

Hosted PBX

The Challenges

A Technical Paper prepared for the Society of Cable Telecommunications Engineers
By

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Overview

Hosted private branch exchange (PBX) is a logical next step in business voice for service providers (SPs). It removes the PBX from the customer's premise and replaces the functionally with a cloud based service. This service has been around for several years, but there are still many challenges to deploying a scalable and reliable solution. Some of the more impacting challenges are moving beyond the traditional customer demarcation point, device management, and support for advanced features.

From the SP's perspective, one of the most obvious changes is the customer demarcation moves from the wiring closet to the customer's desk. This presents several challenges. Voice traffic and customer data now share the same network resources, and the customer local area network (LAN) must be configured to provide quality of service (QoS) for voice traffic.

The complexity of managing the hosted devices increases dramatically. Traditional business voice services (POTS, PRI, etc) are relatively standard across customers. With a hosted PBX service, the SP must manage more complex devices in the network, along with the endless combination of customizations the customers demand. This requires SPs to deploy new management systems and to develop new methodologies on how to manage the variations.

The most challenging aspect of a hosted PBX service is the required support of the advanced features. The majority of the hosted PBX features are essentially the same as those of traditional business voice. There are, however, a few new features found in the hosted PBX model that are a major challenge to support. These features use new SIP signaling and can drastically degrade the performance of an otherwise robust network.

Overcoming these challenges in a cost effective and scalable manner is the key to a successful hosted PBX service.

Contents

Introduction

This document covers some of the main challenges a SP will face when entering the hosted PBX market. These are based on real world issues that each SP offering the service must overcome to be successful. The three challenges include the movement of the demarcation, device management, and advanced features. These are not all the challenges of offering a hosted PBX service, but are some of the more impactful ones.

Each of the challenges has many possible solutions. This paper does not cover these solutions. It is intended to be a warning guide to alert the reader to the potential issues. Each SP's solution varies depending on the product offering and network configuration.

Beyond the Demarcation

With traditional business voice service, the demarcation point is well defined. Typically, the demarcation is within the customer's wiring closet or the minimum point of entry (MPoE). These demarcation locations are relatively secure and controlled. When the SP installs the traditional voice service, the interfaces to the customer network are well defined.

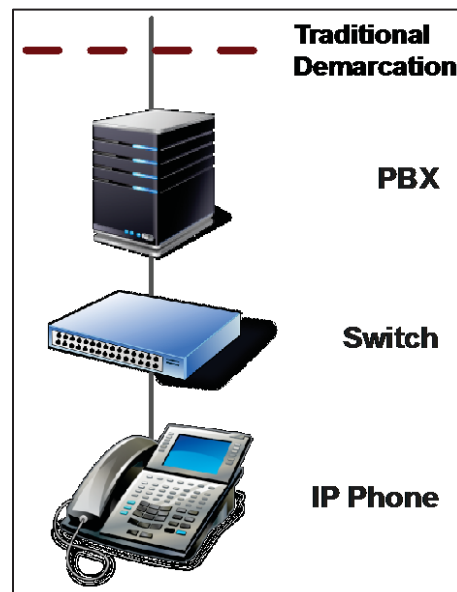


Figure 1. Traditional Demarcation

A hosted PBX service moves the demarcation point to the end user or phone location. This is the new demarcation, and it is anything but stable or secure. The SP must support not only the phone, but also the SP and customer networks delivering service to the phone. Supporting the customer network introduces many challenges.



Figure 2. Hosted Demarcation

Regardless of who owns the customer premise equipment (CPE), the SP will be held responsible for the quality of their phone service. QoS is key to providing a positive customer experience. The customer network is likely to be a mix of voice and data traffic. Fortunately, the majority of enterprise level switches and routers support the various QoS standards. Since the customer has access to the LAN and commonly modifies or moves endpoints, it is a challenge to enforce the policies on their network.

The customer network must be configured to enforce QoS and security. This is necessary to ensure the hosted PBX service is successful. Verifying the customer network is configured correctly requires a different skill set than previously needed for a voice install. Not only does the installer need to know the voice equipment, they must also be knowledgeable of LAN management. Many small business customers do not have the resources or skills to properly manage the LAN for voice service. This places responsibility of the configuration management on the SP.

The shift of the customer demarcation to the desk injects the new challenges of voice QoS and management of the LAN. The SP must address these to provide a successful hosted PBX service. The customer network, QoS, and network management must all be part of the solution.

A New Level of Device Management

A hosted PBX offering provides support for the session initiation protocol (SIP)-based business-class desktop phones. The phones have all the advanced features and customizations a company has come to expect from their premise based PBX. With these new devices comes a new level of device management challenges.

Traditional voice device management is relatively simplistic and, in many cases, standards-based. The majority of the standard voice over IP (VoIP) devices (SIP and PacketCable devices) only require two to four unique parameters per line. This includes the phone number, proxy server, and SIP authentication credentials. The remaining settings (timers, QoS parameters, etc.) are standard across all devices. These settings remain constant across vendors and in many cases are standards-based.

Hosted PBX endpoints can require dozens of unique settings for each device. These range from display setup to advanced button configurations. The settings can vary widely across vendors and product lines. The SP's solution must be capable of handling the increased complexity.

In addition to the base device configuration, the customer normally demands the ability to customize each and every line to meet their business' needs. This multiplies the complexity of the device management by making the configurations dynamic. Each phone can easily be configured in hundreds of variations.

With such flexibility, device management can quickly become unmanageable as the solution scales. The SP must develop a method to standardize the devices while still allowing for the flexibility the customer expects.

The Advanced Features Challenge

The most challenging aspect of a hosted PBX offering is the support for advanced features. With traditional telephony endpoints, the features supported by the devices are relatively simple. A telephony switch may support more complex services, but the devices can only support standard features. With new endpoints, the phones can now support a much larger set of features.

The majority of the hosted PBX features are no different from existing features, with the exception that the control is simplified. An example is call transfer. This is a standard feature that can be done on both a plain old telephone service (POTS) line and a hosted line. The difference is simply the user experience. With a traditional line, this was done with the use of a flash hook. With a hosted phone, it can be done via a transfer button. These standard features do not add any additional complexity for the SP to support. However, there are several new features that can impact the SP.

New features, such as busy lamp field (BLF) and shared call appearance (SCA), make use of SIP event notifications. These new features allow one phone to track the presence of another. The SIP messages (SUBSCRIBE/NOTIFY) used to support these features are new to most SPs' networks. The new message flows can quickly overwhelm the network if not planned for properly.

The new messaging for the advanced features challenges the network in two different ways. First, the size of some SIP messages are much larger than standard SIP messages. The second concern is the quantity of the messages.

The size of the NOTIFY messages can easily be fifteen (15) to twenty (20) times the size of a typical INVITE message. Most SIP networks use user datagram protocol (UDP) as the underlying transport. Using UDP means the NOTIFY message will be fragmented. Unless the SP's network is perfect (and none are) there will be some small percentage of packets lost. In fact, as many as one out of every twenty (20) packets can be miss-ordered or lost. Many of the hosted devices handle packet loss ineffectively with large SIP messages. This can result in a poor users experience with the advance features. The normal recommendation for SIP is to use transmission control protocol (TCP), which is more reliable. Using TCP requires the SP to ensure the network elements support TCP. SIP over TCP is not as universal as SIP over UDP, and it can lead to some vendor incompatibility.

The second and larger issue is the quantity of SIP NOTIFY messages. When a call is placed, three NOTIFY messages are generated for each monitoring endpoint. This may not seem like much, but when combined with the maximum number of monitoring relationships ($n \times (n-1)$), it can become unmanageable even with very small business customers. A company which has ten phones all monitoring each other will have the same signaling impact as a traditional company of one hundred (100) phones. A company of one hundred (100) phones could have the same maximum signaling impact as a traditional enterprise customer with ten thousand (10,000) phones. It is easy to understand why a SP must limit this feature.

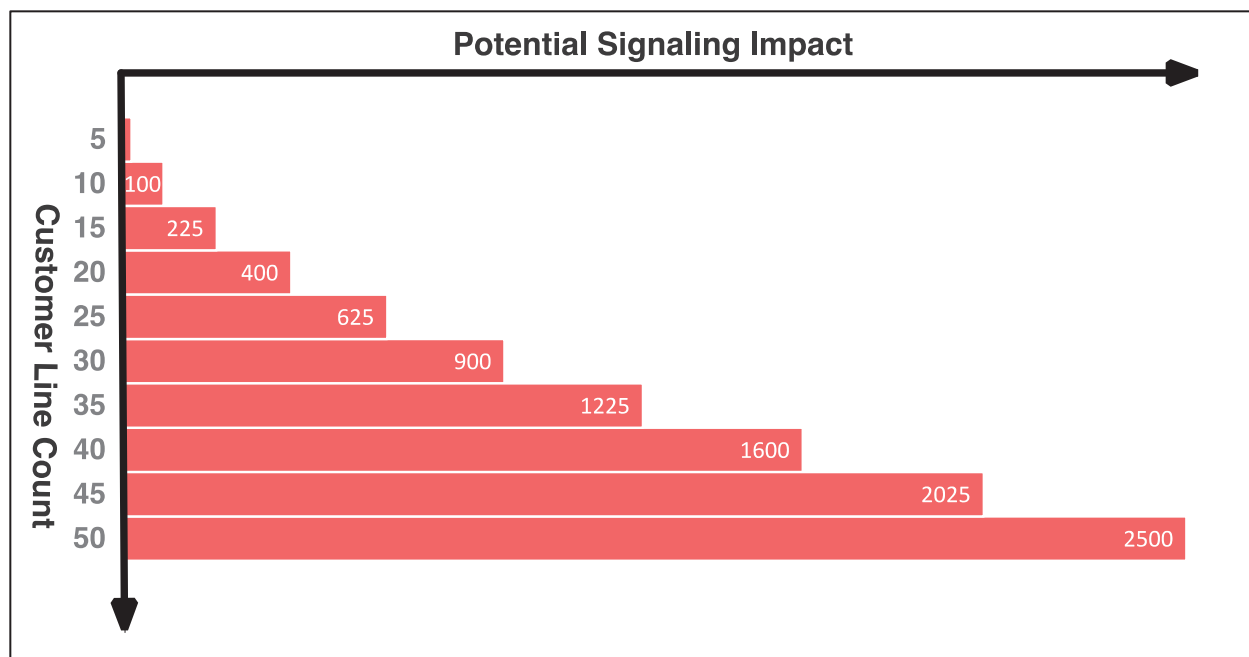


Figure 3. Potential Signaling Impact with the Use of SIP Event Notifications

Without understanding the impact of the new advanced hosted features, a SP could quickly overrun their existing network. The SP must decide how to limit the impact of supporting these new features to ensure success.

Conclusion

There are many challenges that must be overcome when offering any new service in the cable network. A hosted PBX service is no different. Its challenges include movement of the demarcation, device management, and advanced features support. This document was written to provide insight for the SP planning to offer the service. If these challenges are addressed, the SP will be better positioned to have a successful hosted PBX service.

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Abbreviations and Acronyms

PBX	Private Branch Exchange
SIP	Session Initiation Protocol
VoIP	Voice over IP
QoS	Quality of Service
LAN	Local Area Network
BLF	Busy Lamp Field
SCA	Shared Call Appearance
UDP	User Datagram Protocol
TCP	Transmission Control Protocol
POTS	Plain old telephone service
PRI	Primary Rate Interface