4 Key Points to a Successful PSTN to All-IP Transformation
Introduction

The evolution of the PSTN from TDM to IP is happening today. More and more service providers are adopting IP as the technology of choice for providing business voice services. But, it is more than that. For several years we have seen Over the Top (OTT) Service Providers, sometimes called alternative Service Providers, offering competitive voice services based on SIP trunking technology while the traditional fixed line operators continue to offer legacy TDM services. Recently, however, we are seeing a change in the market and a new trend of these operators moving towards complete All-IP services. Taking into consideration factors such as end of life of the traditional TDM switches, real-estate that is occupied by these switches and energy savings together with the need to compete with the growing alternative service providers, Operators are moving towards a complete replacement of their legacy TDM networks with All-IP networks in a process that is also known as “All-IP Transformation”.

The migration of the legacy TDM networks to All-IP is far from simple. In fact, it includes many complex elements such as the migrating the core network to IP, replacing the customer’s on-premises equipment, introducing new services to end-customers and more. In this paper we will cover some of commercial and technical challenges facing the fixed line operators who plan to migrate their networks to All-IP, and we will suggest some guidelines that will help them to overcome these challenges.

Key Point 1 : The Time is Right for All-IP Transformation

That the market has shifted towards a migration to SIP trunking is by this point an established fact. According to Infonetics’ latest report, the number of SIP Trunks will more than double itself in the coming five years to 45 million trunks\(^1\). In North America alone, of the approximately 38.1 million business trunks in service, 30% were SIP at the end of 2014, and this figure is expected to grow to 60% by 2019\(^2\).

While we are expecting a significant increase in the number of SIP trunks in the coming years we are going to see a significant decrease in the number of PSTN lines as users switch to mobile and VoIP alternatives. It is estimated that in the next five years the number of the global PSTN lines will decrease by 33%.
At the same time, the number of the TDM switches serving these PSTN lines will remain almost unchanged as they will need to keep serving the remaining active PSTN lines (roughly around 40,000 global switches). This means that the average number of access lines handled per PSTN switch will decline precipitously, increasing the cost per PSTN user.

According to the Yankee Group\(^3\), by 2020, the number of lines in the US per switch will be 10% of that in the 1990s (when the average was around 50,000 lines per switch), and the cost of maintaining the PSTN will increase by 70% per line between 2013 and 2020. Additionally, legacy TDM switches designed with a life cycle of 25 years have been working for more than 30 years, challenging the operators with increased maintenance costs and a lack of spare parts and expertise. Real-estate that is occupied by these switches and the high energy cost needed to operate them is another important consideration. And above all, the increasing competition from OTT service providers offering compelling IP advanced services looms as a major motivator.

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(1) Infonetics Research, VoIP and UC Services and Subscribers, 2015
(2) Infonetics Research, SIP Trunking Penetration, 2015
(3) [https://www.neustar.biz/corporate/docs/yankee-transition-pstn-to-ip.pdf](https://www.neustar.biz/corporate/docs/yankee-transition-pstn-to-ip.pdf)
Fixed Line Operators and PSTN Migration Status

Many fixed line operators have already begun the process of PSTN migration. Some are still at the evolution point and others are already in advanced stages of the migration. Below is a list, based on information from several sources 4, 5, 6, 7, of operators who have already announced their move to All-IP:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Country</th>
<th>Transition Date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT&amp;T</td>
<td>USA</td>
<td>2020</td>
<td></td>
</tr>
<tr>
<td>Verizon</td>
<td>USA</td>
<td>2018-2020</td>
<td></td>
</tr>
<tr>
<td>CenturyLink</td>
<td>USA</td>
<td>N/A</td>
<td>Made request to FCC</td>
</tr>
<tr>
<td>Oi</td>
<td>Brazil</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td>International</td>
<td>2020</td>
<td></td>
</tr>
<tr>
<td>KPN</td>
<td>The Netherlands</td>
<td>N/A</td>
<td>In progress &gt;60% of connections</td>
</tr>
<tr>
<td>Telekom Austria</td>
<td>Austria</td>
<td>N/A</td>
<td>All fixed voice customers in Austria on All-IP</td>
</tr>
<tr>
<td>Belgacom</td>
<td>Belgium</td>
<td>N/A</td>
<td>In progress</td>
</tr>
<tr>
<td>BT</td>
<td>UK</td>
<td>2025</td>
<td>All-IP core network already built</td>
</tr>
<tr>
<td>Deutsche Telekom</td>
<td>Europe</td>
<td>2018</td>
<td>Macedonia, Slovakia and Croatia are All-IP</td>
</tr>
<tr>
<td>Swisscom</td>
<td>Switzerland</td>
<td>2017</td>
<td>&gt;25% of connections; &gt;33% of customers</td>
</tr>
<tr>
<td>Telefonica</td>
<td>Spain</td>
<td>2018</td>
<td></td>
</tr>
<tr>
<td>Turk Telekom</td>
<td>Turkey</td>
<td>N/A</td>
<td>In progress</td>
</tr>
<tr>
<td>NTT</td>
<td>Japan</td>
<td>2025</td>
<td>2010-20: shifting to alternative services</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2020-25: phase out PSTN services</td>
</tr>
<tr>
<td>Telstra</td>
<td>Australia</td>
<td>2021</td>
<td></td>
</tr>
<tr>
<td>PCCW</td>
<td>Hong Kong</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>PLDT</td>
<td>Philippines</td>
<td>Completed</td>
<td>782 switches and nearly 1.3 million lines migrated to NGN</td>
</tr>
<tr>
<td>Telekom Malaysia</td>
<td>Malaysia</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Telekom SA</td>
<td>South Africa</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

(4) Does BT Lag European Peers on All-IP?, Light Reading, Aug 2015  
http://www.lightreading.com/ethernet-ip/does-bt-lag-european-peers-on-all-ip/a/d-id/716849  
(5) DT Completes All-IP Move in Croatia, Light Reading, Dec 2015  
(6) The Cavell Group: How will the SIP Trunking market develop as the PSTN is switch off? Matthew Townend  
(7) OVUM: Service Providers PSTN Migration, Aug 2015, Kamalini Ganguly
Key Point 2: Focus on the Business Customers

Though one of the main triggers for operators to transit their PSTN networks to All-IP is the significant decrease in the number of PSTN residential lines, they need to keep in mind that once they start the transition process, it will cover 100% of their network - meaning it will also include their business lines.

It is critical for operators to focus on their business customers during the PSTN migration process for several important reasons:

- Business lines account for only 27% of the global fixed voice lines, but in terms of revenue, the figure is considerably higher. 44% of global fixed voice line revenue comes from the business segment.

- Business customers are far more sensitive to changes in voice services as they are critical to their ongoing business operations. Unlike a residential customer who can easily switch to a mobile device if their home phone service is disrupted during migration, business customers can be seriously harmed in the case of service outages and quality issues that might occur during the migration process.

- Moving to an All-IP network will enable operators to offer new, appealing and revenue generation services. The revenue potential from business customers using these services (such as cloud UC) is considerably higher than residential customers.
Key Point 3: Ensure Successful PSTN Migration Process

The PSTN to All-IP transformation process is far from being just a technology upgrade. It includes significant challenges that the operators will need to face such as migrating on a massive scale, on time and on budget, and ensuring that the transformation have zero impact on the existing services and the end users. A detailed description of some of these challenges can be found in a useful paper from Deutsche Telekom covering their successful PSTN to All-IP transformation in Macedonia (http://www.ittoday.info/Excerpts/PSTN_Transformation.pdf).

AudioCodes defines 5 key points that should be followed by the operator as part of the PSTN migration process:

- **Cover any Deployment Option**

A key challenge of PSTN migration is migrating 100% of the network while providing solutions for any customer type, size, or location that may be using existing telephony applications and services.

There are two models that can be deployed in such a migration. In the first model, a large gateway, capable of handling multiple trunks is deployed on the Service Provider side. In the second model, the Service Provider sends a technician to move the ISDN trunk over to the SIP trunk and puts a smaller, but dedicated gateway on the customer site.

**Smart CPE Migration Approach**
- The IP network ends at the customer’s premise
- New CPE has to be installed at the customer
- The customer has to be informed when the migration is carried out
- The customer can keep using his old PBX

**CO Migration Approach**
- The IP network ends in the exchange or in the box near the customer’s premises
- A Trunking Gateway has to be installed at the CO or in the street cabinet
- The customer does not always have to be informed when the migration is carried out
- The customer can use his old PBX
Avoid Customer Churn

The customer-based footprint is the greatest asset of the fixed-line provider. It is critical to minimize churn during the migration process.

- Ensures minimum business disruption during the migration process with a quick installation of the new devices
- Assures better QoS and better QoE with the new IP network

Optimize Migration Time

Reduce the migration time of a large scale deployment

- Quick installation and configuration of on-site devices is made possible by using wide-ranging interoperability devices, auto configuration wizards and zero touch provisioning
- Remote management tools enable remote configuration and installation of new applications while saving costs of technician time and visits

Minimize Migration Costs

The migration process is long and complex and requires detailed cost planning.

- Reduces equipment and logistics costs by using a single provider
- Reduces installation and engineering costs with a quick and easy deployment of the new devices, together with holistic management that saves the costs of on-site technician time and visits

Enable Future Cloud Services

Once the All-IP network in place, the operator will have a “foot in the door” to offer additional revenue generating services. These include new, advanced applications from the cloud all the way up to a full migration to the cloud with hosted Unified Communications services, all offering higher ARPU, improved differentiation and increased stickiness of the service.

During the migration process, the operator should use “cloud ready” devices that will enable the quick, easy and cost effective move to cloud services once the PSTN to All-IP transformation is complete.
Key Point 4 : Use Smart Cloud Transformation

The shift to All-IP networks enables the operators to bring forward new revenue generation services such as cloud services. According to Infonetics, the market size for cloud voice services will grow by 80% in the coming 5 years and during this period, out the total 450 million global seats today, 50 million will be switched to cloud-based services.\(^8\)

The operators need to take into consideration that even though the transformation of the TDM network to All-IP will come with a high price tag, the migration of end business customers to cloud-based revenue services may not be possible immediately.

During the PSTN migration process the operator will need to disconnect the SMB’s voice systems from the PSTN and reconnect them to the IP network using on-premises or central office (CO) VoIP gateways, and their focus should be on doing this with minimum customer disruption. 77% of these businesses are using on-premises PBX systems today and even if they will be connected to a new All-IP network, there will still be another phase that is needed in order to migrate these businesses to cloud-based services. This situation reflects two challenges that the operator needs to face:

- The SMB customers are used to working with their on-premises PBX systems. They have invested funds in those systems, and they are concerned about moving their voice services to the cloud and the disruption to the on-going operation that might occur during this process.
- Moving an SMB customer to the cloud can be a complex task with a need to replace existing equipment such as desk-phones, cables etc. This task will require sending a technician to the customer and can increase the cost of the migration to point that it will be higher than the potential revenue from this customer.

Using modular and hybrid CPE devices will allow the operator a “foot in the door” that can be used in the future to offer additional cloud services.

(8) Infonetics: Business Cloud VoIP and UC Services, Annual Worldwide and Regional Market Size and Forecasts, Sep 2015
Gradual Cloud Migration

The main concern that the operator needs to address during the migration from TDM to IP is assuring that it is done with minimal impact to the customer. If the operator deploys a smart CPE device to connect the customer to the new All-IP network, the device now serves as a “foot in the door” that can be used to offer additional cloud services. These new services can be offered in a gradual way where some applications are offered as enhancements in the first stage, increasing the stickiness of the SIP trunk. Then, the business can expand the number of extensions by adding virtual extensions from hosted UC platforms, together with enhancement features such as mobile clients and collaboration.

Modular Design

AudioCodes’ CPE unique modular design allows for remote installation of Gateways, Session Border Controllers (SBC) and Routing applications in the same device as well as the activation of the most suitable configuration for the desired service. This unique design enables fixed line operators to connect their customers to their SIP Trunking services quickly and with minimum disruption, while being able in the future to migrate these customers to cloud services without a technician needing to revisit the customer and reinstall equipment.

Hybrid Solution

The AudioCodes Hybrid CPE enables fixed line operators to benefit from a coexistence solution that merges the on-premises PBX and the new Hosted PBX into a single telephony solution. This hybrid design allows for a gradual migration to Hosted PBX services while continuing to use the existing on-premises PBX system. The service provider benefits from reduced on-site technician time and from an improved cloud migration offering to the end customers.
Enhanced User Experience with Service Enhancement Functions

Deploying smart CPE on the customer’s premises also opens the door to offering service enhancements which provide tremendous benefits to the customer as well as to the operator. These enhancements, which include among other things monitoring, quality enhancements and resiliency, satisfy customers while lowering operating costs and providing differentiation from the competition. In addition, it allows the operators to allay their customers’ fears of putting their critical telephony services in the cloud.

Monitoring

The AudioCodes CPE, supported by applications such as AudioCodes Element Management System (EMS) and Session Experience Manager (SEM) provide the operator with “eyes and ears” into the customer’s network behind the LAN and can uniformly manage, monitor and operate SBCs, gateways, and IP phones in the network. The operator can in real time see what is going on in the network, receive alarms before the customer feels the problem and can execute a root cause analysis to fix problems quickly.

Quality Enhancements

Built into the AudioCodes CPE are significant quality enhancers that can guarantee voice quality end-to-end. This is especially true in a world increasingly moving to mobile devices, which more and more uses Wi-Fi and 3G/4G networks. Using such networks can also create quality problems on the voice network due to latency and packet loss that are considerably higher than those on a LAN. The CPE is integrated with built-in quality enhancers such as Adaptive Jitter Buffers, Transcoding, Transrating, rules-based routing and more, all of which can make a significant contribution to keeping customers satisfied by guaranteeing end-to-end voice quality.
Resiliency

With a deployed CPE that has resiliency features such as local survivability or dual WAN capability to access an alternative WAN service, the voice network can continue to operate even if there is a problem with the data connection. Resiliency features ensure that WAN connectivity continues either through a dual WAN or 3G/4G backup.

Conclusion

In this paper we have seen that the telecommunications market is going through a significant change as more and more operators are starting to evaluate, and some even to execute, transformation plans from TDM networks to IP. There is no doubt that the operators urgently need a holistic plan to avoid confronting the looming issues of end-of-life of PSTN infrastructure. If executed in a timely and accurate manner, PSTN migration can provide multiple benefits such as additional revenue streams from cloud and IP services. We have highlighted several commercial and technical key factors that we believe every operator should take into account as part of their journey to a successful All-IP transformation.