

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In The Matter of	)	
	)	
Reforming Legacy Rules for an All-IP Future	)	WC Docket No. 25-311
	)	
Accelerating Network Modernization	)	WC Docket No. 25-208
	)	

**COMMENTS OF**

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**I.     ADVANCING THE IP TRANSITION REMAINS A QUESTIONABLE  
OBJECTIVE**

The Commission alleges several “benefits” of completing the transition from TDM to IP, but most of these benefits do not accrue evenly to everyone but are concentrated on the large service providers that want to eliminate TDM as a cost-cutting measure, not because it is technologically substandard in any meaningful way. Addressing the points in the introduction:

- **Technological modernization** – Modernization for the sake of modernization is merely a change, not an inherent benefit
- **Public safety and consumer protection benefits** – This is demonstrably false. In dozens of comments and reply comments to WC Dockets 25-304 (Advancing IP Interconnection), carriers, states, and public safety agencies cautioned against a rapid move away from TDM due to the serious safety lapses that would result. Additionally, regulated TDM-based phone services are regulated by the FCC and state PUCs, while IP replacements generally are not, leaving consumers without any regulatory watchdog for issues with their service. State public service commissions are generally best equipped to deal with consumer protections issues, and while these have not been enforced strongly enough, in any state, these regulations protect consumers much more effectively.
- **Long-term efficiency** – This only benefits the companies providing service and says nothing about the impact on reliability, quality, etc. to consumers.
- **Service-quality for consumers** – This is an unsubstantiated claim. TDM-based services have consistently high-quality. IP-based services are generally best-effort, and even when using IP over private facilities, cannot match the latency and other quality metrics of a TDM-based connection.
- **Decreased maintenance expenses for service providers** – This, too, confers benefits only to the service provider, not to consumers.

It is thus unsubstantiated that there are any material benefits of completing the IP transition for consumers, only that providers stand to benefit from it due to IP-based networks being cheaper to operate (and note that “cheaper” is not always “better”).

## **II. STIR/SHAKEN DOES NOT MANDATE OR REQUIRE IP INTERCONNECTION**

The NPRM alludes to the need for IP interconnection in order to protect consumers against fraudulent calls using STIR/SHAKEN. However, STIR/SHAKEN does not require the use of homogenous IP-based networks. STIR/SHAKEN was designed to accommodate SS7, and the ITU released a new Q.931 draft<sup>1</sup> that amends ISDN standards to include an information element (IE) for caller authentication information. Existing gaps in TDM support for STIR/SHAKEN are not technological, but bureaucratic. Call authentication information can be passed over TDM circuits, and a full IP transition is not strictly necessary in order to realize the benefits of STIR/SHAKEN, as is claimed by numerous commenters. Voice service providers should collaborate with industry to implement STIR/SHAKEN in their TDM networks if they choose not to migrate them to IP-based alternatives.

Many commenters repeatedly tout IP interconnection as a magic bullet solution for today’s robocalling and Caller ID spoofing problems. However, the reality is far more complicated; even in today’s IP environments, many calls are improperly signed, reducing the usefulness of STIR/SHAKEN information. There are feasible solutions to provide authentication information within TDM networks; they are just not widely implemented at present. While traceability may be enhanced, migrating to all-IP interconnection will simply not magically alleviate the problems faced today.

## **III. IP INTERCONNECTION DOES NOT OFFER ANY PROVEN SECURITY BENEFITS**

The NPRM asks if there are any security risks of reliance on “obsolete” TDM-based equipment. In fact, there are likely more security risks with newer so-called “next-generation” IP-based switching equipment. Many IP-based replacements for SS7 and TDM-based services have more, not fewer, vulnerabilities and attack vectors<sup>2</sup>.

## **IV. MOST “ALTERNATIVES” TO SWITCHED ACCESS SERVICE ARE NOT FUNCTIONALLY EQUIVALENT ALTERNATIVES, AND CONSUMERS DO NOT DISTINGUISH BETWEEN THEM**

The Commission points to various “trends” in voice communications, such as online meeting software<sup>3</sup>, as competitive alternatives widely adopted by consumers. This is disingenuous and largely irrelevant; while many phone calls may now be replaced by these

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<sup>1</sup> Q.931 Recommendation Q.931/I.451 (1998) Amendment 2 (12/23). <https://www.itu.int/rec/T-REC-Q.931-202312-I!Amd2/en>

<sup>2</sup> See comments of A. Martinetti in WC Docket 25-304

<sup>3</sup> NPRM, para. 10

services, nobody is using Zoom meetings to call for help in an emergency. Phone calls are still dominant for critical and important needs where reliable real-time communications is the most important thing. Regulation must be approached from this perspective, not purely from the perspective of certain use cases that may be competitive. Traditional phone service has been regulated as a public utility for a century now, and leaving an essential utility to the free market will harm consumers.

The Commission claims that competitive alternatives to incumbent LEC services abound<sup>4</sup>. This is only by the most generous interpretation of “competitive”, and among these the Commission includes subscription to an over-the-top voice service on top off a broadband connection, which does not provide any of the crucial reliability guarantees of facilities-based voice services, and particularly of traditional TDM-based voice services. The Commission also laughably points to LEO satellite services being “sufficient” to support third-party over-the-top voice applications. Sufficient, perhaps; adequate? Very questionable, given the inferior latency and quality. Only on Mars would rational thought conclude that phone calls over LEO satellite would be preferable to having a direct physical connection to every subscriber. Yet, the Commission claims<sup>5</sup> that any broadband connection, no matter how poor, is a competitive replacement for TDM-based service that was engineered with five 9s reliability. Most of the “alternatives” make no pretense to even try to achieve such a goal (and in many cases, they cannot or do not in practice).

Voice services are not inherently interchangeable, and some consumers do distinguish between them. While a plethora of voice services are available over broadband, wireline broadband options do not have the same availability that wireline voice services do (and in fact, its availability is declining due to copper retirement as some customers who previously had DSL available now no longer have any wireline broadband options). Importantly, while some aspects of these alternative services may compliment or substitute (to a limited extent) capabilities of traditional voice service, none are an adequate alternative for reliability and quality. The only even comparable alternative is service provided over private facilities from a LEC, but this service is in many cases demonstrably less reliable than copper-based services due to the additional points of failure (e.g. fiber ONT) and also requires an active power supply from the customer, making it unsuitable for use in prolonged power outages. Non-wireline services also do not provide accurate E911 location information. This is why many customers have retained traditional voice service for its value in emergencies and power outages, even if using other services in parallel. Therefore, “alternative” must be evaluated in the context of a five 9s mission critical voice service.

As a case study, the thousands of public comments to the CPUC when evaluating whether to release AT&T of COLR responsibilities in California provides clear evidence that many

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<sup>4</sup> NPRM, para. 12

<sup>5</sup> NPRM, para. 15

consumers *do* distinguish between and do not find them to be interchangeable. This is why some customers retain traditional service, despite the availability of cheaper services to them.

The Commission asserts<sup>6</sup> that traditional voice service has a significantly narrower functional scope than broadband or wireless services. This is true; however, within that functional scope, it is superior to these other services. Broadband and wireless services cannot match the latency and reliability of traditional copper service. Furthermore, it is not correct that one may always place mobile calls from the same location as a fixed landline; wireless coverage is not reliable or consistent in many places, whereas a fixed landline works consistently. As such, wireless is not always a substitute for switched access service; it is more accurate to say it complements the service by allowing calls from non-fixed locations, and for other purposes. And for those customers with disabilities who cannot use wireless devices at all, it is not a substitute to any extent because the technology is not accessible to them. The Commission's claim that switched access offers "inferior performance over outdated technology" is thus blatantly false. In fact, for voice calls, it offers superior performance over technology that is optimized for mission-critical voice connectivity. To state otherwise perpetuates industry propaganda.

It is true that consumers today require "more than basic voice service"<sup>7</sup>. However, basic voice service still plays a critical role in life safety. It is often the most reliable method for contacting emergency services and remaining connected during extenuating circumstances, such as prolonged power outages, wildfires, and other natural disasters. Many people without landlines have died in wildfires<sup>8</sup>. Real human lives are taking the toll for large greedy corporations attempting to sunset copper services as a cost-cutting measure.

## **V. BILL-AND-KEEP IGNORES IMPORTANT ASSYMETRIES IN THE VOICE NETWORK**

Local voice service has always required subsidies in order to have optimal supply. This was well known to the Bell System, which uses cross-subsidies from long-distance revenue to subsidize local service and ensure service was accessible and affordable to all. Divestiture resulted in a drop in long-distance rates, but also a 40% increase in the price of local phone service due to these subsidies no longer being available. For decades now, intercarrier compensation has provided a critical mechanism to ensure that high-cost, low-revenue services (local exchange service) can be paid for by all the benefitting parties, chiefly through low-cost, high-revenue services, such as interexchange services. While overall toll volume has declined significantly, transitioning uniformly to bill and keep without ensuring the appropriate cost supports would again significantly raise prices for local exchange service, and ultimately, consumers would bear the brunt of these costs, along with RLECs, who have disproportionately high costs and low revenue.

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<sup>6</sup> NPRM, footnote 43

<sup>7</sup> NPRM, para. 21

<sup>8</sup> <https://www.timesheraldonline.com/2019/06/03/6091556-2/>

Bill-and-keep is also designed to force both calling and called parties alike to split the costs of a call. For many customers, particularly customers on fixed incomes who do not make many calls, this is a cost increase that they have so far been able to avoid by having the other party call them. Price-sensitive customers may not be able to afford Caller ID and would thus be forced to pay for unwanted received phone calls, as well as calls received from businesses that previously bore the cost of customer interaction. Not answering the phone is not a viable option in these cases<sup>9</sup>. Callers have traditionally had precise control over costs incurred for placing calls, but the recipients of calls rarely have this level of control. A transition to bill-and-keep would inevitably result in yet further price increases to those who are least able to afford them. Additionally, bill-and-keep works well when call exchange is symmetrical. This may be true in some cases, but many asymmetries exist in the PSTN, such as calls from subscribers to large urban LECs to small rural LECs.

Additional asymmetries exist in the nature of calls to and from switched access lines. Many consumers do not or only sparingly make toll calls from their switched access lines. However, they are likely to receive a larger volume of toll calls. (This is one reason the existing 64.9% safe harbor for VoIP is thus inappropriate to apply to all voice services, because different voice services see different usage patterns.)

The idea that carriers will invest in their networks and engage in “substantial innovation” is simply wishful thinking. We are living in a period of rapid decline in the state of wireline voice services in general, in no small part due to provider neglect and sabotage. Benefitting carriers will use bill-and-keep boosting profits and cut costs that previously supported universal, affordable voice service for all. In turn, service quality is almost assured to decline, as without any incentive for terminating calls using quality routes, an endless race to the bottom in least-cost routing will ensue. We have already seen this in the interexchange market with cheap interexchange carriers utilizing LCR over best-effort IP connections resulting in inferior voice quality to traditional TDM-based interexchange carriers. While it is probable that many carriers will realize efficiency and cost benefits from moving to bill-and-keep, it is very unlikely that any benefits will accrue to consumers, and in fact, bill-and-keep would harm many consumers by raising their rates and worsening their service. The Commission even acknowledges this by admitting that LECs would need to increase end-user rates to allow them to bear the cost of compensating intermediate carriers for their services<sup>10</sup>. Deregulating and detariffing end-user access charges (Telephone Access Charges) would further raise prices for consumers by allowing carriers to recover lost ICC revenues directly from their end users.

The Commission argues that “upgrading” interconnection from TDM to IP and moving to bill-and-keep is sufficient to allow carriers to save costs and maintain viability, but bill-and-keep only addresses the interexchange portions of a carrier’s service costs. It does not include the

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<sup>9</sup> USF/ICC Transformation NPRM, 26 FCC Rcd at 17907, para. 744: <https://docs.fcc.gov/public/attachments/FCC-11-161A1.pdf>

<sup>10</sup> NPRM, para. 34

(often large) fixed costs of providing local exchange services, such as physical plant and Class 5 switching equipment (whether TDM-based or IP-based). For many LECs, and especially small rural LECs, these costs may comprise a significant portion of their costs. Even given an equal amount of incoming and outgoing traffic, RLECs could expect to receive more revenue for calls received than other carriers would for calls terminated. Even if an RLEC moved to IP interconnection, RLECs would have less funding available under bill-and-keep since this funding mechanism would no longer be available.

The transition to bill-and-keep is likely to impose a burden (through deprivation of revenue) on providers that maintain networks using TDM technology. Their consumers are at risk for large price increases as a result of a transition to bill-and-keep, as these carriers seek to recoup their lost revenue. Providers have already imposed many such large price increases in the past, and there is every reason they will continue to do so if there is any excuse to do so. The Commission asks what alternative voice services are available to these consumers<sup>11</sup>. This is the wrong question to ask. It is not purely about price, something the Commission has repeatedly fail to recognize. Consumers have repeatedly demonstrated they do not want so-called “alternative” services that are typically anything but. Remaining customers of TDM-based services want to continue to keep their TDM-based services. Even if there are alternatives, which in many parts of the country, there are not, these “alternatives” fail to provide at least some of the qualities of TDM-based services that make them desirable to consumers (e.g. remaining operational in an extended power outage, ability to presubscribe to a long-distance provider of choice, etc.). The Commission asks what share of customers are likely to migrate to wireless or IP-based services as a result of price increases. The reality is that most consumers who were highly price-elastic and found other services to be viable substitutes are already using these services, in parallel or exclusively. Remaining customers do not find these alternative services to be viable substitutes, partially or in full. Encouraging these customers simply to use “alternative services” in the face of price increases is not an appropriate response by the Commission. The Commission has an obligation to ensure that switched access services remain affordable for those who continue to rely on it.

## **VI. THE NETWORK EDGE STILL EXISTS WITH IP INTERCONNECTION.**

Simply because voice traffic is exchanged in IP format does not mean that the network edge suddenly disappears. IP routing uses real paths over physical circuits in the same way that TDM-based services do; instead of these circuits being optimized for and dedicated to voice, they are simply more flexible shared pathways. However, this does not inherently change the way the network edge is defined. Calls must be handed off from LECs to one or more intermediate carriers to complete calls to destinations to which they do not have direct connections, just as they do today.

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<sup>11</sup> NPRM, para. 158

In particular, IP traffic is not inherently jurisdictionally mixed, as the Commission incorrectly claims<sup>12</sup>, and has (incorrectly) ruled previously<sup>13</sup>. Packets originating and terminating within one state that do not transit through another state are not inherently jurisdictionally mixed, simply because the format is IP instead of TDM. State authority must therefore be preserved in bill-and-keep frameworks for IP, and the Commission cannot and should not attempt to preempt state authority to define the network edge for IP traffic originating, transiting, and terminating purely within a state. Likewise, VoIP-PSTN traffic that remains within a state is not inherently jurisdictionally mixed in nature, and remains subject to state regulation. State commissions will continue to play an important role to ensure compliance during any transitions to bill-and-keep.

## **VII. SOME TARIFFS ARE STILL NECESSARY TO PROTECT CONSUMERS**

Regardless of whether any tariffing remains for carrier agreements, tariffing still serves a necessary purpose in the consumer market. It is the mechanism by which regulators ensure that consumers receive fair and transparent pricing for an essential utility service. Simply because intercarrier compensation may move to bill-and-keep or format may change from TDM to IP does not mean tariffing is magically unnecessary. Indeed, tariffs prevent companies from charging anything the market will bear (or more), particularly in attempts by LECs to price out customers from regulated services. Indeed, in states with weak regulatory oversight of LECs (e.g. Virginia), local exchange service costs significantly more than in states with stronger regulatory oversight (e.g. Pennsylvania)<sup>14</sup>. The mere ideal of competition does not ensure that consumers will actually receive fair prices. In practice, LECs will often charge whatever they can get away with.

Despite ILEC switched access lines accounting for only 3.1% of the voice telephony market, there is no actual competition for the services provided by ILECs. Only ILECs provide dedicated facilities-based voice service that was designed for five 9s reliability, a service that is essential for emergency communications. Lack of regulation in IP telephony has historically not been an issue, because it did not touch domains that were adjacent to life safety. With efforts to move to all-IP calling, it is now inappropriate to pretend that all kinds of traffic are equally important or subject to the same kinds of regulation. ILEC services provide crucial voice connectivity services that cannot be replicated by competitors, and as such, tariffing and price oversight in general remains necessary to ensure that consumers who require or prefer traditional voice services are still able to obtain them at reasonable and just rates. Tariffs have provided price transparency and accountability, and eliminating tariffing requirements without adequate mechanisms to prevent rapid price increases (as has typically happened) would harm consumers.

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<sup>12</sup> NPRM, para. 64

<sup>13</sup> Report and Order, WC Dockets 25-209 and 25-208, III C

<sup>14</sup> A basic measured-rate phone line from Verizon Pennsylvania costs \$12.20 before tax; the same service from Verizon Virginia now costs \$32.05 before tax.

Just this month, the monthly rate for my measured-rate local exchange service from Verizon increased by \$4.08. There was no explanation provided for this increase, and with no corresponding increase in the price of flat-rate service, this seems to be nothing more than a money grab from Verizon, simply because they can. ILECs yield real market power in this context. As a consumer, I cannot simply choose an “alternative service”. There is no comparable service available to me that works reliably during a power outage (although my service, being fiber-based, still requires a local backup battery to function, which only works for 8 hours). There is no alternate service that would provide me with reliable access to E911, during power and Internet disruptions. I am simply forced to absorb the price increase. Regulatory protections protect consumers by limiting the extent of arbitrary price increases like this one.

The Commission falsely claims that rate regulation of incumbent LECs is no longer necessary to protect consumers<sup>15</sup>. In fact, in most cases, there are no alternative providers consumers can switch to for the kinds of services that only ILECs uniquely offer. Over-the-top services available from other carriers through a best-effort broadband connection, if even available, are not a comparable alternative to a dedicated facilities-based connection from an ILEC. Due to the Commission’s forbearance from UNE requirements, in practice, competition is effectively dead in the local exchange services market. What few CLECs still exist providing local exchange services now generally resell the incumbent’s offering in the area, rather than providing their own distinct offering, and are thus subject to the ILEC’s mercy as much as consumers are. As such, in practice, consumers do not have any real alternative to ILEC services. For a brief period of time (beginning in 1996 with the Telecommunications Act and lasting for a few decades), it was possible for consumers to legitimately obtain switched access services from competitors, but we are now back to the point where only ILECs are able to offer this kind of service.

While none of the various entities providing competition voice services are subject to price regulation of end-user charges, none of these services have been considered as critical to users or life-safety as traditional voice service has been. It is therefore inappropriate to forbear from price regulation of end-user access charges solely because “competing” services (which, as pointed out, are not 100% competitive) are not subject to the same regulation and are not used the same way. Indeed, by the Commission’s own admission, interconnected VoIP service is often used to bypass wireline toll charges<sup>16</sup>. Wireless, video, and broadband are not public utilities. Basic voice service is a public utility.

Obviously, forbearance from tariffing would reduce costs and regulatory burdens on carriers. That alone is not a reason to do so. Detariffing access charges would further raise prices for consumers and worsen service availability, something that has already been happening for years now. The Commission falsely claims that “competition is the most effective means of

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<sup>15</sup> NPRM, para. 87

<sup>16</sup> NPRM, para. 109

ensuring that rates are just and reasonable”<sup>17</sup>. In fact, this is patently false, as is evidenced by the period of time in the United State’s history during which there was no meaningful competition (during the Bell System monopoly) but prices were low and service was universal, ensured by an appropriate regulatory framework. If anything, competition has increased prices while providing no actual guarantee that customers will be able to receive service, or at a just price. Competition in switched access lines has proved to be a failure in ensuring just and reasonable rates; appropriate regulatory policies, in contrast, historically proved extremely successfully.

Although there has been a ‘societal and technological shift’ away from switched telephone service for many aspects of American life<sup>18</sup>, their role in mission critical or life safety applications remains important. It is not appropriate to treat voice service as just of “one of many applications” on an unregulated network. Voice service remains an essential public utility, which requires voice services be uniquely regulated, in contrast to the myriad of other unregulated and less critical information services. Historical precedent in recent years shows that carriers will do anything they can get away with, so they must remain subject to ex ante rate regulation to protect consumers. Otherwise, significant price increases would likely ensue and last indefinitely, to discourage customers to move to less regulated and protected services.

The Commission proposes that interstate access charges be detariffed automatically after a period of time. The Commission would do well to remember that intrastate tariffs are the jurisdiction of states, not of the Commission, and thus the Commission should refrain from attempting to interfere with the ability of states, in theory or in practice, to tariff intrastate access charges, now or in the future.

## **VIII. INTEREXCHANGE CARRIERS CONTINUE TO OFFER CONSUMER CHOICE**

Despite declining demand, there continue to be customers who subscribe or would like to subscribe to presubscribed or dial-around long-distance services. In many cases, this is the only high-quality toll service available to consumers, as over-the-top interconnected VoIP services cannot provide acceptable quality or latency for many applications, such as modem sessions. As an example, I personally maintain standalone traditional TDM-based long-distance service – although my local service is fiber-based, it is traditional regulated service, which allows me to presubscribe to a TDM-based Feature Group D Equal Access long-distance service. While I utilize interconnected VoIP services heavily for general-purpose wireline toll needs (as do many customers), this is the only service that provides consistently sufficient quality for 300-baud remote telemetry sessions. Particular for PSTN-PSTN connections, which originate and terminate in ILEC exchanges, I have found this service to be worthwhile, despite its higher cost.

The overall switched long-distance market, however, has entered a state of market failure. Post-Divestiture, interexchange services have always been considered “optional”, without the

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<sup>17</sup> NPRM, para. 97

<sup>18</sup> NPRM, para. 97

requirements imposed on local exchange service. As such, providers are largely free to enter and leave the market. In October 2025, AT&T grandfathered long-distance service (0288) to existing customers and stopped accepting new orders for long-distance service. CenturyLink also announced they would discontinue service on their 0432 CIC effective April 30, 2026. Given that AT&T and CenturyLink were two of the larger interexchange providers accessible nationwide via Feature Group D tandems, many consumers no longer have a clear choice for a quality TDM-based long-distance carrier, as remaining carriers are largely grandfathered, only serve their LEC customers, or only have a local presence and are not accessible from most of the country. Conceivably, the Commission never foresaw that there would one day come a time when there were no carriers interested in providing interexchange services. It is now possible that where LECs are not offering a bundled service, some consumers may no longer be able to place long-distance calls at all. Indeed, consumers have already objected in comments to state public service commissions that they have requested switched long-distance service from carriers such as AT&T and been refused. Demand still exists, yet providers are refusing to supply.

Despite the inability of many customers to now easily presubscribe to an intra-LATA or inter-LATA interexchange providers, the ability for consumers to use casual dialing remains valuable, both for testing and to work around issues with certain carriers. Indeed, this highlights the continued importance of customers being able to select a different provider for interexchange services than for their local exchange service. As providers move to bill-and-keep, it is likely that overall call quality will decline as providers seek to use least cost routing to minimize their costs. Aside from quality, it is not uncommon for many carriers today to take “shortcuts” when using LCR, resulting in calls terminating to the wrong destination or not completing at all. Subscribers to non-regulated voice services generally are unable to use alternate long-distance carriers directly and have limited ability to work around these issues. Providers can continue to offer IP-based long-distance interexchange services via Feature Group D Equal Access, allowing customers to choose an interexchange provider of their choice that provides quality and prices acceptable to them. More generally, this highlights the distinction between local services (which involve carrier-customer connectivity) and long-distance services (which involve carrier-carrier connectivity).

Choice is an important advantage of TDM-based services to highlight. The Commission suggests that all IP-networks offer consumers greater choice<sup>19</sup>. In fact, the opposite is true. Customers of unregulated IP-based voice offerings by incumbent facilities-based voice providers do not have the ability to use alternate interexchange carriers for intrastate and interstate long-distance calls. In contrast, customers of regulated IP-based and TDM-based switched access services can continue to access a myriad of TDM-based and IP-based interexchange carriers via Feature Group D Equal Access capabilities. There is no inherent technical reason that TDM-based customers continue to have a much wider selection of carriers from which to choose than

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<sup>19</sup> NPRM, para. 185

customers of IP-based offerings. Providers could choose to offer consumers of unregulated IP-based voice offerings the same capabilities, but in practice, they have not done so.

Particularly for subscribers to traditional local exchange service, there remains a clear distinction between local and long-distance service. Many consumers do not have a presubscribed long-distance carrier at all, typically for cost reasons. It is most economical for such customers to receive only basic local service. All-distance calling services force these customers to pay a higher base rate for service they may not want to use. This includes many customers who may rely primarily on traditional switched access services for emergencies and critical needs only and want to keep their cost as low as possible. It is logical that only customers who wish to make and pay for long-distance calls should pay for that part of the service. This is a classic example of “price discrimination”. Consumers with a lower ability or willingness to pay will pay less (and receive less), and vice versa. All-distance services do not make this distinction and treat everyone equally, meaning that some consumers will pay more than they would have otherwise. Pricing for traditional long-distance services is already much higher than calls using VoIP. Forbearance from tariffing domestic, interstate, interexchange services should not be granted unless the Commission determines it would not impede the availability or affordability of TDM-based interexchange services. In particular, wireless and satellite are not adequate alternatives to TDM-based interexchange service. TDM-based interexchange service is the highest-quality and lowest-latency interexchange service, and many subscribers retain this service because of its quality and consistency. (If this were not a factor, many if not most of these customers would already be using VoIP instead.) Wireless and satellite are simply incapable of competing with TDM-based interexchange services. Interconnected VoIP over private wireline facilities can come close, but without the appropriate measures, is not guaranteed to provide the same level of service.

In the interest of price transparency, the Commission must retain sections 42.10 and 42.11 of its rules, requiring nondominant IXCs to make public current rates, terms, and conditions for detariffed interstate, domestic, interexchange services. It is critical that both the public, state regulatory commissions, and the Commission have accurate pricing information so that consumers receive fair and transparent pricing, which can be publicly verified. This is not an unnecessary regulatory burden. It is a critical requirement to ensure availability and accountability of a utility-like service (even though interstate service is not considered an essential utility the same way that local exchange service is, in practice, it often functions like one; consumers without the ability to access interstate services are not able to fully participate in daily activities.) Likewise, requiring even nondominant IXCs to publicize their pricing information ensures that consumers receive the information necessary in order to make an informed change.

In practice, the bulk of today’s interexchange carriers no longer share customer records to facilitate third-party billing. Billing from alternate long-distance carriers is generally billed directly to consumers nowadays, rather than billed via the consumer’s local exchange carrier.

Customer account record exchange requirements in part 64 are therefore less critical to facilitating competition in interexchange services than they once were. While it would be easier for customers to receive a unified bill (and that was the Commission's intent in the early 2000s), because this is no longer happening in practice, this regulatory requirement could be safely eliminated without harming the public interest.

Remaining tariff requirements for international interexchange services are likewise less critical to the public interest. International calls may be placed using 101-XXXX<sup>20</sup> dial-around services (and I have personally done so within the past year). This is particularly valuable when customers only sporadically place international calls, as they may not need to retain international service as a normal part of their presubscribed services.

#### **IX. CHANGES IN FUNDING MUST NOT BE TECHNOLOGY-BASED**

Funding to support lost revenue must be purely revenue based and not technology based, i.e. withholding funding from carriers that do not transition from TDM to IP must not be used to "punish" carriers that do not oblige the Commission's copper retirement agenda. If carriers are able to demonstrate a loss in revenue that would previously have been provided through intercarrier compensation, but is no longer available due to bill-and-keep, carriers may require funding, regardless of whether they are interconnecting using TDM or IP.

#### **X. CRITICAL SAFEGUARDS ARE NEEDED TO PROTECT VOICE QUALITY**

As expressed elsewhere in my comments, bill-and-keep would likely result in a decline in the overall quality of voice calls. For years, random call failures and misroutings have become commonplace due to the normalization of least-cost-routing that is done at the lowest possible costs. TDM-based services, while expensive, are reliable and inherently high-quality. IP-based networks do not provide any of these guarantees. While they can achieve a similar level of quality in theory, in practice they rarely do.

As another example, out-of-band DTMF is a technology commonly used in VoIP to send DTMF tones used in subscriber signaling out-of-band during a call. This feature was mainly introduced so that VoIP calls using non-linear codecs (e.g. codecs besides G.711 ulaw/alaw) could reliably convey signaling information across a poor-quality connection. This kind of double-conversion is problematic for many systems; alarm systems, for example, commonly use variable-length DTMF tones that are easily butchered by out-of-band DTMF.

In my own experience, I frequently encounter issues with calls that are handed off from TDM networks to IP networks (or vice versa), specifically where the IP network side contains DTMF detection for out-of-band DTMF purposes which can remain activated, even when the negotiated DTMF method is "inband" (equivalent to how a TDM-based network would operate where all audio is sent end-to-end without modification by the network). Overly eager DTMF

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<sup>20</sup> The Commission erroneously refers to these codes as 1010-XXX codes in the NPRM, para. 143

detection with false positives can butcher audio in a phone call (the multifrequency digits ‘7’ and ‘8’ are often conflated for a DTMF ‘3’, resulting in the conversion of non-DTMF audio into DTMF audio and dropping the aforementioned non-DTMF audio entirely from the call while adding spurious signaling information the other party did not send<sup>21</sup>, a clear transformation of the communication into something unintended by the recipient). Incidentally, this violates the definition of “telecommunications”, defined by 47 U.S.C. § 153(50) as “transmission, between or among points specified by the user, **of information of the user’s choosing, without change in the form or content of the information sent and received.**” Out of band DTMF conversions can expressly manipulate and destroy the information sent and received (and generate new information), resulting in the loss of intended information and the creation of unintended information and thus, by a plain reading of the definition, no longer qualifying as “telecommunications” as defined by 47 U.S.C. § 153(50). Moreover, the service provided is clearly no longer functionally equivalent to traditional TDM telephony, because the content of the call was changed by the network as a result of the VoIP interconnection. An inherently end-to-end TDM-based network would never suffer from this issue.

Even large carriers, such as Intelliquent, contain the flaws described here that make their networks unsuitable for many of these applications which may rely on innocuous tones that, due to sloppy design or carrier management, do not work reliably on calls that transit IP networks. This has been confirmed experimentally; testing has shown that calls within Verizon’s wireline network do not face this issue, and calls leaving Verizon’s network to other CLECs do not universally exhibit this issue either. However, calls from Verizon’s network to Intelliquent’s network (handed off using TDM), even when configured for in-band DTMF on the Intelliquent side, consistently exhibit this issue, demonstrating that even large CLECs have not been able to universally achieve quality parity with TDM in their networks due to misconfiguration or other issues. For this reason, forcing interconnection to move to all IP is worrisome when existing IP interconnections can cause issues with certain calls. These need to be addressed, and the nature of IP interconnects needs to be regulated to ensure that these issues do not happen (and can be fixed readily when they occur), before any kind of en masse migration away from TDM interconnection. While interconnected VoIP does not always provide transparent transmission in the same manner as TDM today, interconnection requirements and frameworks must ensure that it does in the future.

To be clear, this is not a technical flaw (if the call was truly inband end-to-end on the IP side, it should work identically to as in a TDM network); it is an implementation flaw in carriers’ IP voice networks. However, it does show that VoIP is not inherently equivalent to TDM, without proper configuration. Hastening a transition to all IP without ensuring these serious problems are

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<sup>21</sup> Even casual users may be familiar with this phenomenon of “falsing”, where spurious DTMF digits occasionally show up in a VoIP call utilizing out-of-band DTMF, resulting in random occasional digits due to talk-off or pitch similarities to the frequencies used in DTMF tones. At best, this may be merely an annoyance; at worst, this may well change the meaning of the information exchange that was intended during the call.

rectified would be catastrophic for such applications and services that depend on the integrity of information exchange during a phone call. A successful transition to all-IP interconnection must ensure, above all else, that voice calls continue to behave the same way when IP interconnection is used as when TDM interconnection is used. Regretfully, this is not currently the case. Stipulations ensuring that interconnection allow for end-to-end connectivity without any modification or processing (e.g. no out-of-band DTMF detection or transformation) is critical to ensuring this.

Unfortunately, in its recent March 27<sup>th</sup> order for “Advancing the IP Transition”, the Commission declined to “impose (sic) on technology transitions discontinuance authorizations a condition that ‘the replacement service support G.711 codec handshake with RFC 2833 disabled on calls to telephone numbers serving life safety alarm monitoring receivers, end-to-end through all carrier handoffs’”<sup>22</sup>. The Commission declined because it would introduce “a new compatibility requirement for legacy devices”. This is a serious setback to the viability of IP networks to quickly and efficiently replace TDM-based networks. The Commission is mistaken that this will be “introduce unnecessary delay from the transition to modern, reliable services”. In fact, refraining from imposing such requirements will do exactly that; there are hundreds of thousands of low-speed data terminals that are field-deployed and cannot be replaced with alternatives, even at significant cost. If IP networks cannot provide the same level of service as TDM networks, these applications will continue to be compatible only with TDM, further delaying the IP transition. If so-called “advanced” IP networks cannot even support low-speed data transmissions reliably, then the message the Commission sends to consumers, understandably, is that these networks are neither high-quality nor reliable. And while this is undoubtedly true for certain technologies (wireless, satellite), it is not *inherently* true for all IP-based communications. VoIP with appropriate QoS over private facilities is not inherently incompatible with these transmissions. However, RFC2833 and out-of-band DTMF in general is particularly problematic, because it interferes with the audio path of a call by adding and removing audio to and from the call, sometimes erroneously. This effectively distorts or corrupts the “message” a call is trying to convey. The Commission’s refusal to impose these requirements demonstrates its unwillingness to ensure that replacement services are of a comparable quality and configuration to the services they replace. I reiterate the need for a requirement for end-to-end G.711 connectivity as an option, along with the ability to have true end-to-end inband (RFC2833 disabled) to ensure there is no interference with voice or data transmissions alike. (Those familiar with VoIP have probably heard “falsed” DTMF digits on conversations in the past; this is the same phenomenon under discussion. When this occurs during data or signaling exchanges, such “falsing” can be catastrophic or fatal).

The Commission nonetheless encourages carriers to ensure that IP networks are appropriately configured to prevent alarm signaling failures<sup>23</sup>. However, without an appropriate

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<sup>22</sup> FCC 26-19, para. 31 (<https://docs.fcc.gov/public/attachments/FCC-26-19A1.pdf>)

<sup>23</sup> FCC 26-19, para. 31

mandate, this will not happen. I have already submitted in previous comments to the Commission that even large carriers like Intelliquent have bugs in their IP voice connectivity that cause RFC2833-induced squelching and corruption in the audio path, something that TDM links are inherently immune to. Out-of-band DTMF in the core of the network has largely outlived its useful purpose; it was built for an era when VoIP connectivity was so poor, plagued with jitter and latency, that DTMF could not reliably pass through the audio path. This is not (I hope) the state of connectivity that carriers or the Commission wish consumers to experience today. It is therefore imperative that the Commission adopt uniform rules requiring end-to-end transmission of audio in a phone call *exactly as transmitted*, unperturbed by RFC2833 or other out-of-band DTMF methods. This will ensure that applications which are technically compatible with VoIP (such as modems, alarm receivers, etc.) are not disrupted by the transition when there is an extremely easy way to avoid this. It will also expedite the transition to all-IP networks by eliminating one of the final roadblocks to moving certain services away from TDM – a roadblock that exists only because carriers do not uniformly refrain from using out-of-band DTMF in their networks.

It is imperative the Commission convene or encourage the convening of an industry working group in order to establish suitable standards for the use of IP as a replacement for traditional TDM-based connectivity. Without appropriate safeguards and requirements, many calls exchanged by IP will result in degraded call behavior, not for inherently technical reasons, but as a matter of policy or lack of policy enforcement. Once suitable standards have been agreed upon, it is imperative the Commission formalize these requirements in an upcoming order to ensure minimum quality and interconnection requirements for IP interconnection when used to replace TDM-based connectivity for traditionally regulated and other critical voice services.