



## **Directory Services for Multimedia Telephony An Infrastructure for Supporting Video and Voice Over IP**

*December 4, 2000*

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**ViDe – The Video Development Initiative**

**Center for Advanced Video Network Engineering and Research**

### **Why Directory Services For Video / Voice Over IP ?**

There has been a move in recent years towards the implementation of centralized Directory Services as a cornerstone of institutional IT services. Generally defined, Directory Services are a central database of users and resources in an organization, and a well-defined method of accessing that database. Commonly, institutions are utilizing LDAP as the protocol of choice for Directory Services communications. The existence of a central directory server is attractive because it promises an increase in efficiency for business processes that heretofore have maintained separate and parallel databases of users. For example, on a university campus, human resources, payroll, admissions, electronic mail and libraries are all services that rely to a large extent on the same fundamental set of data describing users. Managing intake and attrition are often extremely problematic for non-HR services and therein lies one of the chief advantages of a centralized directory.

Telephone systems are a classic example of services operated inefficiently in parallel with the sister services mentioned above. Telephone service providers rely on accounting systems that are highly integrated with PBX operation – a technology broadly acknowledged as moribund.. While profit margins and monopolistic stature in the past have made this inefficiency acceptable, the emerging realm of multimedia telephony renders the efficacy of this approach financially untenable.

Early conceptions of voice over IP (VoIP) projected cost savings by abandoning telephone transport wiring in favor of running the service over the data (IP) network alongside with other data services. This conception has largely proved false in implementation because the model simply trades one wiring system for another, without making any fundamental changes to the business process itself, wherein the bulk of the cost of service delivery is contained. Recent approaches to VoIP broaden the scope of the original model to include true integration of voice services into the entire IT organization, leveraging not just the wire, but the systems management, network management, customer service and database management systems as well. Full integration of these elements is the key to a converged and cost-effective service.

The other important conceptual element is the expansion of the notion of communications from simply the telephone system, to a full multimedia telephony environment. Broadly defined, multimedia telephony is the interconnected network of telephones, cellular phones, IP telephones, desktop video conferencing, conference room and classroom video conferencing, fax machines, pagers, personal digital assistants, instructional and archived media on demand and entertainment video (television) programming. Thus, multimedia telephony integrates not just the business processes, but the modes of system use and thus enables personal, business and administrative communications, distance education, research and scientific collaboration, and entertainment use of the network and its services.

This document describes a general scheme for Directory Services infrastructure to support multimedia communications. It enumerates the specific data elements that need to be present to support multimedia telephony services, but assumes that more general and conventional elements (user name, user ID, address, etc.) are already present. This scheme is technology neutral in that it does not describe these data elements in any specific protocol.

**Tyler Miller Johnson**

Director

919.843.7004

[Tyler\\_Johnson@unc.edu](mailto:Tyler_Johnson@unc.edu)

**CAVNER**

G01 Morehead Labs

Campus Box #3224

University of North Carolina

Chapel Hill, NC 27599-3224

Fax: 919.843.7008

[www.cavner.org](http://www.cavner.org)

## The Nature of Multimedia Telephony – Fundamental Concepts and Definition of Terms

It is generally accepted that Directory Services need to accommodate both **people** and **resources**. People, of course, are the users of a system. Resources are classrooms, offices, conference rooms, etc. and are generally associated with people or departments as well as specific conferencing equipment and accounts. For example, there may be a conference room in a Physics department that is called 'Physics Conference Room' into which one might want to conference regardless of the particular person making the call. This concept is very important in multimedia telephony.

An **account** is a specific instance of multimedia telephony permissions available to a user on the network. A user may have many accounts. It is useful to consider the familiar example of electronic mail. A user may have multiple electronic mail accounts on a system, each with its own address, storage, and rights. Similarly, a user may have multiple accounts that give her access to communications on the network. In general, a single account per user is desirable, but as with telephones and email, there will be instances where multiple accounts per user are desirable or unavoidable. Note that accounts include a PreferenceOrder value which enables them to publish their communication methods in the desired order of importance.

Another key concept is the separation of accounts from **endpoints**. An endpoint in multimedia telephony is a physical device, such as an IP telephone, a computer running a video conferencing program, a tele-classroom codec or even a cellular telephone that is physically capable of running specific communication protocols under an account. An individual may use many different endpoints to access the same account. For example, a user may log into her computer-based telephony program from her desk in the morning, log into a computer in a classroom for teaching in the afternoon, and log into a cellular phone in the evening. In each case, the user should have access to the same account, or set of rights and messages (e.g. voicemail, multi-way conferencing) from any endpoint, assuming the underlying network supports those services. Similarly, an endpoint may access multiple accounts, allowing users to 'log in' under their respective accounts. This concept is not new for computer-based services such as electronic mail, but it is quite foreign to telephone services, which are identified and authenticated by a physical instrument connected to a physical wire in a physical location that never changes.

**Streaming Accounts** refer to privileges a user has to access video on demand, multicast and live streaming services. These may include entertainment television programs or databases of multimedia content.

Finally, while it is desirable to consider Directory Services as a central database that includes everything and the kitchen sink, integrating too many functions will lead to an unwieldy and unworkable system. Therefore, multimedia telephony support should include data elements to identify users, accounts, telephony addresses, and authorization information. It should not include all the possible data elements necessary for a billing system or complete account management. These specific functions should be supported on separate systems that are merely pointed to by the directory server.

### Gatekeeper Interactions

As noted earlier, the major reason for implementing Directory Services as a part of multimedia telephony systems is to automate the parts of the overall user database that do not pertain directly to multimedia telephony itself. For example, if all users are granted basic dialing privileges, then all user h.323 account data should be present in the gatekeeper. Therefore, the gatekeeper must have the ability to make an LDAP query of the Directory Server in order to ascertain user alias, extension, aliases, account privileges and related data. The gatekeeper should update its information from the Directory Server at regular intervals, defined by the system administrator. The gatekeeper should support a push mode as well that allows individual entries to be updated on the fly. The gatekeeper should support reading of its internal user tables via LDAP query.

### Data Elements

**People Objects** represent individual users on the system and are presumed to be defined elsewhere. **Resource Objects** represent individual classrooms and conference rooms and are also presumed to be defined elsewhere. **Multimedia Telephony Account Objects** represent individual accounts through which users access services and are the primary data element of interest. **Endpoint Objects** represent physical communications devices such as IP telephones and video conferencing systems. **Multimedia Telephony Account Objects** can be associated with either a User Object or an Endpoint Object. Endpoint Objects may be associated with a Resource Object.

Object	Type	Size	Read Access	Write Access	Comment
<b>H.323 Account</b>					
Alias	text	32 chars	W	N	H.323 Alias
AliasFriendly	text	32 chars	W	N	Allow multiple instances
Extension	text	12 chars	W	N	H.323 Extension
ExtensionFriendly	text	12 chars	W	N	Allow multiple instances
PSTNAccessNumber	text	16 chars	W	N	E.164 telephone DN of endpoint
ZoneDNS	text	32 chars	W	N	DNS name of H.323 Zone (gatekeeper) of object
ZoneIP	IP address		W	N	IP address of H.323 Zone (gatekeeper) of object
ZonePrefix	text	20 chars	W	N	H.323 zone prefix
ZonePrefixFriendly	text	32 chars	W	N	Easily to read
DialURL	text	64 chars	W	N	TBD by upcoming h.323 annex O
ServicesCode	text	32 chars	N	N	Authorized services code referring to rights for this account
BillingCode	text	32 chars	N	N	Billing reference code
Association	link		N	N	Link to user or endpoint instance
Listed	boolean		NU	NU	Listed / Unlisted in directory
DisplayName	text	32 chars	W	N	Friendly display name for account
PreferenceOrder	integer	8 bits	NU	U	Display and access preference
<b>SIP Account</b>					
Address	text	32 chars	W	N	SIP address
PSTNAccessNumber	text	16 chars	W	N	Telephone DN of endpoint
DialURL	text	64 chars	W	N	SIP URL
ServicesCode	text	32 chars	N	N	Authorized Services Code
BillingCode	text	32 chars	N	N	Billing Reference Code
Association	link		N	N	Link to user or endpoint instance
Listed	boolean		NU	NU	Listed / Unlisted in directory
DisplayName	text	32 chars	W	NU	Friendly display name for account
PreferenceOrder	integer	8 bits	U	U	Display and access preference
<b>PSTN Telephone Account</b>					
PSTNAccessNumber	text	16 chars	W	T	Telephone DN of endpoint
ServicesCode	text	32 chars	T	T	Authorized Services Code
BillingCode	text	32 chars	T	T	Billing Reference Code
Association	link		T	T	Link to user or endpoint instance
Listed	boolean		T	TU	Listed / Unlisted in directory
DisplayName	text	32 chars	W	TU	Friendly display name for account
PreferenceOrder	integer	8 bits	U	U	Display and access preference
<b>Cellular Telephone Account</b>					
PSTNAccessNumber	text	16 chars	W	T	Telephone DN of endpoint
ServicesCode	text	32 chars	T	T	Authorized Services Code
BillingCode	text	32 chars	T	T	Billing Reference Code
Association	link		T	T	Link to user or endpoint instance
Listed	boolean		TU	TU	Listed / Unlisted in directory
DisplayName	text	32 chars	W	TU	Friendly display name for account
PreferenceOrder	integer	8 bits	U	U	Display and access preference
<b>Pager Account</b>					
PSTNAccessNumber	text	16 chars	W	T	Telephone DN of endpoint
ServicesCode	text	32 chars	T	T	Authorized Services Code
BillingCode	text	32 chars	T	T	Billing Reference Code
Association	link		T	T	Link to user or endpoint instance
Listed	boolean		TU	TU	Listed / Unlisted in directory
DisplayName	text	32 chars	W	TU	Friendly display name for account
PreferenceOrder	integer	8 bits	U	U	Display and access preference
<b>Streaming Account</b>					
ServicesCode	text	32 chars	NU	N	Authorized Services Code
BillingCode	text	32 chars	N	N	Billing Reference Code
Association	link		N	N	Link to user or endpoint instance
<b>Endpoint</b>					
EndpointType	text	64 chars	NTU	NT	make/model/version
EndpointIdentifier			NTU	NT	Serial number or tracking reference
EndpointURL			NTU	NT	URL for web access to endpoint
<b>Access Key</b>					
	N	Networking - IP Networking Administrator			
	T	Telecom - PSTN Telecom Service Administrator			
	U	User - End User Account Owner			
	W	World - All Users			