PSTN to IP Transition: Why Bother or Why Wait?

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Jennifer Pigg, Vice President, jpigg@yankeegroup.com

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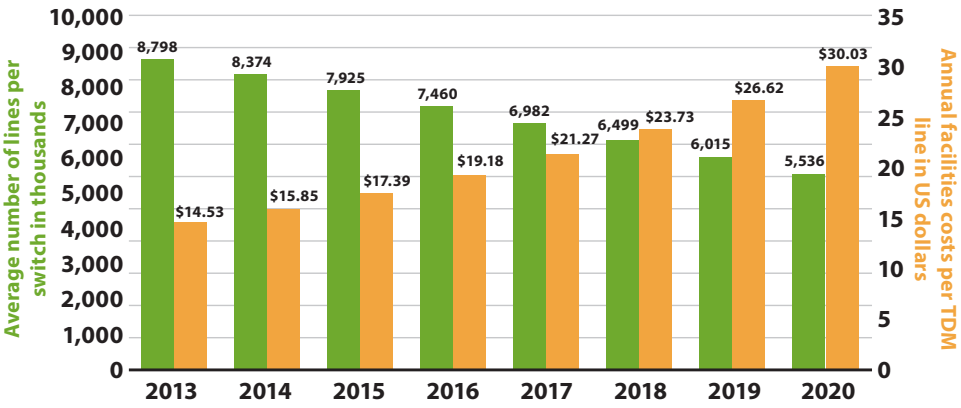
Executive Summary

Three years ago the FCC Technological Advisory Council (TAC) made the recommendation to sunset the PSTN by 2018, an announcement that was met with profound skepticism by operators. In 2014, changes in the telecom ecosystem are encouraging operators to move beyond ad-hoc switch replacements to a planned transition to IP.

Today we have fewer users per switch and a higher cost per user as consumers drop their landlines in favor of their mobile phones (see Exhibit 1). At the same time the enterprise community is growing and has no plans over the next five years to abandon switched access. The enterprise community is sharply divided, however, between those that demand new IP services and those that depend on the PSTN for mission-critical applications including alarm systems, auto-dialers, ATMs and PoS terminals.

Exhibit 1: Fewer Users Per Switch Has the Cost Per User Climbing
Source: Yankee Group, 2014



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The cost of maintaining dual PSTN/IP networks is considerable from capital (on the IP side), operational and facilities cost perspectives. While the PSTN may be largely depreciated with little impact on capital budget, it certainly is impacting the operational budget. A 2010 AT&T Labs study of 3,918 central offices (COs) reveals that, when analyzing actual power usage by type of equipment, Class 5 TDM telephone switches were "easily the largest contributor to power consumption, accounting for 43.0% of the total consumption." IP softswitches, conversely, consume one-tenth to one-quarter of both data center space and power. To eliminate the last barrier to transition, capital cost, operators should look to their softswitch vendors for innovative financing options that share the operator's financial risk.

Network operators are aware of the savings in space and power that IP offers, along with improved network flexibility and ease of configuration and management. However, there are additional advantages that should be acknowledged:

- **Improved regulatory environment:** Regulatory incentives to connect users via the PSTN have been phased out, resulting in a neutral regulatory playing field for IP.
- **Lower CO2 emissions:** IP softswitches generate one-quarter of the emissions produced by TDM switches, resulting in tax breaks and helping operators achieve their green goals.
- **Recovered precious metals:** Who knew? There are recovery companies that will pay good money for the gold, silver and palladium in old TDM switches.
- **Repurposed data center space:** Less space for IP means much more than a cost savings – it means square footage can be repurposed as data center space for critical IT revenue streams including content hosting, outsourcing and cloud services.
- **New IP application revenue streams:** An IP platform will dramatically shorten, simplify and expand the development ecosystem as operators shift more of their revenues from network access to IT.

Yankee Group believes operators that accelerate their transition to IP can save money, assume minimal financial risk and enable new revenue streams. The transition to IP should no longer be carried out at a leisurely cadence – it should be raised to a strategic initiative.

Ready or Not, We're Pulling the Plug

Three years ago, on June 29, 2011, the Critical Legacy Transition Working Group (CLT-WG) of the FCC's Technology Advisory Council (TAC) issued the following succinct recommendation: "Target 2018 as the end of the PSTN." The TAC saw a need to sunset the PSTN because: "As the number of subscribers on the PSTN falls, the cost per remaining customer increases and the overall burden of maintaining the PSTN becomes untenable. A fast transition can generate significant economic activity and at the same time lower the total cost."

Curious to see how North American operators were responding to this recommendation, and by how much they were accelerating their transition, Yankee Group spoke with 10 Tier 1/Tier 2 carriers (responsible for over 90 percent of U.S. consumer access). We asked them what they thought of the recommendation. The responses were uniformly negative, ranging from: "Irresponsible and out of touch with consumer customers. They would not appreciate it nor would they be ready to pay for it," to a terse "It's not going to happen."

The cost of maintaining dual PSTN/IP networks is considerable from a capital, operational and facilities cost perspective, so even if the operators were not prepared to meet a 2018 deadline even back in 2011, we reasoned that they had to have their own plans in place to phase out their Class 5 PSTN switches and transition to IP. They told us frankly:

- "We have not said, 'year by year we're going to convert this many offices.'"
- "We are trying to avoid doing it to any pace."
- "I don't think there's a typical sequence."
- "We don't have a master plan to get there."
- "It is not a goal in and of itself."
- "To say that we have a plan in place and that we are stepping through that plan? No."

Our snapshot of operator attitudes in June 2011 showed they were still attached to their (mainly Nortel) switches, they had an elephant graveyard of spare parts at their disposal and the regulatory environment did not promote an accelerated transition. In addition, the PSTN network was fully depreciated in most cases, and the operational budget for the PSTN tended to roll over from year to year with modest goals for contraction. New IP softswitches, on the other hand, would come out of the capital budget, which had to be fought for and won each year when the bulk of operator capex was being funneled into the mobile network. Space and power were seen as significant costs of maintaining parallel networks, but they were not considered to be transformation drivers in 2011.

Fast-Forward to 2014

It has been three years since the TAC's recommendation to sunset the PSTN by 2018. What has changed in the telco ecosystem in that time and how has it impacted operator attitudes and their plans for a PSTN-to-IP transition?

Consumer Fixed Flight

The FCC TAC cited the decline in the number of switched access customers as a reason to encourage the transition from PSTN to IP. Exhibit 2 shows U.S. operator data, reported to the FCC, on the number of switched access, mobile and VoIP lines from 2000 through 2012. Because operators were not required to break out VoIP numbers from switched access until 2008, the VoIP numbers for 2004-07 are Yankee Group estimates. More and more consumers are turning to their mobile phones and cutting the cord on their fixed access connection. The last three years of FCC data (2009-12) show the number of switched access connections declined by 25 percent. This trend has intensified in 2014 to the point where only 58 percent of respondents to our March consumer survey have a landline home phone (see Exhibit 3 on the next page). (Note that our consumer survey is biased toward Internet users and therefore shows a higher percentage of cord-cutters than found in the general population.) The trend will further accelerate as younger consumers enter the market (see Exhibit 4 on the next page). This trend cuts across all operators: cable, Tier 1 telcos and Tier 2 telcos. In addition, Yankee Group survey data also shows very little recoil – i.e., users who had cut the cord returning to a landline.

Exhibit 2: 12-Year Trend Paints a Clear Picture
Source: FCC and Yankee Group, 2014

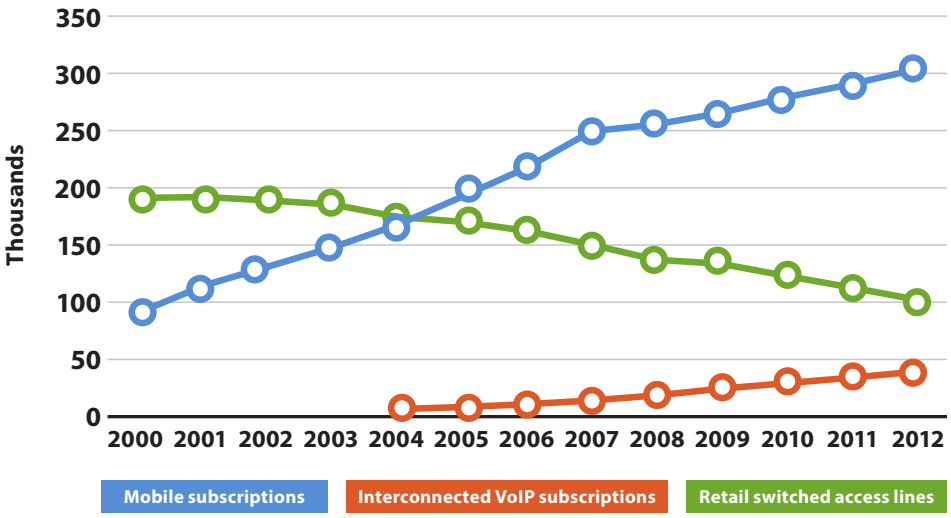


Exhibit 3: Mobile Takes Over in the Home
Source: Yankee Group's 2014 US Consumer Survey, March

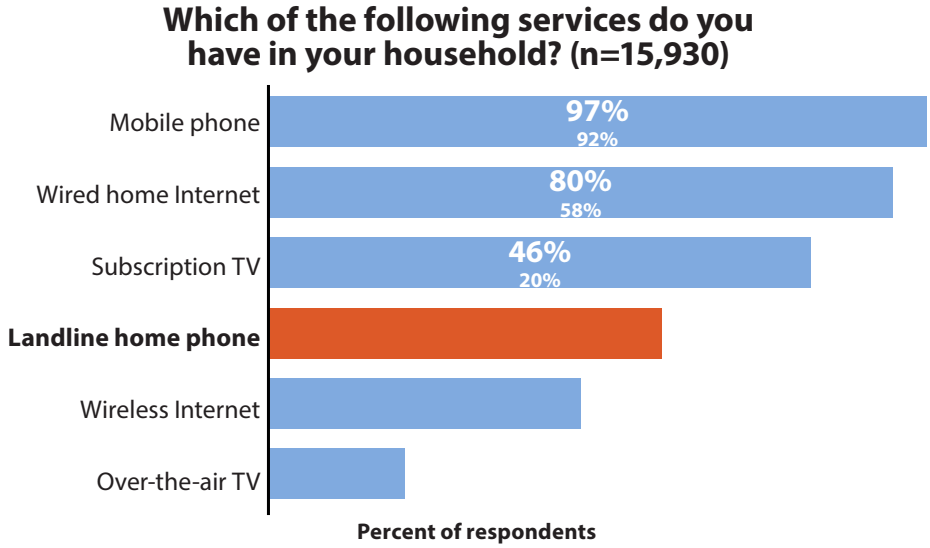
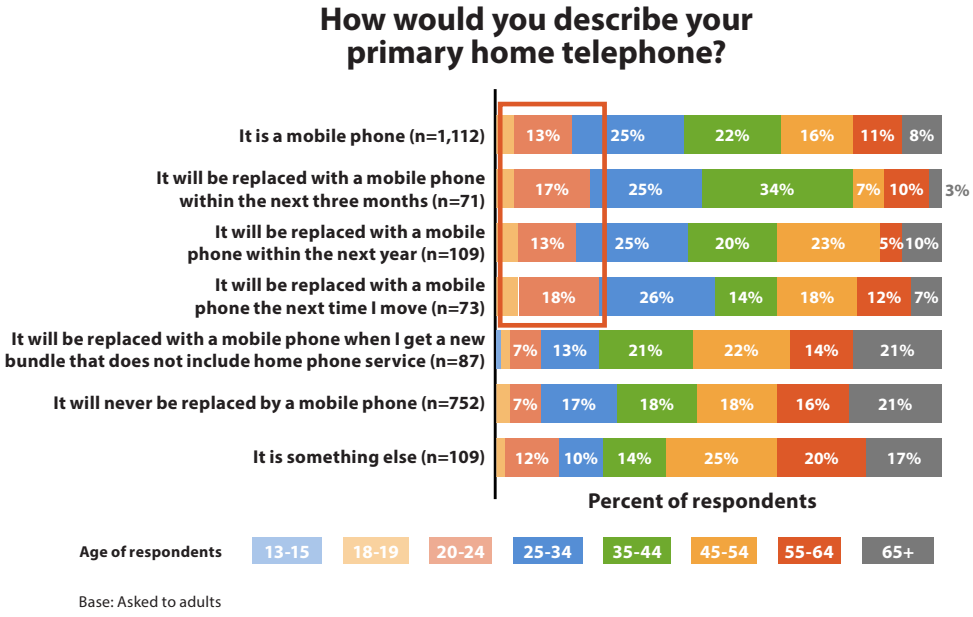


Exhibit 4: Kids May Not Know What a Landline Is
Source: Yankee Group's 2014 US Consumer Survey, March



Base: Asked to adults

Enterprise Is a Different Picture

Enterprise attitude toward switched access and the PSTN has a very different profile from that of the consumer. First, close to 100 percent of enterprises with more than 500 employees have switched access today and plan to retain it for at least the next five years. Second, while many enterprises are driving operators to transition to IP, an equal number are currently dependent on the PSTN. These pro-PSTN enterprises still use devices that depend on specific characteristics of today's TDM network (e.g., auto-dialers, alarm systems, ATMs, PoS terminals). Business and heavy industry may remain on the PSTN because they require some of the special services that IP does not have: a strong solution for telemetry, control systems and central-office-powered devices.

Recent economic downturns have also affected enterprise, and therefore operator, transitions to IP. As one operator explained to us: "When you tell the customer that they have to buy a new phone – they don't have the money to invest in this which, in turn, may be putting a drag on the overall network transformation."

The Same Trend Is Playing Out on the Infrastructure Side, Right?

The total number of PSTN switches is declining as well, but nowhere near as rapidly as the number of switched access users. FCC data from the Automated Reporting Management Information System (ARMIS), based on reporting from the operators, showed 13,711 Class 5 CO switches in 1997, including 472 analog switches (Mayberry RFD, here we come). Ten years later, in 2007 (the most recent year for which the FCC has switch data), that first number was down to 12,347 – a decline of only 10 percent over the decade, driven mainly by operator mergers resulting in CO and switch consolidation. Five years during this period actually saw an increase in the number of PSTN switches, including the last year for which FCC data is available, 2007. The number of analog switches dropped like a stone to only 64, a decrease of 85 percent; but seven years later, in 2014, Yankee Group estimates that we still have 20 analog switches remaining in the U.S. PSTN. Note that the FCC data only captures rate-limited ILEC switches. It does not reflect all of the switches owned and operated by competitive local exchange carriers (CLECs). These switches account for an additional 8-10 percent in the total number of lines and twice the number of switches. Our numbers also do not include Class 4 tandem switches, nor any SONET gear or digital cross-connects.

Yankee Group estimates that there were 10,520 PSTN switches in 2013, including 20 analog switches. These numbers are based on our research with:

- Carriers, notably CenturyLink and Verizon
- IP and TDM switch providers, notably GENBAND, Alcatel-Lucent and Metaswitch
- Academia, notably MIT
- Telecommunications numbering and addressing database administrators, notably Neustar and Telcordia (now part of Ericsson)
- FCC proceedings from October 2013

These numbers suggest a gradual acceleration in the decline of voice switches compared to the preceding decade: a contraction of 3.5 percent per year for the six years between 2007-13. This accelerated, though still leisurely, rate of decline in PSTN switches was driven primarily by aging TDM infrastructure impacting the availability of parts, spares and personnel. The catalyst for change is often an unforeseen event or natural disaster (fire, flood, lightning strike) that creates a decision point; as one operator put it: "Do I keep existing architecture and get some gray market stuff, or do I let the event drive a local transformation?"

"Between cleaning up after natural disasters, CO consolidation due to budgeting, transitions due to switch/part failures that we can't recover from (only two come to mind), deploying bundled multiplay services, and taking into account the cord cutters, the transition to IP switching is snowballing; it's moving faster than we predicted as recently as two years ago. It would be good to get out in front of the horse with a planned transition that saves us some money and improves services to the end user but does so without jeopardizing our remaining TDM customers."

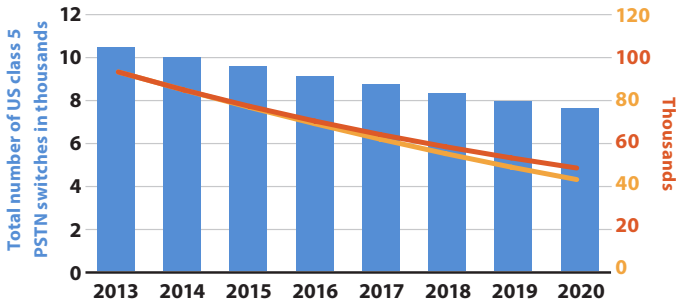
US Tier 1 operator, 2014

"We don't have the week of DMS 100 training in (city) anymore. We're relying on embedded tribal knowledge so there is going to be a disconnect as people retire. We'll get by, but it puts stress on the NOCs. Everyone there is 50 or 60 – they'll retire before the switches are gone."

US operator, 2013

Exhibit 5 shows Yankee Group's forecast of the decline in switches versus the decline in access lines from 2013-20. We have been generous with our estimates and show a 4.5 percent per year decline in the number of PSTN switches; our research does not support a more aggressive decline at this time. As we show, the number of PSTN users is contracting far more rapidly than the number of switches. This means the average number of access lines handled per PSTN switch (already low) will decline precipitously, raising the cost per user on the PSTN. By 2020, we expect the number of lines per switch to be 10 percent of what we experienced in the 1990s, when the average was between 40,000-70,000 lines per switch.

Exhibit 5: Decline in Access Lines vs. Decline in Switches Is Far From Equal
Source: Yankee Group, 2014



Excerpt from the transcript of the FCC Technology Transitions Policy Task Force Workshop, March 18, 2013

"So, I think there are 10 probably more data points out there, but one data point I just looked at. So, I just took our cost per customer for our TDM switches that we pay for maintenance over the last three years, and that cost per customer has gone up a million dollars. Because, as we have lost customers off of that network, then the cost per customer goes up. So, that is just one data point.

I think if you sit down, you could analyze a number of data points in the network. For us, I think some of the other challenges really come down into other big buckets, just platform obsolescence. The whole conversation around getting the hardware is increasingly becoming challenging. We do have sources today, but over time that continues to be challenged.

And then, the third one is the physical reality. They do take up a significant amount of our physical space, and I think we would like to repurpose that for better technologies. And so, over time in some cases that is driving the transition for us. Where we face a facility expansion project and the alternative is to remove the TDM infrastructure instead and create the space, we have gone that route. So, I would say those are three pretty good examples of where it is impacting."

Senior Vice President of Engineering and Technology of a US Tier 2 Operator

Can Operators Afford To Transition Their Networks? Can They Afford Not To?

Falling numbers of users and consistently improving space and power efficiencies in today's softswitches are compelling reasons to accelerate a transition to an all-IP network. However, this must be weighed against the capital cost of the IP switches. In 2007 (the last year the FCC required that this data be made public), the three largest U.S. operators had recovered 70 percent of their regulated investment in telephone plant (2007 ARMIS 43-03). With more than six years of additional depreciation since that time, we assume, for the purpose of this report, that PSTN plant is now fully depreciated (see Exhibit 6). While the PSTN may have no significant impact on capital budget, it certainly is impacting the operational budget. A 2010 AT&T Labs study* of 3,918 COs of a "major U.S. telecommunications service provider" revealed that, when examining actual power usage by type of equipment, Class-5 TDM telephone switches were "easily the largest contributor to power consumption, accounting for 43.0% of the total consumption." The next largest contributors were SONET/MUX systems (14.4 percent), D4 Carrier systems (8.5 percent) and digital cross-connect systems (DESX/DAX, 6.6 percent). Among the COs studied, newer access technologies such as DSL were responsible for only a small fraction of overall power consumption (4.4 percent DSL).

Exhibit 6: The Cost Equation Goes Beyond TDM Facilities Costs versus IP Capital Cost
Source: Yankee Group, 2014

	TDM	IP
Capital Cost	Fully depreciated	Capex hit (Regardless of lower price per port than "new" TDM switch)
Facilities Costs	Averages 4 to 10 times more power and cooling	10-25% of the power & cooling
	Averages 4 to 10 times more floorspace	10-25% of the floorspace
Ability To Deploy New Services	EOL	Frequent upgrades
	Legacy features and services only	Multimedia/multidevice services
Operational Costs	High OSS costs via legacy interfaces	Low OSS costs via Web-based GUIs and modern APIs
	Aging support personnel	Growing support community
	Lack of spare parts for repairs	No scarcity of spare parts
	Parts aging out even with no malfunction	No scarcity of spare parts

For purposes of this report we focus on the following cost areas:

- Maintenance of switch and peripheral equipment, typically in the form of a contract with the equipment vendor
- Power
- HVAC
- Data center space
- Staffing

However, there are many more hard costs associated with operating the POTS network:

- New switch and peripheral hardware, which will vary with the amount of network growth; growth is likely to be seen in subscriber PRIs and trunks, not necessarily POTS lines
- Feature and port licenses, usually paid to hardware vendor
- Leased circuits for transport and backhaul
- Recurring charges for network trunking
- Taxes
- Environmental costs (e.g., CO2 emissions)

There are also significant opportunity costs associated with maintaining the stable but inflexible PSTN. Operators cited the following as key advantages to IP. In their words:

- **Enabling enhanced services:** "A move to IP means changing to more software development, which enables cloud and other enhanced service development."
- **Scaling and flexibility:** "It scales more easily, allows you to move resources from voice to data – do enhanced services better, focus operations teams more easily, keep up with the bandwidth growth scenarios."
- **Bandwidth efficiency:** "The main thing you get is oversubscription, so a very efficient use of your network."
- **Redundancy:** "You get some redundancy without having to create redundant rings."

Operators struggle to compete with over-the-top (OTT) providers but they have been unable to match the agility of this new class of competitor. To remain competitive in an increasingly virtualized, cloud-based environment, operators must commit themselves to an IP network ecosystem. This is not to suggest that IP is free. While it will save on facilities and operational costs, there are additional costs associated with a transition to IP including training and integration into upstream systems, such as operational and business support systems (OSS/BSS). A key concern is the transition of PSTN applications and functionality to the IP network. This is a very complex topic, dealing with the dozens of legacy PSTN applications including emergency services, lawful intercept, fax, alarm systems and public interest payphones. Decisions have to be made regarding which applications to sunset (e.g., analog loop signaling-dependent services), which to maintain as transitional services (e.g., DTMF) and which will be IP network services (e.g., emergency services, lawful intercept, etc.).

As we look at these expenses, we have to acknowledge that the PSTN will be with us, in some form, for the foreseeable future. Yankee Group forecasts that there will still be 20 million POTS customers in the U.S. in 2024. However, this does not mean that these customers will be connected to Class 5 switches. These consumers can be served, without disruption, by narrowband connections back to a gateway location (most likely their former CO location) and from there will connect via IP to a remote IP switch. Phasing out the Class 5 switches does not mean phasing out POTS for those users that, for whatever reason, want to retain their current service. Operators can continue to support their POTS customers on an IP network.

What Is It Currently Costing Us?

In pricing out an operator's options, we rely on the following cost parameters:

- **Rent/floor space:** $100 per square foot per month is the average cost for data center facilities. Data center costs are increasing at an average of 2.51 percent per year in the U.S.
- **Power:** $0.08 is the average cost to businesses in the U.S. per kilowatt hour (kWh). Prices vary by region. For example, Los Angeles prices average almost twice the national rate. Note that the average consumer price in the U.S. is $0.11 per kWh. Industry power costs are currently increasing at an average of 2.11 percent per year in the U.S.
- **Support personnel:** $100,000 per year, fully loaded, for each dedicated support person. U.S. labor costs are increasing at an average 2.34 percent per year.
- **Support costs:** Annual service and maintenance contracts average between 5-10 percent of equipment purchase price. For the purposes of this study we have estimated the average support costs (either external support contract or internal support personnel, or a combination of both) for one 15,000-line Class 5 switch at $100,000, one softswitch at $100,000 and gateway switches at $12,000 per year.

These costs are a reasonable straw man for the U.S. In other global regions, power costs are likely to be far greater and labor costs will vary wildly, as will data center space. Exhibit 7 shows how we break down these costs between the IP and TDM networks.

Exhibit 7: IP Requires a Fraction of the Power and Data Center Floor Space of TDM
Source: Yankee Group, 2014

	TDM	IP
Rent/Floor Space	40-150 square feet per CO switch, depending on number of lines supported 3,000 to 20,000	4 square feet (1 rack) per softswitch and per gateway (we are rounding up – they take up only ½ a rack in many cases)
Power	Increases with number of lines supported: for 15,000 users 13,500 W/hr at $.08 per kWh requiring $9,500 to power	On a switch with supporting 15,000 lines: 2,910 W/hr requiring $2,038 per year to power
HVAC	Demand increases with number of lines supported: for 15,000 users 13,500 W/hr requiring $3,500 per year to cool	2,910 W/hr requiring $747 per year to cool
Support Personnel	1 full-time equivalent	1 full-time equivalent per softswitch .125 per media gateway
Maintenance Costs	$100,000 per year	$100,000 per softswitch, per year $12,000 per media gateway, per year

Softswitches are undergoing constant refinement and optimization. Models vary widely in capacity and power consumption. Higher-capacity softswitches can support 400,000 lines or more. We use 15,000 lines for an apples-to-apples comparison, and also because today's PSTN switches are supporting, on average, fewer than 10,000 lines, far down from their 1990s average of 40,000-50,000 lines. Today's second-generation softswitch architecture calls for two softswitches (for redundancy) to replace dozens of Class 5/4 switches and for less expensive media gateways to be placed in the COs.

For example, as part of his TIA keynote in October 2013, GENBAND President David Walsh presented a case study of a telco with 86 COs and 104 switches that could be consolidated into one switch and 39 gateways. The transition could be executed in three years and would then generate $8 million a year in savings resulting from cutting the power usage for the entire network in half, while also reducing real estate costs and taxes. Note that, as we mentioned earlier, energy costs in the U.S. are relatively low. In Western Europe, power averages three times U.S. costs and IP solutions can prove in even faster.

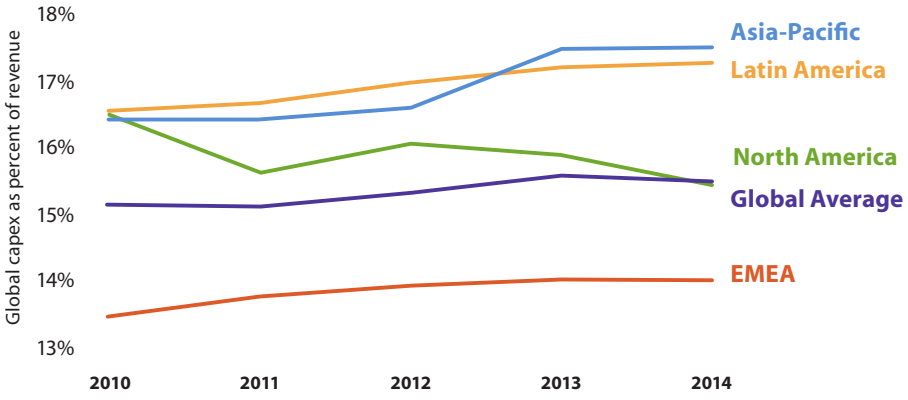
Removing Capital Costs as the Roadblock

Operators are accelerating their transition to an all-IP network, motivated by the savings in power and space, the shrinking of the PSTN, and the increased difficulty of maintaining the PSTN. However, capital cost remains the stumbling block for many operators. The rule of thumb Yankee Group uses to estimate the cost of a softswitch implementation is $100 per line, with half of that cost going toward capex and half to the cost of transition. As many operators have emphasized to us, the transition is a labor-intensive process as each line, or customer, has a specific set of applications and a unique number. Those applications and that number must be ported to the new switch accurately, seamlessly and without service interruption.

According to Yankee Group research, global operator capex as a percentage of revenue has stabilized at around 15.5 percent in 2014, with the Asia-Pacific region leading and EMEA trailing. Indeed, without data from the Middle East, the EMEA line would still be sinking (see Exhibit 8). These numbers are unlikely to increase as a percentage of revenue over the next three years, and over 80 percent of this budget is tied to the mobile network. How can operators fund a multimillion-dollar transition to IP even if they are motivated to do so, and even if they are looking at a payback period of seven years or less due exclusively to savings in power, including HVAC?

Some softswitch vendors are offering innovative financing options that share the operator's financial risk. GENBAND, for example, is working with energy audit firm TelEfficient and Wall Street financiers to finance IP network buildouts. GENBAND installs and maintains the new IP networking solutions, i.e., softswitches and media gateways. The vendor, together with TelEfficient, then demonstrates that energy cost savings, reduced real-estate requirements, tax credits, government incentives, etc., are able to finance the entire cost of a new network. The bank partner holds all the financial risk. Keep in mind that GENBAND bought all of Nortel's TDM business when Nortel filed for bankruptcy. GENBAND now supports the Nortel DMS line and is able to offer its own softswitch as a transition solution.

Exhibit 8: Operators Are Fighting for Capex
Source: Yankee Group, 2014



The Financial Advantages to an IP Transition Go Beyond Savings in Facilities

Network operators are aware of the savings in space and power that an IP network offers, along with improved network flexibility and ease of configuration and management. However, there are additional advantages that should be acknowledged.

Improved Regulatory Environment

Until the end of 2011, the regulatory environment, specifically broadband access funding, was seen by U.S. operators as a deterrent to moving off the PSTN and transitioning to IP. In November 2011, the FCC introduced The Connect America Fund (CAF), which gradually phases out subsidies for traditional landline phone services. The CAF is disbursing approximately $4.5 billion per year in high-cost support to subsidize broadband deployment to homes, businesses and community anchor institutions located in underserved areas. The operators perceive this as neutral from a PSTN-to-IP transition perspective.

One other regulatory element mentioned by operators that favors IP in a less quantifiable way is the end-of-month bill presentation. Operators currently have to tax for everything, creating five rows on the bill that customers hate to see. IP presents a much cleaner bill.

Lowered CO2 Emissions

Swapping out TDM switches in favor of IP switches results in a significant reduction in carbon emissions, which in turn creates tax benefits for the operator. One softswitch vendor cited 65,000 pounds of CO2 saved in one 3,000-line office, which is equivalent to a passenger car driving 85,000 miles. In another example, 159,000 pounds of CO2 was saved in one 12,000-line office – enough to heat 11 homes for a year.

Recovered Precious Metals

At a time when it is difficult to keep copper lines in the ground due to theft (1 pound of copper today goes for four times the 1999 price), let us point out the pounds of precious metals that can be harvested from old CO switches. While some may cringe at the thought of shipping their old DMS switches off to the horse knackers, there is a market for TDM CO switch printed circuit boards for precious metals recovery including gold, palladium and silver. Recovery companies will also buy CO switch power supplies, whole cabinets, racks, rectifiers, etc.

Repurposed Data Center Space

If an IP switch or media gateway demands between one-tenth and one-quarter the space of the TDM switch it replaces, clearly the operators are going to have some data center space on their hands in the wake of a transition to IP. As one network architect remarked to us, “It’s pretty amazing when you see a CO after the transition.” Some COs will be collapsed, certainly, but many others will be retained with a softswitch or media gateway on site. What happens to the remainder of the space? From a balance sheet perspective, it represents a savings in real estate or lease costs. However, these data centers offer a greater value in terms of revenue potential. Data center space in COs distributed across the country, sited in prime locations, and selected to service the greatest number of enterprise and consumer customers presents a valuable untapped resource. These sites can be ideal for content hosting, cloud services, enterprise outsourcing, etc. Service providers know that their value lies in their customer touch and that their future lies in enhanced applications and value-added services. As more of their revenue moves from the network to IT, the data center space reclaimed from TDM switches can be a key asset for success.

New Revenue Streams

Network operators require an average of 18 months to roll out an application on the PSTN. Three generations of consumer hardware come and go; Internet empires rise and fall in that amount of time. A transition to IP dramatically shortens this cycle. It introduces operators to an open development environment and broadens their development community beyond their own walls to a limitless community of third-party developers. IP is essential in positioning the operators to compete or even collaborate with OTT providers.

The Long Goodbye to TDM Is Over

In the three years since we started looking at how and at what pace operators were transitioning from TDM to IP, there have been remarkable shifts in the industry. These shifts, in turn, are changing operator attitudes toward an accelerated transition from "Why bother?" to "Why wait?" Today, we see that:

- Deterrents of the past, such as regulatory disincentives, have been resolved.
- The parts and the people needed to keep the TDM switches running are even more difficult to find.
- The momentum of users moving off of the switched access network is accelerating and is raising the cost per user year after year.
- Current generations of softswitch architectures are increasingly efficient in their space and power utilization profile.
- Innovative financing options that assume much of the transition risk are now available to operators.
- New revenue opportunities presented by freeing up data center space beckon to operators.

Yankee Group believes that operators that accelerate their transition to IP can save money, assume minimal financial risk and enable new revenue streams. The transition to IP should no longer be carried out at a leisurely cadence – it should be raised to a strategic initiative.

About the Author

Jennifer Pigg

Vice President

Jennifer Pigg is a vice president of research on Yankee Group's Mobile Broadband team. Her area of expertise is network carrier infrastructure, examining the challenges facing service providers in provisioning the edge and core network, and the solutions and technology that will meet the demands of cloud computing, Web 2.0 mobile data networking and LTE. Her areas of research include Software Defined Networking (SDN), Network Functions Virtualization (NFV), network policy management, Diameter Routing, IPv6, DNS, mobile backhaul and the Evolved Packet Core.

HEADQUARTERS

Corporate
One Liberty Square
6th Floor
Boston, Massachusetts
617-598-7200 phone
617-598-7400 fax

European
30 Artillery Lane
London E17LS
United Kingdom
44-20-7426-1050 phone
44-20-7426-1051 fax

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