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# The Resilient VoIP Enterprise: True Voice Resiliency for the Enterprise

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## Synopsis

The VoIP PBX is becoming more prominent on the enterprise scene, driven primarily by cost reductions and improved flexibility in a dynamic environment. A significant problem, however, is looming in the guise of improper architectures and deployments. These can create an extremely dangerous "single point of failure," but with a little foresight and engineering, the VoIP PBX, coupled with a stable Internet Telephony Service Provider ( ITSP), can provide fully redundant voice telephony for the enterprise, and offer services that a traditional telephony (TDM) deployment cannot. This is ***"True Voice Resiliency for The Enterprise."***

## Today's TDM PBX Deployment in the Enterprise

Medium and large enterprises today handle telephony needs by deploying a variety of PBXs at various offices throughout their enterprise locations. These switches can range from small key sets, supporting as few as 4 stations, to systems as large as central office switches supporting thousands of users.

Most of these enterprises use Time Division Multiplexing (TDM) local exchange carrier (LEC) services to connect with the outside world. These connections are accomplished through what know as trunks - circuits that are shared on the network side of the PBX to handle calls for the stations served by the PBX.

As a result of these circuit-based trunks, each enterprise location is committed to a costly dedicated line to the LEC, and pays for the entire circuit cost whether or not they are needed. At the same time, the PBX client is also bound to an antiquated mode of direct inward dialing (DID) number allocation that is tied to the physical infrastructure of the carrier.

In traditional TDM networks, the telephony application is linked to the LEC rate center. The rate center dictates the DID numbering scheme required at each deployment site. That, in turn, ties the PBX to a specific set of local DID numbers.

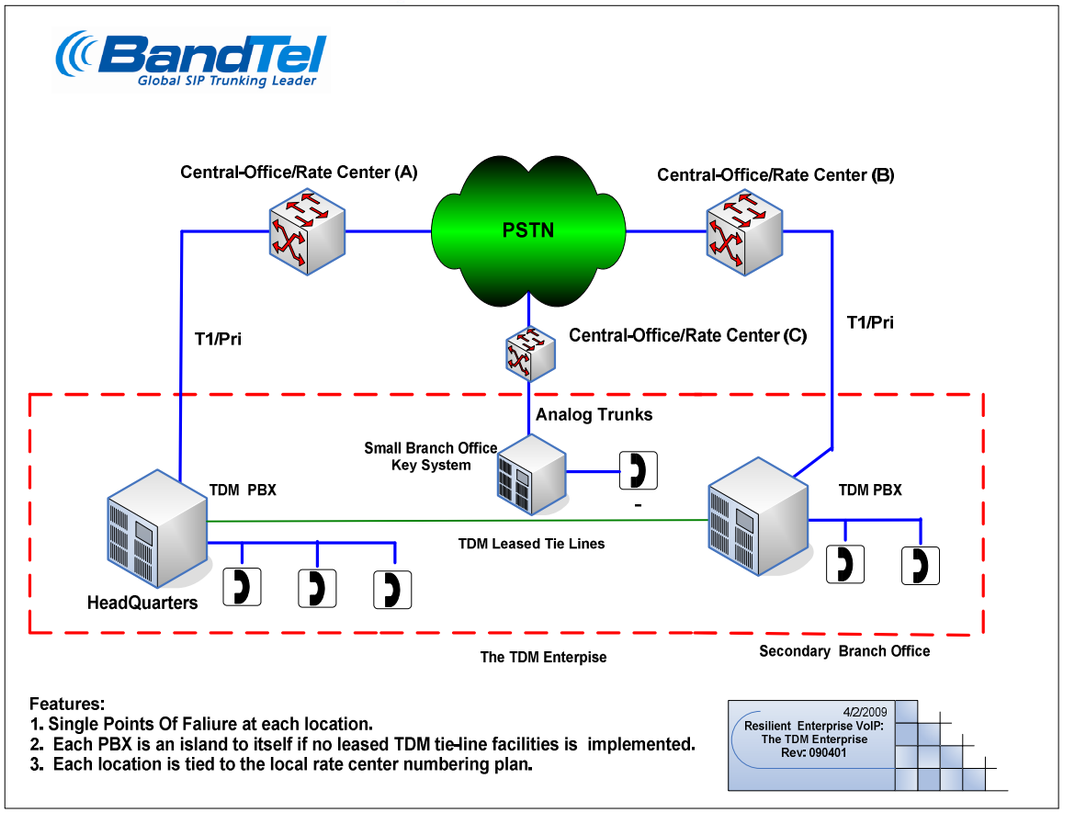


Fig. 1

As a result, there is very little flexibility on how one can configure a distributed enterprise voice network with respect to assigning DID numbers to locations (see "BandTel's Global Number Portability" article for more detail on this subject). In the TDM world, "where you live (physically)" dictates the telephone numbers that are available to you.

Lastly, the LEC TDM connection to the legacy enterprise represents a single point of failure. If that umbilical cord to the LEC is severed or impaired in any way, service to the outside world is lost. That single point of failure has plagued TDM PBX customers, large and small, since the advent of the PBX.

DID inflexibility and single point of failures no longer need to be the case. VoIP can solve the problem. However, if done incorrectly, VoIP deployments can also make that single point of failure problem even worse.

## Enter VoIP and the Distributed IP-PBX

VoIP is now at the point where it is quickly gaining acceptance in the enterprise, is being increasingly recognized as “Ready for Prime Time,” and is being deployed on a large scale. Drivers behind the enterprise VoIP movement are:

- Cost savings on long distance usage charges.
- Migration from two networks (TDM and IP) to one consolidated network (IP), radically lowering support costs.
- Freedom from geographical tethers for telephone service from the LECs.
- New application possibilities via the IP cloud that would be impossible or cost prohibitive in the TDM world of the past.

VoIP began because it was almost free. One could connect VoIP to the public Internet, talk to someone else on the other end, and not have to pay a usage fee.

That then blossomed into the enterprise establishing point-to-point connections between offices using VoIP gateways connecting to their legacy PBXs. This eliminated costly leased line TDM circuits between facilities, and replaced it with public or private IP connections. It was, and still is today, very popular, and can save incredible amounts of money when switching internal enterprise traffic.

VoIP is also a great application to add onto the ever-expanding IP infrastructure. The stateless IP network that carries VoIP is far simpler and more flexible to deploy and maintain. It is therefore a natural evolution that the IP network, running alongside the enterprise TDM network, eventually assumes the duties handled by that TDM network, and then ultimately replaces it.

Another major driver for VoIP is freedom from the LEC rate center. In VoIP space, no longer do PBX’s need to be geographically tied to a single specific local DID numbering plan. With VoIP, there are no restrictions on the inbound DID calls that a specific VoIP signaling device can receive (For more info on this see “BandTel's Global Number Portability”).

Lastly, moving voice to IP networks now allows us to deploy a distributed enterprise PBX. In IP space, the geographical placement of enterprise resources becomes irrelevant. Anyone can be anywhere so long as the IP network follows them.

Migrating the enterprise to IP voice with the IP-PBX at the core has allowed true voice unification. Communications can flow ubiquitously over a distributed VoIP PBX architecture, allowing all the convenience of full Centrex and more, yet at a fraction of the cost of a TDM solution, and with none of the geographical limitations.

## In a Rush To Deploy, Beware the Landmines!

As a result of these compelling reasons to move to VoIP, a surge of new IP based PBX devices have come to the market. These products can potentially take advantage of this new voice transport medium, but in the rush to deploy the new technology there are hidden landmines for those that are not prepared.

With legacy PBX deployments there is often one egress/ingress point of presence to the PSTN. This is a single point of failure, as previously mentioned, and something that VoIP can rectify. This TDM problem is generally confined to the single local enterprise facility, as that physical facility location, for the most part, does not supply telephone services as a tandem signaling element to other offices in the enterprise.

But in the rush to deploy distributed IP PBXs, we now see a trend. Because of VoIP's ability to allow call routing inside the distributed enterprise to be so easy, network designers are deploying networks that have a "single Ingress/Egress access point for the entire enterprise." The logic is that this saves on multiple T1 costs at remote offices, and in so doing, realizes significant cost savings. Unfortunately, it's a calamity waiting to happen.

TDM architectures were incapable of permitting this mistake to be occur as the freedom to map DIDs to any remote office via a centralized access point simply does not exist. With VoIP, however, it's easy to do, and happens frequently with inexperienced teams. This mistake is creating a network topology that has a single ingress/egress access point for VoIP services into the enterprise, and then originating and terminating to and from a single centrally deployed IP-PBX system.

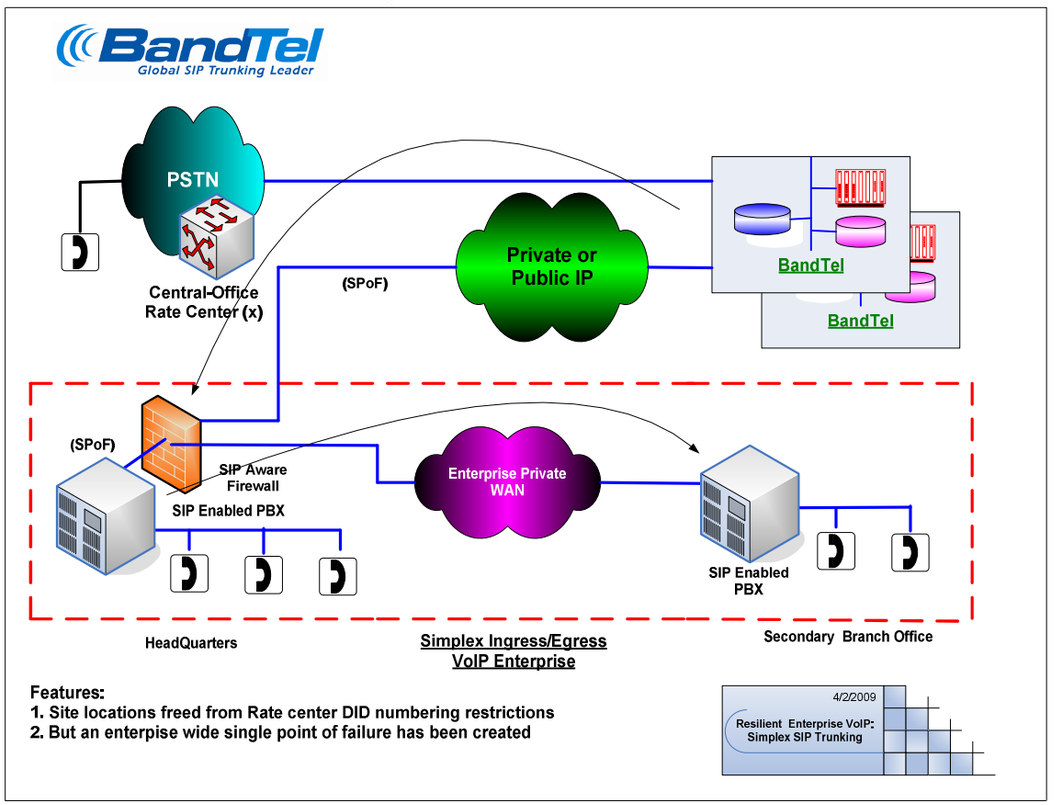


Fig. 2

Let's looks at an example to see how bad this architecture could be for a distributed organization in Figure 2.

Company XYZ has its headquarters in Brownsville, Texas. It has 47 smaller remote stores spread out across each state in the continental USA. It is tied to each of the remote branches through a high-reliability MPLS network, managed by one of the top national tier-1 carriers.

All VoIP telephony is brought into a single ingress/egress point at the Texas headquarters, and terminated into an IP-PBX that serves and controls the smaller branch locations. Furthermore, many of the smaller office locations do not have IP-PBXs, but rather just VoIP phone extensions from the main IP-PBX at headquarters.

Along comes a natural disaster. Let's see what happens. Brownsville is hit by a major hurricane. In the process, Company XYZ ends up with its telecom equipment room 6 feet underwater. What just happened…?

Well, certainly Company XYZ has just lost its communications at headquarters. However, it has now also lost all communications for all of its branches across the nation.

So Company XYZ has now lost all its telephony services for all its locations across the entire country, even though there are no natural disasters anywhere else in the country. So ponder what just happened here…

This type of catastrophic VoIP network is being deployed throughout the world "now" to save on communications costs. In the end, no costs are saved with this solution.

By stepping back and analyzing this scenario, we see that this need not happen. The very attribute of VoIP that allowed this faulty type of network to be built in the first place can also be used to solve the problem. Specifically, because VoIP, and VoIP Service providers like BandTel have the ability to route ingress/egress traffic to any VOIP signaling point, multiple Ingress/Egress points can be established into the enterprise, thus avoiding the single point of failure issue.

Further, IP-PBX manufacturers are beginning to see this problem, and as a result, are creating resilient PBXs whereby two IP-PBXs can be deployed in the enterprise to share telephone operations across the distributed enterprise.

But Even without such dual/resilient PBX products, one could simply configure station phones to work with two IP-PBXs in the enterprise, and then have that station information built into both IP-PBXs databases. That way, the phone is now served from two geographically dispersed switches when disaster strikes.

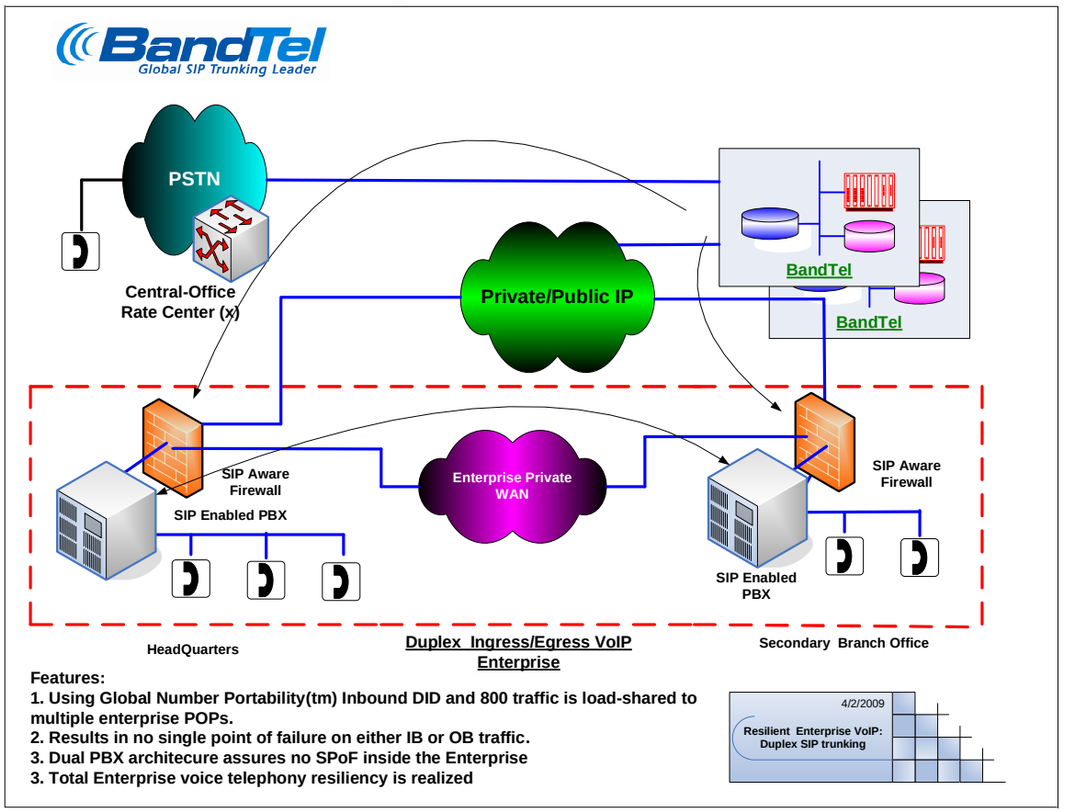


Fig. 3

Now, let's look at the same basic network redesigned in figure 3. In this architecture, we've added a second ingress/egress point to the enterprise network, and also added a second IP-PBX to act as a peer to the other system. In doing, so we've gotten rid of our single point of failure PBX but we've also done much more.

Since the ITSP can load share all traffic to the two or more ingress/egress points, we now have created a resilient enterprise voice network that cannot fail as the result of a single element being knocked out or a single interconnect to the carrier being disrupted. With this architecture, we radically reduce the costs for enterprise voice communications, and yet at the same time, realized full voice redundancy on the customer premises.

Here are a summary of some of the advantages of this architecture and technology.

- **Reduced CPE equipment-** By having main switching facilities deployed in two locations, and only secondary IP-PBX's or VoIP phones in the other locations, CPE equipment costs and the support costs that go along with them have become radically reduced.

- **One Network-** With the TDM network in the enterprise eliminated and the IP network and staff taking over telephony functions, more significant savings are realized through economies of scale. Furthermore, simplicity and better reliability are also gained by extending IP technology into new applications, namely VoIP telephony.

- **True Global Number Portability**- Ingress DID functionality is now freed from the TDM rate center, offering the VoIP network designer possibilities that previously were impossible (realizations of the Resilient VoIP network). See "BandTel's Global Number Portability" for a more in-depth discussion of this subject.

- **Resilient Services-** Moving beyond TDM limitations, we now move into an era where voice can become truly redundant at the CPE edge as opposed to just the PSTN core.

## Summary

It is curious to note that VoIP technology first started entering the enterprise on the station side. VoIP phones were implemented with the IP-PBX, with TDM trunks provided by the LEC and/or the long distance telephone service carrier. Now, with SIP trunking becoming mainstream thanks to ITSPs like BandTel, the TDM trunk-side barrier is falling. We see captive expenses and limitations associated with the incumbent LEC and LD providers going away.

More important than saving costs, however, is the removal of TDM circuits on the trunk-side of the enterprise, and replacement with VoIP. That allows true resilient survivable voice services to be realized for the enterprise. That is priceless.