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The End of the PSTN as we know it?

At its June 29, 2011 meeting, the FCC's Technology Advisory Council ("TAC") received a report from its "Critical Legacy Transition Working Group" addressing the "Transition from the PSTN [Public Switched Telephone Network] to an all IP Network and future technologies." The Working Group projected that by 2018 only 6% of US households will still retain a traditional copper wireline local exchange access line as their primary voice service, not having "cut the cord" and replaced their wireline phone with wireless or some other "new" technology. Based on that projection, the Working Group proposed that the TAC call on the FCC to "[t]arget 2018 as the end of the PSTN."

A call for the FCC to "sunset" the "PSTN" as the term is being defined by the TAC is, in reality, yet another effort to insulate wireless and IP-based services from traditional forms of telecommunications regulation. Indeed, the TAC group is urging precisely that outcome. What this proposal fails to recognize or understand is that the basis for telecom regulation is *market structure*, not technology, and the migration to wireless and IP-based technologies has not and will not alter the fundamental economics of telecom services and networks – high fixed costs, significant economies of scale and scope, and formidable barriers to entry that preclude a competitive outcome in the absence of economic regulation.

The TAC is "comprised of a diverse array of leading technical experts that assist the Commission with identifying important areas of innovation. The TAC will develop informed technology policies supporting America's competitiveness and job creation in the global economy." While the FCC can surely benefit from forward-looking perspectives of technology futurists, the group's conclusion that the PSTN is ready for hospice care as it confronts impending death appears to stem from an unduly narrow view of the PSTN and its critical role in facilitating and assuring universal connectivity across all telecom technologies and among all elements of American society. Seen in that context, the PSTN is far from dead, and the TAC's apparent misunderstanding of the PSTN and its place in the US telecom infrastructure has the potential to drive policy in a seriously wrongheaded direction.

The PSTN is not a specific technology or technology platform

The TAC Working Group seems to view the PSTN as consisting of the legacy wireline copper-based circuit-switched voice-oriented network operated by incumbent local exchange carriers (ILECs) and the remaining handful of competitive LECs that have deployed similar circuit-switched networks. This notion of the PSTN thus

excludes any sort of IP-based service – i.e., fixed VoIP services offered by local cable operators as well as nomadic VoIP services of the type offered by Skype and Vonage. It also excludes any form of wireless service, switched data service, or broadband in any form.

But the PSTN and the telecommunications policy that governs it needs to be understood in a considerably broader context than under the myopic perspective being advanced by the TAC. And the issue here is not just semantics. The PSTN has evolved from the earliest magneto hand-cranked telephones and cord switchboards through electromechanical "step-by-step" switches and non-carrierized copper, through electromechanical "common control" crossbar switches and frequency-division multiplexed coaxial cable and microwave transmission, on through analog electronic switches and time-division multiplexed (TDM) carrier, from twisted-pair copper to fiber optics, from analog space-division switching to digital time-division switching, and most recently to packet-based switching and transmission. The PSTN has evolved from hard-wired fixed-location station lines to mobile wireless handsets. It has evolved from a voice-only medium to one capable of providing switched data services as well. And it has evolved from narrow bandwidth services capable of supporting voice and low-speed data to broadband services that can carry high-speed data and video. Distance was once the principal cost driver of PSTN services, but distance is now so inconsequential as to be all but ignored in the pricing of most services.

Telecommunications policy and regulation evolved, albeit at a somewhat slower pace, along with these technological breakthroughs. Each generational change in technology brought with it new services, new cost conditions, and new competitive opportunities. The transition from TDM to IP has far more parallels to each of these earlier evolutionary technology transitions (e.g., analog to digital, electromechanical to electronic) than to the kind of revolutionary event that the TAC seems to foresee.

IP or TDM, wireless or wireline, the underlying network infrastructure is characterized by high fixed costs and significant economies of scale

Included among the TAC Working Group's finding that 2018 should mark the end of the PSTN is the admonition that the Commission should "[i]dentify necessary regulatory changes to address the change in technology from the PSTN." In that regard, the Working Group calls on the FCC to "[m]aintain or establish the least restrictive regulatory environment that still protects the public interest" but goes on to advance the far more unconditional

suggestion that “[r]egulations that support the ‘regulated monopoly aspect’ of the PSTN should be abandoned.” That suggestion seems to be premised upon the notion that the “post-PSTN” technologies do not suffer from the “monopoly aspect” of the legacy circuit-switched, copper-based narrowband wireline PSTN. That’s a rather large leap of faith, and is one that is not even close to being accurate.

The source of the “monopoly aspect” of the (legacy) PSTN lies in the huge fixed costs of constructing ubiquitous networks and the substantial economies of scale and scope that characterize the services that these networks provide. The “new” technologies do not alter those conditions, and summarily abandoning economic regulation of dominant carriers in possession of significant market power will result in increased market concentration and increased prices overall. Indeed, the experience of the 15 years following enactment of the 1996 telecom legislation certainly bears this out. Entrants have either withdrawn from the market or have been absorbed into those legacy PSTN carriers that the TAC seems to view as dinosaurs whose days on Earth are numbered. AT&T has itself conceded that it needs to swallow up T-Mobile in order to increase its efficiency and competitive position in the wireless market (see *Views and News*, May 2011). Market concentration is on the rise in each of the “deregulated” telecom sectors—wireless, cable and broadband. Calls to summarily “abandon” the “regulated monopoly aspect of the PSTN” ignore the inescapable fact that the post-circuit-switched telecom world is itself characterized by the same or greater “monopoly aspect” that the TAC Group seems to so lightly dismiss.

The new technologies have never been subjected to a fair market test vis-à-vis legacy circuit-switched copper-based PSTN services.

The one aspect of “PSTN” regulation that certainly does need fixing is the persistence of surcharges and subsidies that distort the economic trade-offs between legacy wireline TDM services and most everything else (see *Views and News*, June 2011). Wireless carriers have enjoyed decidedly preferential treatment with respect to switched access charges, with many calls that would be considered to be “toll” and subject to access charges if originated from ILEC lines being classified as “local” and exempt from such charges if a wireless carrier is involved. Similarly, many VoIP providers—particularly those offering nomadic or “over the top” VoIP services—have not been required to pay access charges. The lower prices that apply for wireless and VoIP long distance calls vis-à-vis wireline end-to-end calls over the same route exist largely because the former are not subject to access charge and other payments.

In fact, VoIP calls may actually involve more bandwidth, all else equal, than TDM calls. A technical note published by IP behemoth Cisco Systems, Inc. examines VoIP per-call bandwidth requirements—including overhead—for a number of available voice codecs. The nature of IP traffic is such that each packet must carry both its data “payload” as well as the destination address and certain other overhead information in a “header.” Moreover, the IP voice conversation, like its TDM counterpart, must be continuously sampled for the full duration of the call, even when the callers are silent, so the number of bits involved for a given call duration is not dependent upon whether actual conversation is taking place. All of this means that even using a 64 kbps voice codec similar to that used in traditional TDM circuit switched service, the IP call will take up as much as 30% more bandwidth than its TDM counterpart. TDM circuit-switched PSTN calls that are subject to switched access

charges are burdened with more than one cent per minute in access payments over and above the cost of the transport itself. That access charge is an order-of-magnitude greater than the underlying transport cost of either the TDM or IP call, thus overwhelming any actual technology-driven cost difference. The FCC has for more than a decade been engaged in a thus-far unsuccessful effort to eliminate these longstanding distortions, but until this actually happens and the market has been given an opportunity to subject the various technologies to the laws of economics, conclusions as to the demise of one technology in favor of another are premature, at best.

The TAC’s projections as to the demise of fixed wireline services

In that regard, the TAC Group’s projection that only 6% of US households will retain wireline service by 2018 may be a self-fulfilling outcome of its own policy recommendation. The projection appears to have come from an extrapolation of the data compiled by the Centers for Disease Control and Prevention (CDC), which has been studying and gathering statistics on wireless-only households for a number of years. “These findings are important to CDC because many of our largest surveys are done on calls to landline phone numbers. All of those adults with only cell phones are being missed in these surveys.” The most recent CDC report provides data through the end of 2010. The dataset provided in the TAC presentation begins in 2009, so at the very best the TAC’s eight years of extrapolations (i.e., 2011 through 2018) are based upon only two years of actual data! With only a single year-over-year change as the basis for whatever “trend” the TAC group has applied going out eight additional years, the 2018 “sunset” date for the TAC’s version of the PSTN has no legitimate scientific basis.

It is also worth noting that the fall-off in PSTN demand that is being forecast by the TAC is designated specifically as “TDM lines” and “TDM revenues.” Fixed VoIP services, such as those offered by cable companies and even by ILECs such as Verizon as part of its *FiOS* broadband package, may well be IP-based, but from the customer’s perspective provide substantially the same functionality as traditional TDM services. The TAC’s conclusion is badly misguided if it believes that the PSTN is necessarily limited to TDM services and thus views IP-based fixed wireline service as falling outside its scope. In fact, nothing in the CDC study addressed TDM vs. IP technology, and an extrapolation of the CDC’s conclusions regarding wireless substitution over to TDM-to-IP migration is simply meaningless.

The broad view of the PSTN as embodied in the 1996 Act should not be subject to the revisionism being proposed by the TAC

The *Telecommunications Act of 1996* and the FCC regulations that it had spawned were premised upon an expansive view of the PSTN. Carriers are obligated to interconnect with one another and to exchange traffic. Incumbent carriers are obligated to make those elements of their infrastructure that cannot be readily or economically replicated available to entrants at rates based on forward-looking economic cost. Obligations to contribute to, and ability to withdraw funds from, the various universal service funding mechanisms are intended to apply to all switched services carriers irrespective of the technology utilized.

The implementation of these principles has not been without its

frustrations and disputes. On June 28, 2011, the day before the TAC Working Group made its “PSTN sunset” presentation, tw telecom (TWTC) filed a Petition for Declaratory Ruling asking the FCC to clarify “that TWTC has the right under Section 251(c)(2) ... to establish direct IP-to-IP interconnection with incumbent LECs for the transmission and routing of TWTC's facilities-based VoIP services as well as voice services that originate and terminate in TDM format but are converted to IP format for transport ...” In its Petition, TWTC explains that “incumbent LECs such as AT&T and Verizon have seized upon the industry's transition to IP technology as a pretext for denying competitive carriers the right to IP-to-IP interconnection under Section 251(c)(2) for exchanging facilities-based VoIP traffic. Instead, AT&T and Verizon insist that competitors must exchange all telephone traffic in TDM format if they seek to avail themselves of the competitive protections of Section 251 (c)(2).” The TAC group’s proposal to define all IP-based telecom as falling outside of the PSTN and any PSTN-oriented regulation is, of course, consistent with AT&T’s and Verizon’s position on IP-to-IP interconnection as TWTC has described it and, like the ILECs’ view, must be seen for the nonsense that it represents. tw telecom’s Petition underscores the critical importance of a regulatory model that focuses upon market structure and market power rather than upon an arbitrary (and economically meaningless) technology-based bright line regulatory demarcation. The FCC’s technology advisors would do well to focus their attention on policies aimed at promoting competition and innovation rather than network fragmentation and market concentration.

Regulation needs to confront – and prevent – balkanization of the PSTN along technology lines

The PSTN is far more than copper loops and drop wires into individual residences. It serves as the cement that binds all of the various telecom technologies into a single unified network. It is no accident that users of wireless handsets can place calls to and receive calls from legacy wireline phones as well as to and from fixed and nomadic VoIP users. It is no accident that all of these services share a common addressing system known as the North American Numbering Plan. Indeed, the failure of governments at all levels to see the PSTN in this broad context has already succeeded in fragmenting and undermining universal connectivity. Here are some examples:

- *Telephone directories and listings.* Traditional “white pages” telephone books and directory assistance data bases have included only fixed wireline services; the 1996 *Telecommunications Act* and subsequent FCC implementation regulations were focused upon assuring that customers of competitive wireline carriers (CLECs) would be included in such directories. While individual customers could “opt-out” of being listed in the local telephone directory by requesting (and usually paying extra for) an unlisted number, *all wireline telephone numbers were available for emergency response and law enforcement purposes.* Significantly, wireless services and nomadic VoIP were never included in this listing requirement. The most recent CDC study reported that, as of the end of 2010, “[t]hree of every ten American homes (29.7%) had only wireless telephones.”
- *E911.* Local governments have invested massive sums to acquire the capability to provide rapid emergency assistance and response to their citizens. Fixed wireline telephone numbers are used as

retrieval keys to pull location information from the “E911 Database” maintained at a local Public Safety Answering Point (PSAP). This information is obtained directly from the wireline service provider (ILEC or CLEC) and provides precise street address and, for multi unit buildings, floor and/or apartment number. The FCC has for many years been grappling with the problem of extended E911 capability to wireless and nomadic VoIP technologies. Wireless location can be determined by means of GPS or by triangulation based upon the respective signal strengths at multiple nearby cell sites. Reporting of location information to the E911 database is entirely passive to fixed wireline customers; the process is handled entirely by the service provider. However, in the case of nomadic VoIP users, customers are currently responsible for reporting their precise location to the VoIP provider, which will then forward this information to the appropriate PSAP. The FCC has just announced a rulemaking to address this issue and shift the location identification burden to the ISP. However, for wireless and nomadic VoIP, there is no existing technology that can provide the level of precision in location identification that is available with fixed wireline service. GPS and cell site triangulation may not even work for 911 calls placed from within large buildings, and even if they can identify the building’s address, they will generally not be able to pinpoint the location within the building where the emergency assistance is needed. (This may be acceptable in the case of a fire where flames and smoke may be visible when the fire engine arrives. It won’t do the caller much good in the event of a heart attack.) If the TAC’s projection that by 2018 only 6% of US households will retain a wireline phone is even remotely accurate, then the ability of emergency responders to reach some 94% of the public will have been compromised.

- *Law enforcement.* Many of the new telecom and information technologies have raised serious privacy concerns – face recognition systems, data mining, networks of security cameras, tracking of search requests and location tracking – are all good examples. At the same time, these same technologies have also contributed to the anonymity of those accessing the PSTN and the public Internet. The availability of disposable prepaid cell phones, public terminals at Internet cafes and public libraries, spoofing of caller id, and nomadic VoIP services like Skype whose use requires little or no user identification, have fostered a variety of new opportunities for untraceable communications, many of which are in direct support of illegal activities.

Further fragmentation and dismemberment of the PSTN along technology lines as suggested by the TAC serves no valid purpose and is certainly not in the public interest. The FCC needs to unify disparate technologies within a greater PSTN, not ghettoize the legacy network until the wall around it that the TAC would construct suffocates it out of existence.

Verizon litigates – and loses – a dispute over \$4.19

Verizon, it would seem, considers no dispute with a consumer too small to fight over – even where the amount involved is

only \$4.19! In a consumer complaint case decided in June by Pennsylvania Public Utilities Commission Administrative Law Judge Mary D. Long, Verizon not only failed to prevail in its position on the matter, but got its hands slapped in the process.

The case arose out of a Complaint filed with the Pennsylvania PUC by Mrs. Bernice F. Keebler of Willow Grove, Pennsylvania, a Philadelphia suburb. In September 2010, Mrs. Keebler received her telephone bill from Verizon which included a charge for unitemized local calls of \$4.19. Mr. Keebler subscribes for flat-rate local service, which provides unlimited calling within "Band 1" of the Philadelphia Metropolitan Exchange Area and usage-based charges for calls beyond Band 1. She explained at a PUC hearing that she "typically uses her cellular telephone for calling numbers outside of Band 1," and so she had "contacted Verizon after receiving her September 2010 bill to determine which specific numbers she was being charged for." The ALJ's Decision indicates that in response to her request "[a] Verizon customer service consultant told her that the information was not available unless she hired a lawyer to subpoena the numbers or she could pay \$40 to make the search."

In her 13-page ruling, ALJ Long found that "Verizon does offer a service for detailed billing of local use calls. This service is offered for a one-time set-up fee of \$40 and an itemization of two cents per printed call. This [detailed billing] service is a Commission-approved tariff which became effective December 3, 1999." However, "[t]he detailed billing service would only print detailed call information going forward after a consumer subscribes to the service. It does not capture information on calls made in the past." Thus, the "subscription to detailed billing service would not tell Mrs. Keebler which calls generated the \$4.19 charge on her September 2010 bill."

Verizon's position was that "if Mrs. Keebler wants to have detailed local call information, it is their right to charge her for that service pursuant to Verizon's Commission-approved December 1999 tariff." Put differently, Verizon argued that the existence of that detailed billing service tariff effectively relieved it of any obligation to substantiate local call charges such as the \$4.19 at issue here. However, while agreeing with Verizon that "Commission-approved tariffs have the force of law" and that "[t]ariff provisions previously approved by the Commission are *prima facie* reasonable," the ALJ nevertheless determined that in this instance "the record does support a conclusion that Verizon's response to Mrs. Keebler's initial inquiry regarding her September bill constitutes a failure to provide adequate customer service."

Verizon's policy of requiring a subpoena in this situation to learn the source of a charge on a bill is tantamount to refusing to provide a customer with adequate information about charges on her bill. Verizon's witness testified that there is no way for a customer service consultant to verify that a charge is accurate without an investigation. It is Verizon's policy to require a subpoena before it will initiate an investigation. There is no explanation in the record for why Verizon would require Mrs. Keebler to subpoena her own telephone records in order to learn what calls generated a charge of \$4.19. She simply wanted to know which numbers generated the charge so that she could make knowing and intelligent decisions about when to use her Verizon telephone service and when she should use her cellular telephone service. ...

Although the bill amount involved in this dispute is small, this case raises a significant issue of customer service. Any time a customer contacts a utility about a charge on his or her bill, that utility must provide sufficient information to the customer to verify that the charge is correct and to

allow the customer sufficient information that they can make knowing and intelligent decisions about their utility usage. General calling plan information, as provided by Verizon here, is not sufficient. Further, Verizon's policy of requiring a subpoena is an intentional refusal to provide adequate information about a charge.

The ALJ assessed a "civil penalty of \$1,000" on Verizon for its conduct in dealing with this situation.

The wireless gap: The biggest get bigger while the small struggle for survival

For the four major wireless carriers, July 28, 2011 was a day of good news and bad news. First, the bad news. Sprint Nextel announced its earnings: After having increased its spending on marketing to stem market share losses and after continued subscriber attrition, Sprint lost nearly \$850-million in the second quarter of 2011. Sprint hasn't turned a profit since before 2007, and its inability to grow its base of lucrative post-paid subscribers (despite success in the less profitable pre-paid segment) does not bode well for the company's future. Sprint has not yet released an official statement of cash flows for the quarter, but if the first quarter is any indication, Sprint has entered a dangerous zone of incurring both accounting losses and hemorrhaging cash. Investors did not take this news lightly: Sprint stock closed down nearly 16% on the news.

After the markets closed on July 28, Verizon Wireless announced its good news. For the first time since 2005, the company is paying a dividend to its owners. Cellco Partnership, the joint venture of Verizon and Vodafone, has been continually profitable for the last decade, but has not turned over any of those profits as cash dividends to its parent companies. Instead, VZW has been reinvesting that cash to grow its business and paying off debt. Those efforts have propelled Verizon Wireless to the top spot in the US wireless industry, with AT&T running a close second. Sprint's position as No. 3 is eroding (as discussed above), and T-Mobile is in the process of being absorbed into AT&T (pending regulatory approval). Verizon's dividend payment is noteworthy not just because it is the first in many years, but because of its magnitude: \$10-billion. To put that number in perspective, the entirety of AT&T Inc. (both wireless and wireline) paid just under \$10-billion in dividends to its shareholders last year.

So what does all of this mean? If the AT&T/T-Mobile merger is allowed and Sprint is unable to reverse its downward spiral, the US wireless market will necessarily devolve into a two-firm duopoly with a small number of regional or specialized providers at the fringe, none of which will be capable of offering a serious competitive challenge to either of the two dominant carriers.

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