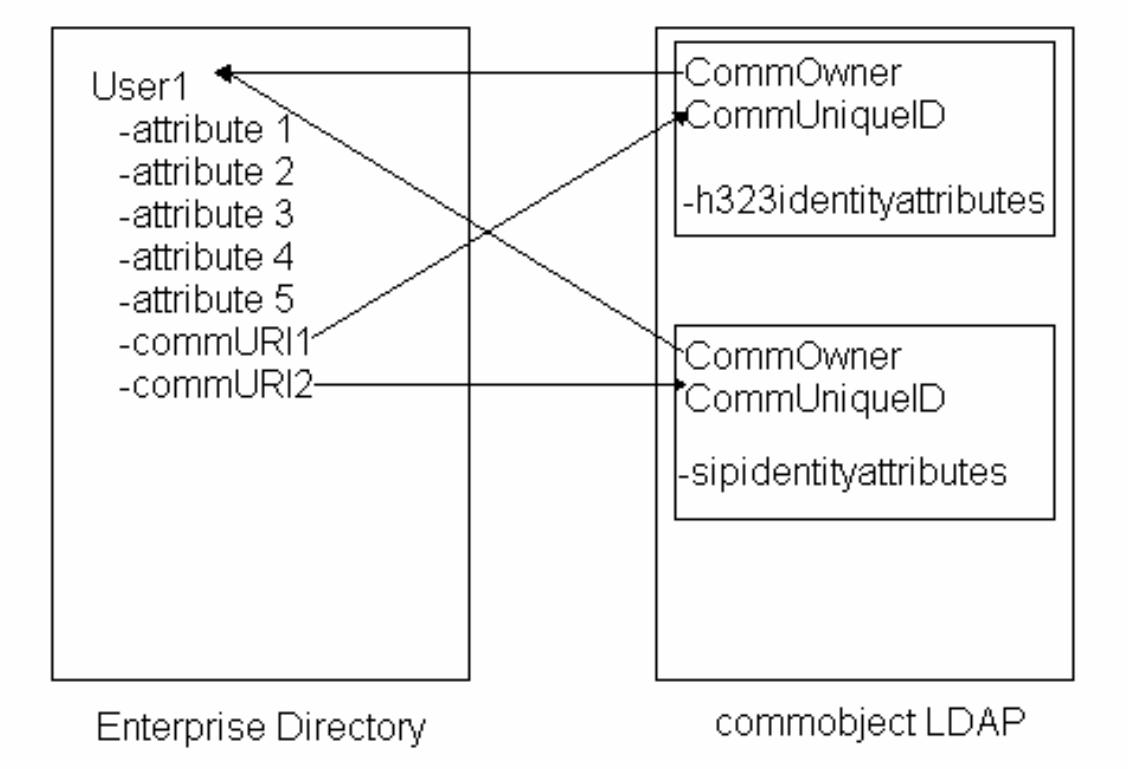
Flexible Architecture



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

One person can be associated with multiple protocols, eg. H.323 *and* SIP

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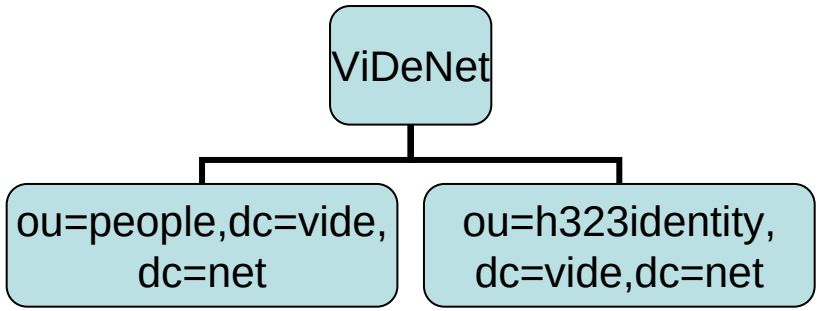
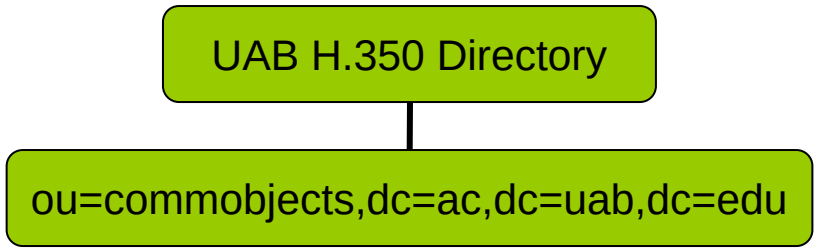
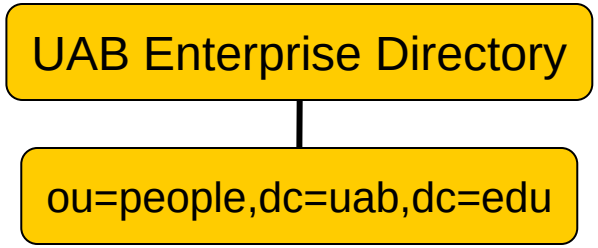
Flexible Deployment

- 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







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H.350.6 Call Forwarding and Preferences

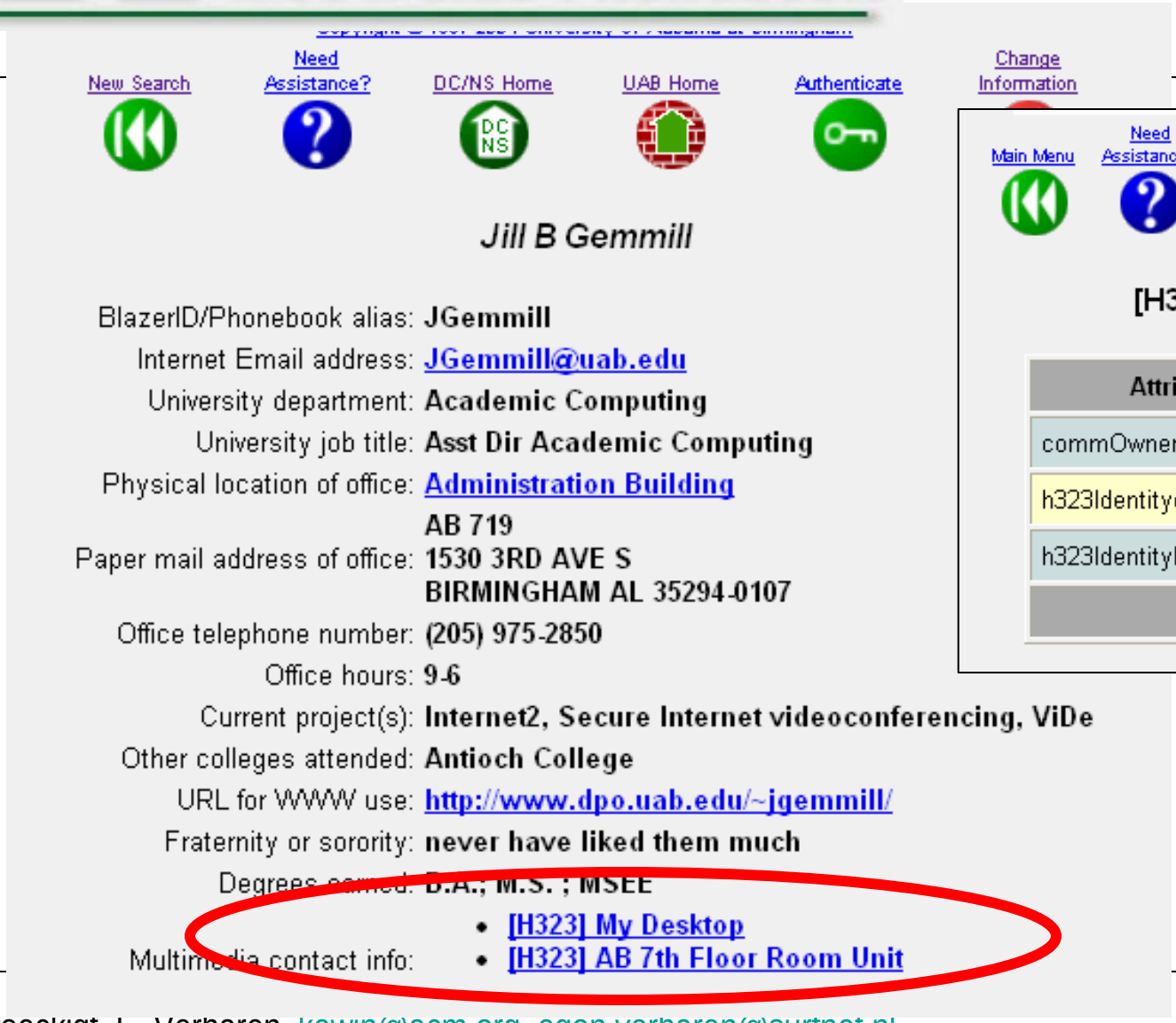
- URI + Label
  - URI points to location where call forwarding address can be found
  - Label specifies type of forwarding and wait time
- Potential Targets
  - Another number
  - Unified messaging number
  - CPL script
  - mailto:
  - Web form ‘Sorry we missed your call. Please fill out this form and we’ll have someone call you back’
  - whack_a_mole.jsp video game

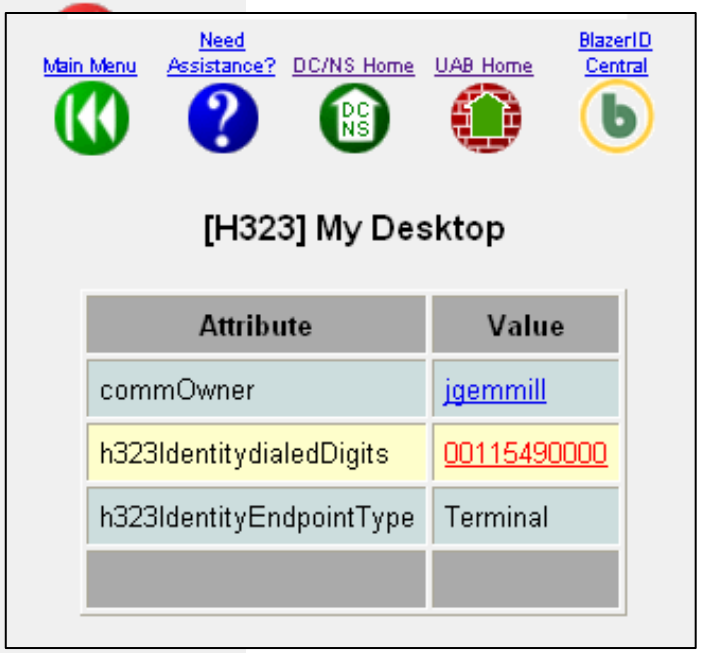
What about Rooms?

- Depends on objects available in enterprise directory
- Open question: if authentication is used, who should authenticate?
  - The device
  - The conference moderator
  - Everyone in the conference
  - All of the above

UAB Electronic Phonebook

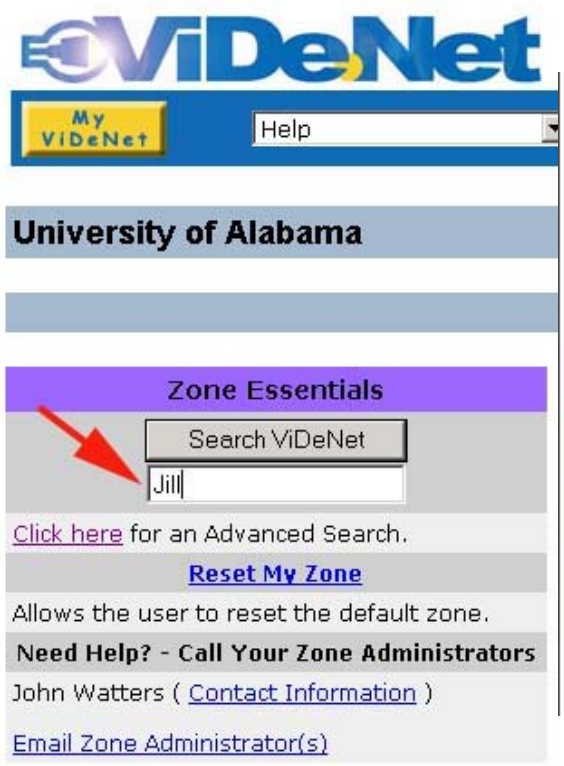
http://www.uab.edu/phonebook/



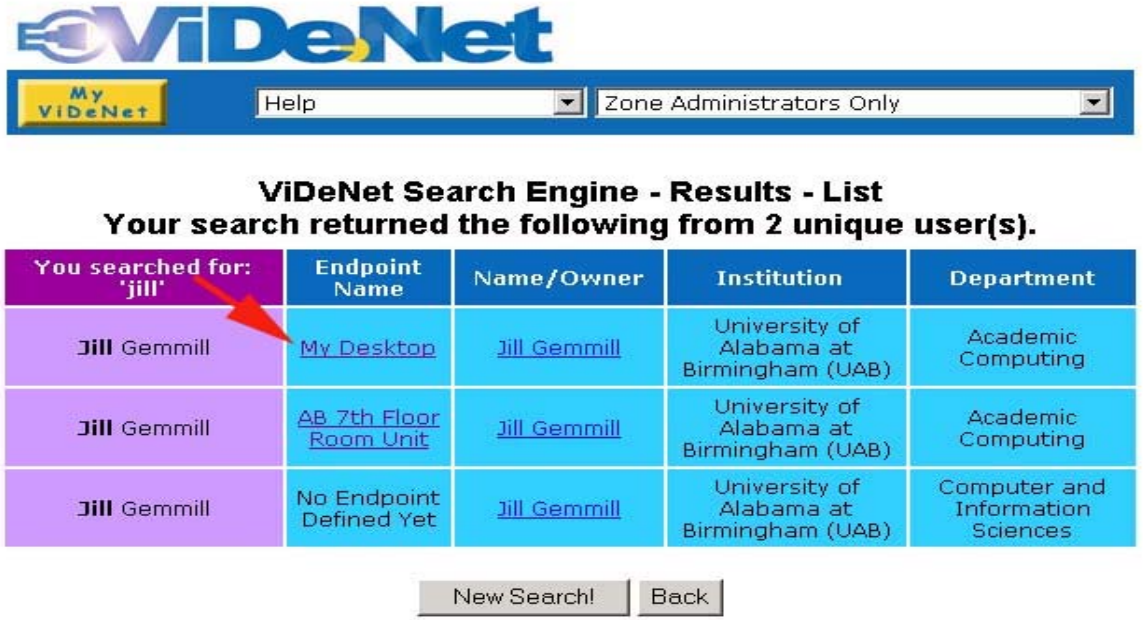


Search for a person

http://videnet.unc.edu/vide-dod/index.phtml



Enter name; Search



Result: Associated with multiple endpoints

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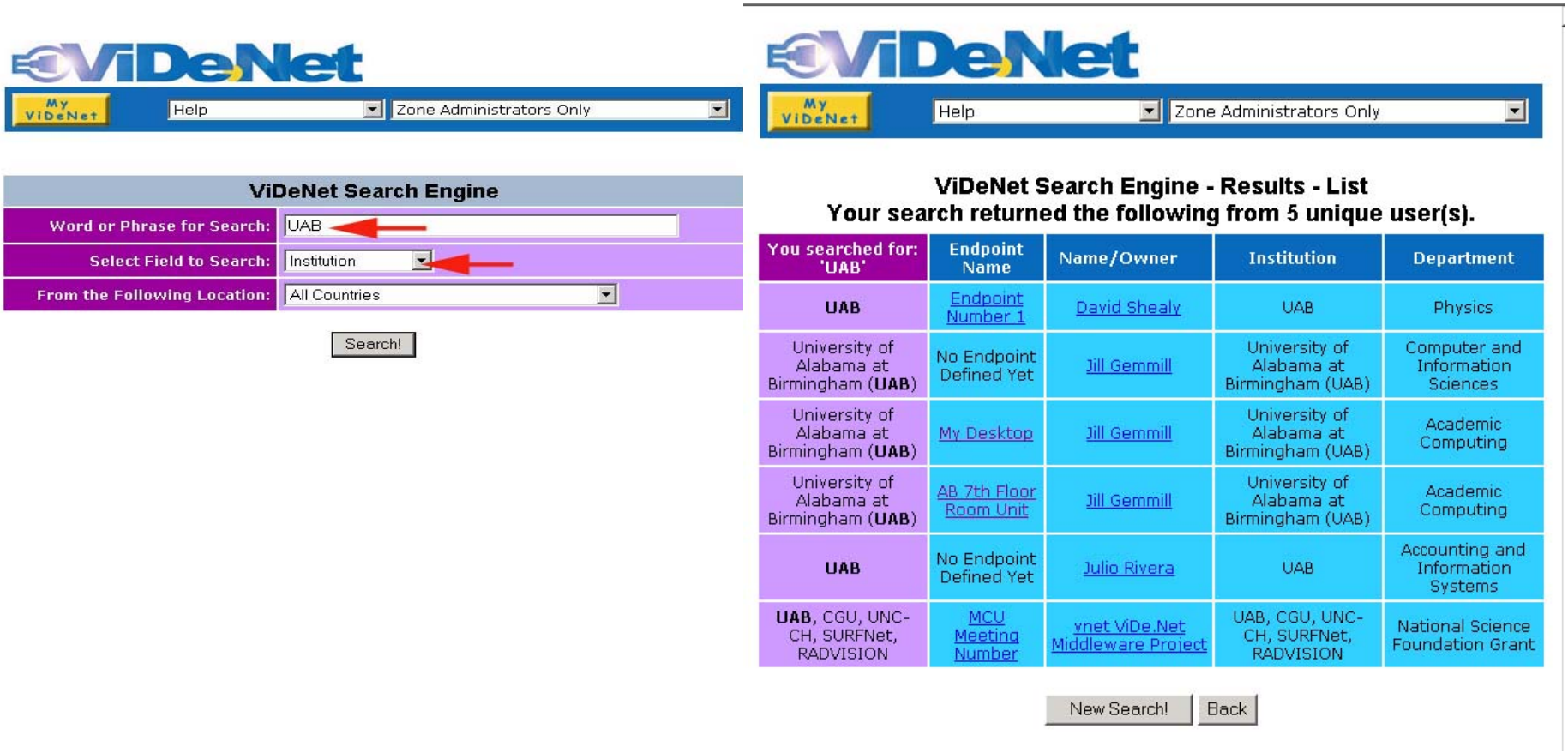
Other Searches Possible



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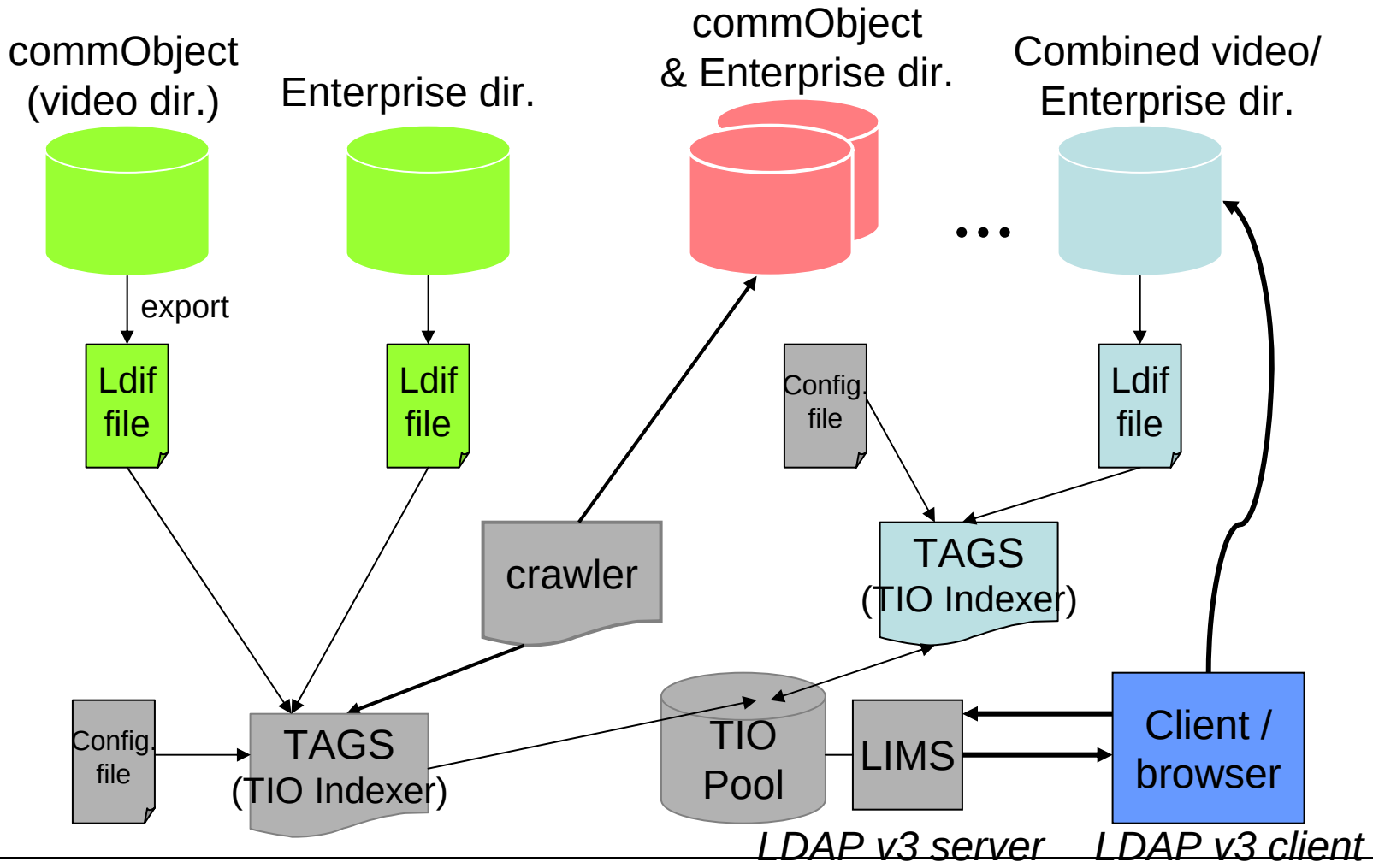
Global Directory Services



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Directory of Directories Search

- Simple Java Directory Search searches public attributes in predefined list of directories.
- Under Development: scalable approach indexes remote directories (LIMS/TIO). A “google-like” repository linking back to distributed entries.

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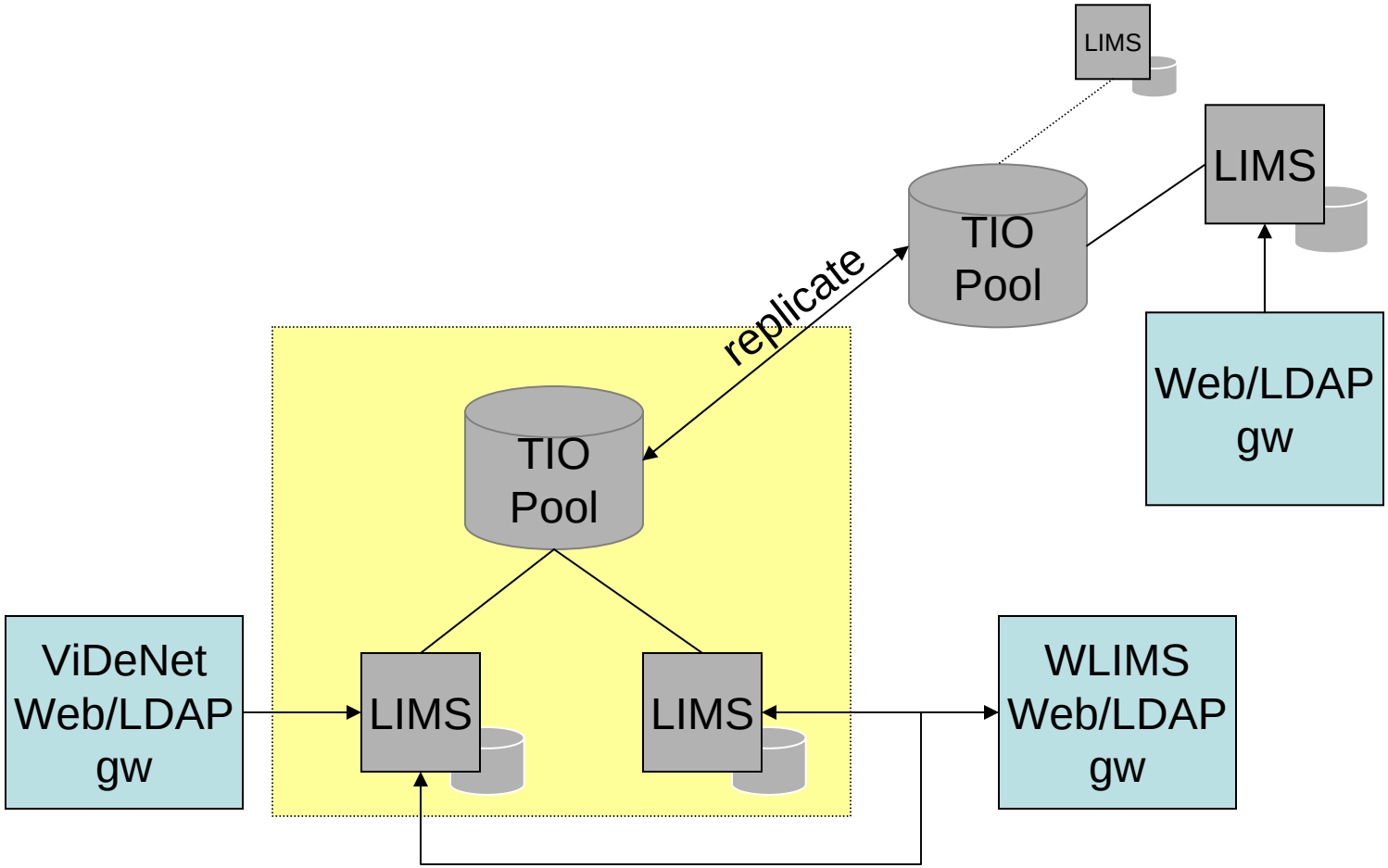
Distributed TIO pool



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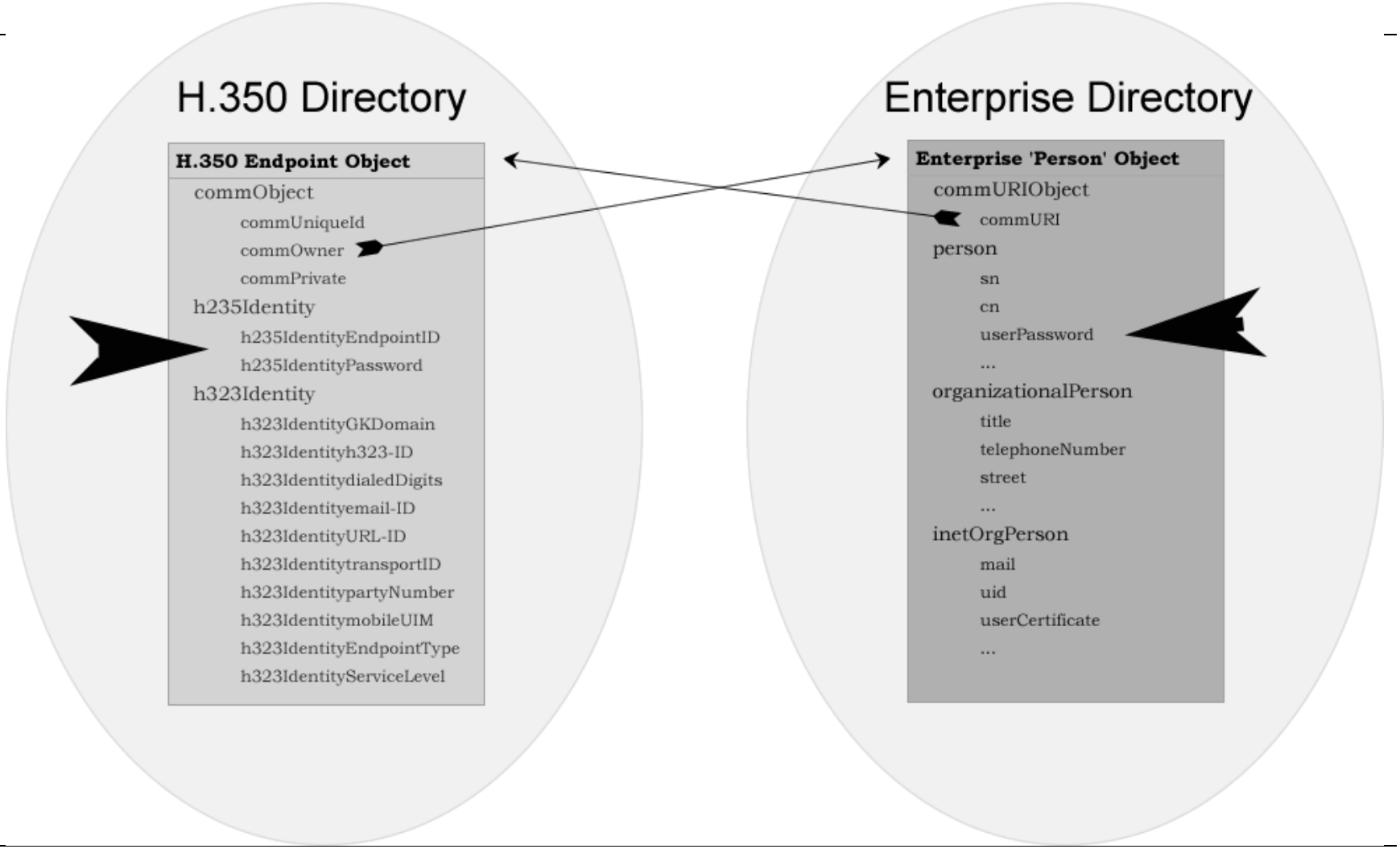
Software

- TAGS
  - LDIF to TIO converter
  - Roland Hedberg (Catalogix.se)
  - Open source
- LIMS (LDAP Index Metadata Server)
  - TIO/LDAPv3 index server
  - Roland Hedberg
  - Open source
- SUDALIS
  - LDAP crawler
  - Peter Gietz (DAASI)
  - Open source, but availability restricted
- WLIMS
  - Web/LDAP gateway
  - Stig Venaas (Uninett, Norway)
  - Open source

Security Credential Storage (H.235 and SIP)



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Security Mechanisms in Voice&VC

H.323/H.235

- Annex D - Baseline Security Profile
  - Hop-by-hop processing
  - Password based security
- Annex E - Signature Security Profile
  - Certificate Based Security (PKI)

SIP

- End-to-end mechanisms
  - Basic authentication
  - Digest authentication
  - Message body encryption using S/MIME
- Hop-by-hop mechanisms
  - Transport Layer Security (TLS)
  - IP Security (IPSec)
  - The SIPS URI schema

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Endpoints Implementing H.350 can…

- Lookup correct configuration information and load it.
  Solves big user support issue!
- No matter what protocol or brand, necessary data can be managed in an organized way.
- Do white pages search via LDAP protocol – receive answers; ‘click to dial’ if supported.

Endpoints Implementing H.235 can…

- Lookup correct configuration information and load it.
  Solves big user support issue!
- No matter what protocol or brand, necessary data can be managed in an organized way.
- Do white pages search via LDAP protocol – receive answers; ‘click to dial’ if supported.

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Call Servers Implementing H.350 can…

- Pull information from canonical store
  - Solves manual data entry problems
  - Can convert canonical to proprietary if needed on the fly
- Use *X*IdentityServiceLevel attribute to provide levels of authorization
- Scale up video/voip operations

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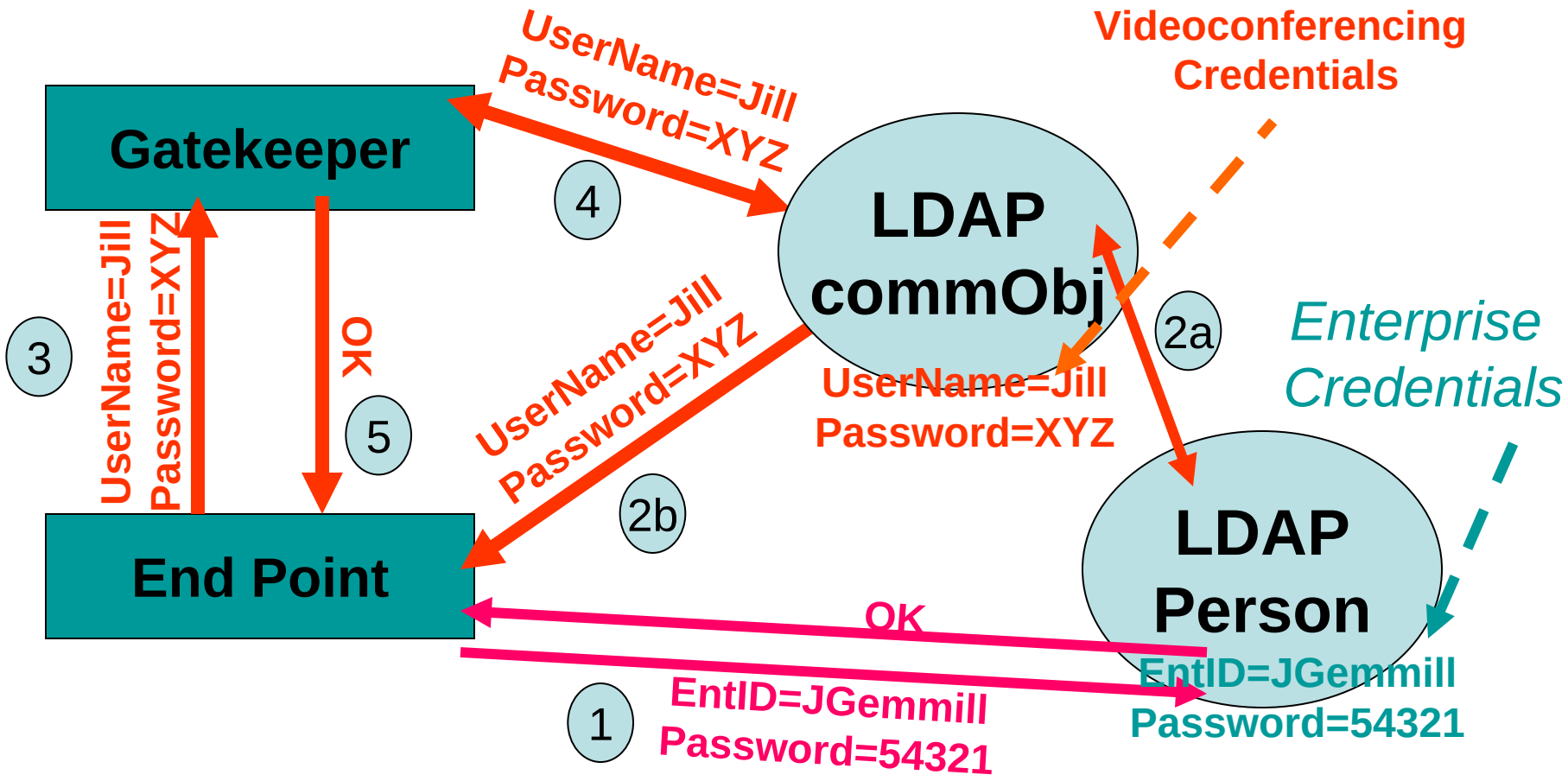
Enterprise Authentication with H.350



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So, does any of this stuff work and exist in the real world?

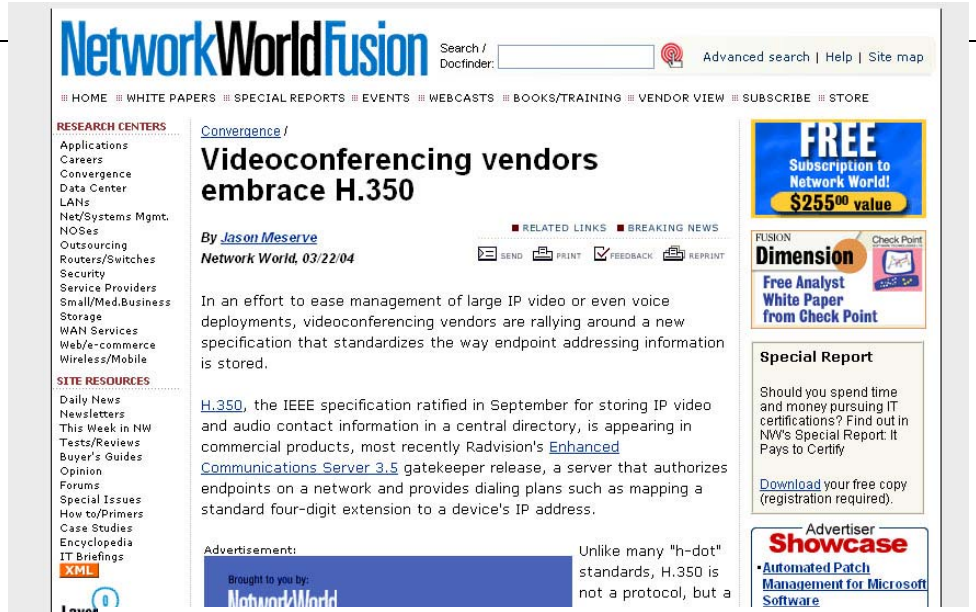
Prototypes Developed

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

H.350 Enabled SIP User Agent

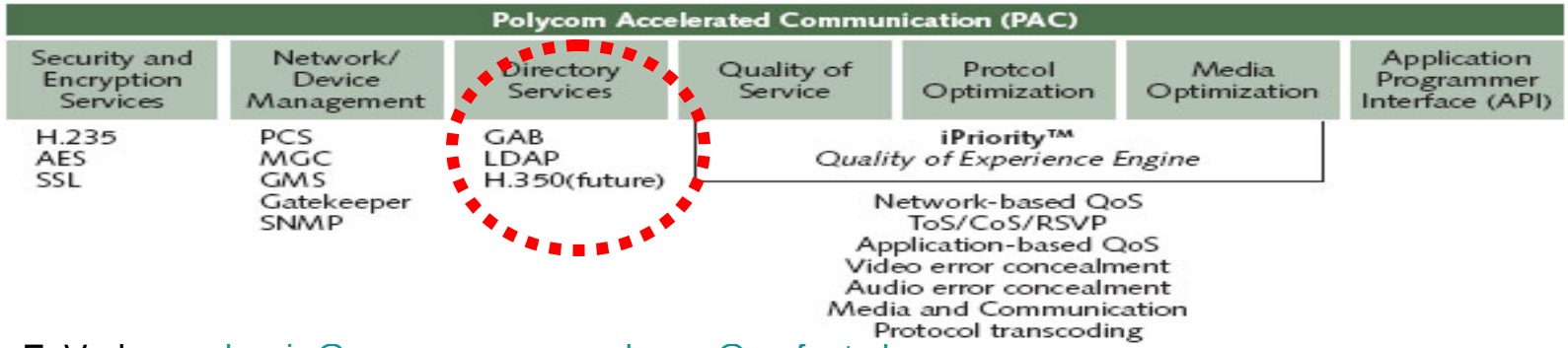
- Built by Samir Chatterjee and his Network Convergence Lab at Claremont Graduate University
- Built on Java Media Framework
- Uses DynamicSoft stack
- User agent available for download http://ncl.cgu.edu/sipclient/index.php

Industry Uptake? Yes!



- RADVISION ECS
- VCON MXM (Q2 2004)
- Tandberg TMS 8.0
- HCL SIP Proxy
- Aethra

Exhibit 5
Polycom Accelerated Communications (PAC)
Source: Polycom, Inc., 2004



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ViDe H.350 Cookbook http://lab.ac.uab.edu/vnet/

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ViDe H.350 Cookbook

- 60+ pages of text and 200 pages with step by step instructions and examples
  - Detailed description and example use of each attribute in all H.350 objects
  - LDIF files ready to use for iPlanet, OpenLDAP, and Active Directory
  - H.350 installation and server configuration instructions
- Included in National Science Foundation Middleware Initiative (NMI) Releases 4 & 5

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Conclusions

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

Acknowledgments

Colleagues: Tyler Miller Johnson, Samir Chatterjee, Jill Gemmill, Jason Lynn

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 ANI-0123937 *"NSF Middleware Initiative"* **via SURA-2002-103 "***UAB Middleware Testbed Program: Integrated Directory Services, PKI, Video, and Parallel Computing***",** Subcontract (Shealy, Gemmill (Technical Lead))

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.

Links

- TNC2003 presentation on European VC services and GDS and H.350
  http://www.carnet.hr/CUC/tnc-cuc2003/program/slides/s6a1.pdf
- ViDe.Net project http:// metric.it.uab.edu/vnet /
- ViDeNet https://videnet.unc.edu/
- ViDeNet dir. of video dir.s http://videnet.unc.edu/vide-dod/index.phtml
- Vidmid-vc http://middleware.internet2.edu/video/
- Presentations
  - Vidmid
    http://www.internet2.edu/presentations/spring02/20020507-VidMid-Verharen.ppt
  - H.323 and Approaches to Authentication
    http://www.dpo.uab.edu/%7Ejgemmill/Presentations/Year_2002/Internet2AUthNZ2002.pdf
  - Secure videoconferencing
    http://www.vide.net/conferences/spr2003/presentations/day_one/jill_gemmill

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