How to support Voicemail as you migrate your network from TDM to IP

An XOP Networks White Paper

What's Inside

EXECUTIVE SUMMARY

Competition is forcing the Independent Operating Company (IOC) to migrate from the traditional TDM network to a Voice over IP (VoIP) network. The new network must be able to provide "Triple Play" Services (VoIP, Internet & Video) in order to effectively compete against carriers such as Wireless Operators, Vonage and Skype. The new network strategy for IOCs generally revolves around introduction of IP based digital loop carriers that are homed in on one or more soft switches.

One of the challenges of this strategy is how to support the value added services subscribers are familiar with on the TDM network in the new world of VoIP. The short answer is, it is very difficult.

A commonly used value added service that most IOCs offer today is CO based Voicemail. Voicemail subscribers are generally resistant to change, e.g., Voice Mail commands and features.

With a multivendor, multi-technology network (e.g., Mitel, Nortel, MetaSwitch) the voicemail support is further compounded by differing methods of communicating Message Waiting Indication associated with different voicemail systems.

What is needed is voicemail technology that works effectively in a multivendor, TDM and VoIP environment, and emulates the features and services of the old network such as message waiting indication. Also, it should allow a service provider to introduce newer features to keep current with modern times such as Voice Mail-to-email, Visual Voicemail web portal etc.

The XOP Networks' Voice Mail Application (VMA) running on the Universal Service Node (USN) platform can answer all of these challenges, while reducing both CAPEX and OPEX for the operating companies.

Typical IOC Network Transitioning to VoIP

In this network scenario, the IOC is being driven by competition to evolve the network to support triple-play (VoIP phone, Internet & Video). Typically such an IOC will have to deploy soft switching along with IP based access network elements (IP based DLCs, Session Border Controllers, WiMax or fiber based access etc.)

However, no operating company does such a change over night. This kind of change will occur over a period of time. The service provider will typically deploy a soft switch in addition to the current legacy switches. During this phase, the operating company will cap any new subscriber additions to the legacy network and add new subscribers to the IP Network. When they have reached the critical mass, they will then move rest of their customers from legacy switches to the soft switch and then phase out the older legacy switches. This transition period could last for several years depending upon the number of switches involved.

During this period, the operating company will need to provide value added services such as voicemail to both sets of customers. Before we look at the voicemail migration solution, it is important to understand how a typical voicemail system operates.

Voicemail Message Waiting Indication Operation

When an incoming call arrives at the Class 5 switch for a subscriber and if the subscriber is busy or does not answer, the call is steered to an external Voicemail system, whereupon the calling party deposits a message for the called subscriber. The Voicemail system then in turn has to communicate with the switch to notify the called subscriber that a message has been left for him/her. After the subscriber has picked up all his/her messages another set of messages are exchanged between the switch and the voicemail system to turn message waiting indication 'off' from subscribers phone line. Depending upon the vintage of the switch and the voicemail platform, this communication is generally provided by following three Message Waiting Indicator (MWI) methods:

- Switch Dial out – after a message has been deposited, the Voicemail system makes an outbound call to the switch. The dialed number area code represents a Voicemail dial out call, and the remaining 7 digits indicate the telephone number of the Voicemail subscriber. Using this information the switch turns the message waiting lamp or a stutter dial tone 'on' on the subscriber's phone. Similarly after the subscriber has picked up all stored messages, another call is made towards the switch with a different area code but with the same 7 digits to tell the switch that it should turn the message waiting lamp or stutter dial tone 'off' on the subscriber's phone.
- SMDI: Station Message Desk Indicator is an industry standard for passing MWI information between a switch and the associated voicemail platform. It makes use of a RS-232 based serial interface. The set of messages are defined in Bellcore TA-TSY-1080 specification.

- SIP Notify: This method of MWI is used in conjunction with next generation soft switches. It is equivalent to functionality specified in the SMDI specification, however makes use of Session Initiation Protocol' (SIP) Notify message for passing MWI related information.

Following diagram shows CO switches, voicemail platforms and associated MWI methods currently in use in the ILEC industry.

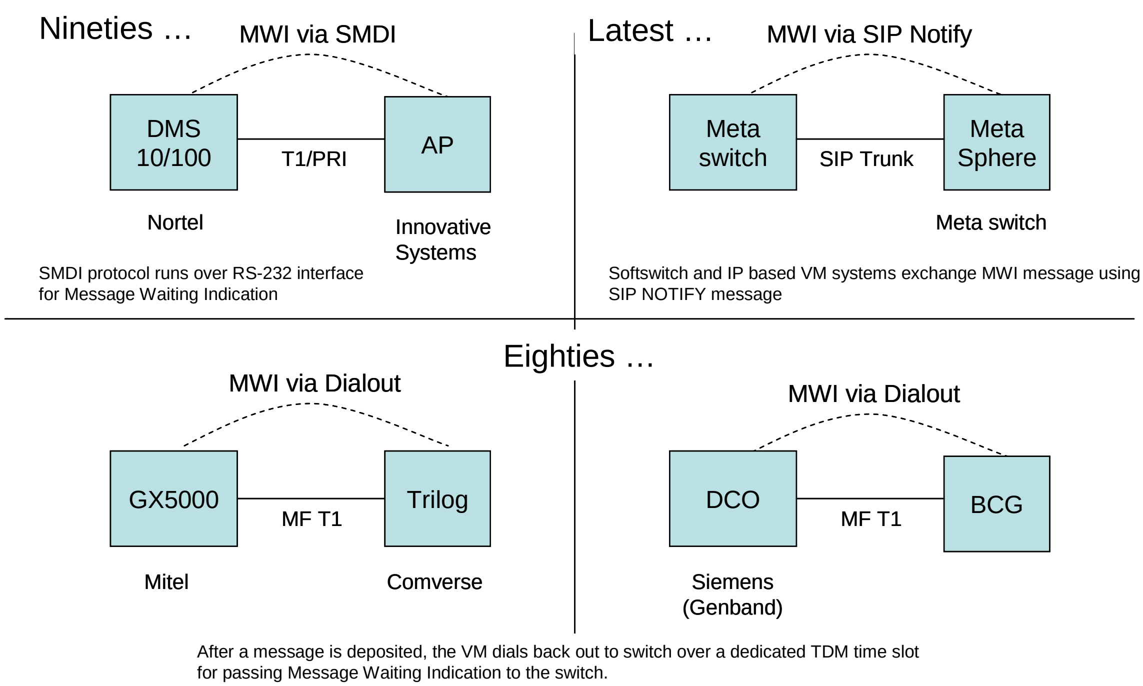

Figure 1: Message Waiting Indication Methods prevalent in IOC networks

IOCs with Multivendor Networks

In a multivendor situation the problem is further compounded by different message waiting indication methods used by each generation of switching system. An IOC with three different switches of different vintages will need to have three different Voicemail systems to match the MWI technique used by each switch as illustrated below.

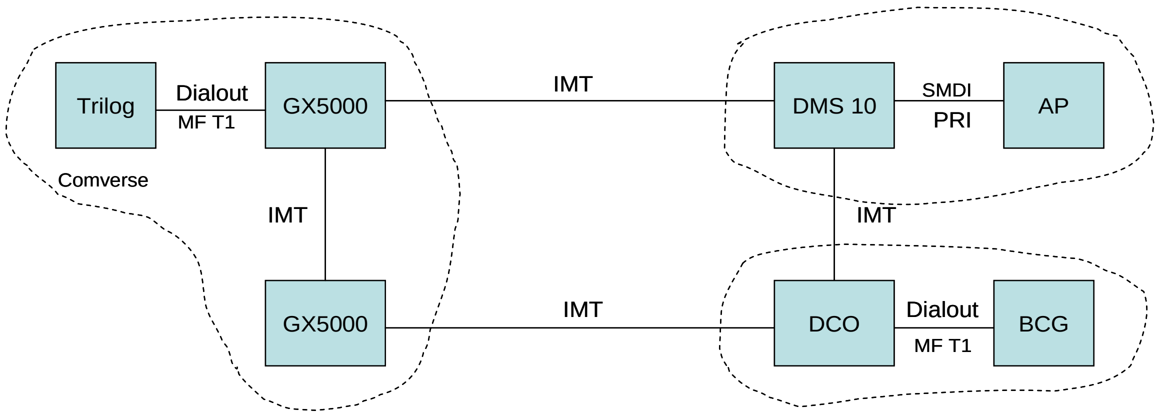

Figure 2: A multivendor IOC network with multiple Voicemail platforms

THE XOP NETWORKS' SOLUTION

The following diagram illustrates the deployment of the XOP Universal Service Node platform with Voice Mail Application (USN-VMA) in an evolving IOC network. The IOC has in this case replaced one of the legacy GX5000 switches with a Metaswitch soft switch and deployed XOP Networks' USN-VMA for supporting Voicemail for subscribers connected to the remaining legacy switches as well as to the newer soft switch.

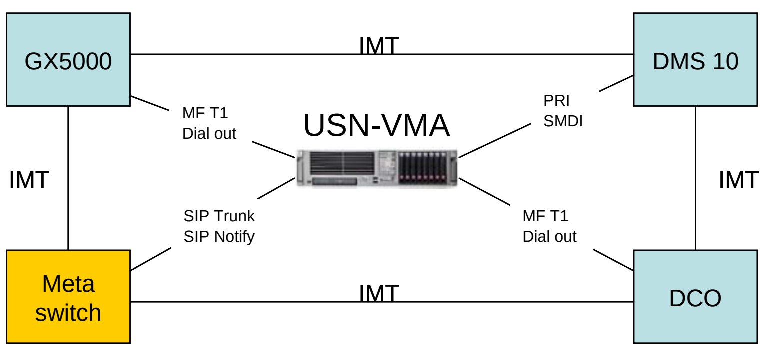

Figure 3: Support for Voicemail as IOC network migrates from TDM to IP

The XOP Networks USN-VMA is built to serve as a common voicemail platform across legacy switches and the next generation VoIP switches. Towards that goal, It supports a) multiple MWI methods that can be selected based on subscriber number and switch ID, b) multiple physical layers including MF T1, ISDN PRI and VoIP based SIP trunks and c) capability to emulate 3rd party voicemail IVR trees.

Message Waiting Indication Operation with the USN-VMA

Let us say that a VoIP subscriber connected to MetaSwitch calls another VoIP subscriber also connected to the same switch, and the called subscriber is busy. Then the MetaSwitch directs that caller to the USN-VMA, which in turn allows the caller to deposit a message. The USN-VMA then sends a SIP Notify message to MetaSwitch to indicate that a message has been left. The Notify message carries the phone number of the subscriber. Based on that data the MetaSwitch then turns the message waiting lamp 'on' for the voicemail subscriber's IP phone. Similar steps again take place after the subscriber has retrieved all messages to turn the message waiting lamp 'off'.

Now let us say the IOC has a few subscribers connected to legacy Class 4/5 TDM switch and a few subs connected to the VoIP switch. A VoIP subscriber calls a Class 4/5 subscriber. The Class 4/5 subscriber is busy. The Class 4/5 then routes the call to the USN-VMA. The USN-VMA knows that calls are for a subscriber on the Class 4/5 so it uses the older method of dialing out to turn message waiting lamp on the Class 4/5 subscriber.

Similarly if reverse happened, i.e., a Class 4/5 subscriber calls a VoIP subscriber, and the VoIP subscriber is busy. In this case the VoIP switch will send the caller to USN-VMA. Again, the USN-VMA knows that message was left for a subscriber connected to the VoIP switch. In this case it uses the SIP Notify method to tell the VoIP switch to turn the message waiting lamp on.

As described above, the USN-VMA's ability to pick the correct MWI method allows it to serve as a common voicemail system in a multivendor multi-technology network situation. Having one common platform therefore significantly reduces both CAPEX and OPEX for the operating company.

VISUAL VOICEMAIL ENHANCEMENT

Besides facilitating the voicemail migration from TDM to VoIP, the XOP Networks' USN-VMA allows an IOC to offer newer capabilities. One such capability is 'visual voicemail'. Current voicemail systems only allow sequential access to voicemails. XOP Networks USN-VMA allows the stored voicemail messages to be accessed in a random order. The USN-VMA application displays all stored voicemails on a Web portal. The Web portal can be accessed via a PC or via a number of PDAs including Blackberry and IPhone. By a simple click, a user can hear the selected stored message through the PDA's built in media player and ignore/discard other messages.

Log-on Screen | VM Summary | VM List – select only those you want to listen to

Figure 4: Voicemail access via PDAs

Benefits of visual voicemail:

- Voicemail list can be viewed on web
- User does not have to listen to voicemails sequentially
- Voicemail accessed over the cellular data network (usually with unlimited data plan)
- User does not use voice minutes
- Avoids voice charges in caller pays countries
- Allows international travelers to avoid voice roaming charges

OTHER CONSIDERATIONS

PHYSICAL CONSTRAINTS

In terms of physical space, a new system with typically 10,000 mail boxes should not take up more than 4U space on a standard Telco rack. The server must be industrial grade and available in a number of configurations, i.e., 48VDC, 1:1 hot standby, RAID1 Mirrored Disks, redundant power supplies and NEBS compliant hardware.

FUTURE SERVICE EVOLUTION

Given the placement of a value added services platform and a TDM-to-VoIP gateway for Voice Mail, it becomes very simplistic to add additional services such as Audio Conferencing, Web Conferencing, Video Conferencing, Alert/Mass Notification, and Firebar services to the USN platform. These new value added services will enable the IOC to maintain and grow its subscriber base and at the same time, significantly reduce CAPEX and OPEX.

CONCLUSION

In networks where legacy TDM switches are already deployed (e.g., Mitel GX 5000, Nortel DMS 10/100, Lucent 5E, etc.), and the IOC wants to migrate to a VoIP network and as such wants to cap the TDM network, the XOP Networks' USN-VMA makes perfect sense. Its support for multiple MWI methods and multiple trunk types enables Voicemail service to work seamlessly across both networks. Over a period of time, the carrier can migrate all subscribers from the TDM network to the VoIP network and the change will be completely transparent to the subscribers.

With XOP Networks' USN-VMA, the IOC can also introduce several new voicemail related features including Visual voicemail, voicemail to email, family mail boxes etc.

ANNEX 1 FEATURE SET FOR XOP NETWORKS' USN-VMA

The following feature set should be considered as the minimum to enable the smooth transition of a TDM based Voice Mail system to a true hybrid TDM-VoIP network.

Required Subscriber Features

- Subscriber Web portal for managing the Voicemail configuration, greetings.
- Access Voicemail using multiple PDAs including Blackberry, iPhone etc.
- Voicemail to Email
- Up to 9 Sub-mail Boxes per subscriber account
- Announcement Only Boxes
- Multiple Mailbox Configuration Options
- Find-me before Voicemail Deposit
- Back, Pause, Forward, Volume up/down.

Required System Features

- Message Waiting Indication based on Switch Dial out, SMDI and SIP Notify
- Support for TDM (CAS E&M, PRI, MF trunks) and VoIP/SIP trunks
- Support for emulation of third party Voicemail IVR tree
- Secure Voicemail Retrieval based on Password or ANI
- From 100 to 10000 Voicemail boxes with 10 minute storage each in one chassis
- Bulk uploading of subscribers using CSV files
- See voicemail activity in real time on a Web portal
- Voicemail usage reporting

ANNEX 2 – NETWORK COMPATIBILITY REQUIREMENTS

XOP Networks products are deployed against a number of Central Office Switches, IP based Soft switches, PBXs, Hybrid PBXs and IP PBXs in the field. The table below provides a list of such platforms and their specific interfaces that our products have proven interoperability with.

XOP Networks Interoperability Matrix			
Manufacturer		Interface	Protocol
Lucent	#5ESS	Analog	Loop Start, Centrex
Lucent	#5ESS	T1	ISDN PRI
Nortel	DMS-10, DMS-100	T1	CAS T1, E&M
Mitel	GX-5000	T1	CAS T1, E&M, MF
Mitel	GX-5000	T1	CAS T1, E&M, DTMF
Sonus	GSX-9000	T1	CAS T1, E&M
DSC	DEX-600	T1	ISDN PRI
Siemens	EWSD	E1	ISDN PRI
Coppercom	CSX	T1	CAS T1, E&M
Taqua	OCX1000	T1	CAS T1, ISDN PRI
Ericsson	AXE 10	E1	ISDN PRI
Huawei	CO Switch	E1	ISDN PRI
Manufacturer	IP Soft Switch	Interface	Protocol
Broadsoft	Broadworks VoIP	Ethernet	SIP Trunk
Meta switch	MetaSwitch	Ethernet	SIP Trunk
Emergent	Softswitch	Ethernet	SIP Trunk
Manufacturer	PBX	Interface	Protocol
Toshiba	DK-280	Analog	Loop Start Trunk
Inter-tel	GLX	T1	CAS T1, Loop Start
Panasonic	TD-500	T1	CAS T1, E&M
Panasonic	TD-600A	T1	ISDN PRI
Avaya	8710	T1	CAS T1, E&M
Avaya	AVAYA G3i R9.5	T1	ISDN PRI
Nortel	Meridian 81c	T1	ISDN PRI
Nortel	SL-100	T1	ISDN PRI
NEC	NEAX 2400 IPX	T1	ISDN PRI, CAS T1 E&M
NEC	NEAX 2000 IPS	T1	ISDN PRI, CAS T1 E&M
NEC	Univerge 7000 IVS	T1	ISDN PRI, CAS T1 E&M
Cisco	IP PBX (Call Mgr 4.1)	T1	ISDN PRI
Cisco	IP PBX (Call Mgr express)	T1	ISDN PRI
Mitel	SX2000	T1	ISDN PRI
Mitel	SX2000	T1	CAS T1 E&M
Manufacturer	Hybrid/ IP PBX	Interface	Protocol
Avaya	IP Office 4.0+	Ethernet	H.323 Trunk
Avaya	8800	Ethernet	SIP Trunk
NEC	Univerge 7000 IVS	Ethernet	Station Side SIP
NEC	NEAX 2000 IPS	Ethernet	SIP Trunk
Cisco	IP PBX (Call Mgr express)	Ethernet	SIP Trunk
Cisco	IP PBX (Call Mgr 4.1)	Ethernet	SIP Trunk
Asterisk	Asterisk Server	Ethernet	Station Side SIP
Asterisk	Asterisk Server	Ethernet	SIP Trunk

Want to Learn More?

For more information, please visit our Web site http://www.xopnetworks.com or send an email to marketing@xopnetworks.com

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About XOP Networks

XOP Networks, founded in 2002, is a leading supplier of TDM and IP based value added services platforms for Enterprises and Independent Telephone Companies. Its unique product architecture allows smooth migration of value added services from legacy circuit switched TDM networks to VoIP based packet networks. Its products support Audio Conferencing, Web Conferencing, Group Alerting, Enhanced Firebar, Voicemail and a few other services. XOP Networks is headquartered in Plano, Texas. XOP Networks uses its platforms and network for offering managed services as well