Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Federal-State Joint Board on Universal Service	)	CC Docket No. 96-45
	)	
	)	
Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Transport Rate Structure and Pricing, End User Common Line Charge	)	CC Docket Nos. 96-262, 94-1, 91-213, and 95-72

COMMENTS OF THE UNITED STATES TELECOM ASSOCIATION

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SUMMARY

The requests by three state public utility commissions and the Rural Utilities Service (RUS) to expand the definition of "voice grade access" in the Commission's universal service definition should be denied. The attempts to obtain greater access to the Internet by rural customers of the public telephone network through increasing the frequency range is misdirected from a procedural, technical and public policy basis.

The definition of universal service can only be changed through the procedures set forth in Section 254 of the Communications Act, which requires obtaining recommendations from the Joint Board on Universal Service after notice and opportunity for public comment. That procedure has not been followed here.

Petitioners' attempts to specify voice grade bandwidth for Internet access are technically deficient. Analog frequency response specifications are only one of a number of factors that affect the data speed that modems can achieve when applied to voice grade facilities. Others include attenuation loss, induced noise, and A/D conversions. Furthermore, different modems respond differently to different forms of robbed bit signaling.

If a universal service standard expands the bandwidth beyond that embodied in the Commission's current definition, it could expose carriers and customers to significant new costs and time delays required to design and implement equipment that would conform to the new standard. Furthermore, it is very likely that increases in bandwidth advocated by the petitioners would not have any noticeable effect on data rates experienced by customers.

The transmission of data over voice grade circuits is an inherently inefficient process in the first instance. It has reached its current level of performance because of efforts to utilize existing voice circuits to the maximum capability possible. USTA believes that there is need to continue to make the best use of voice grade circuits well into the future. However, we must keep in perspective the fact that, even in virtually ideal conditions, data rates rarely exceed 52 Kbps for data channels that pass through loop circuits designed for voice service. We believe that the Commission should provide incentives to encourage the industry to move to newer technologies in order to provide consumers access to advanced services that will provide data rates greater than those achievable using voice grade loop transmission. The industry is continuing to upgrade its loops to provide the highest degrees of service available using currently available technology. This can be done within or outside the context of the definition of universal service. If the Commission determines to pursue this as part of the universal service definition, it must do so within the process prescribed in Section 254 of the Act.

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COMMENTS
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The United States Telecom Association (USTA)[1] hereby submits its comments in response to the Commission's Public Notice[2] seeking comment on requests by three state commissions and the Rural Utilities Service (RUS) to expand the definition of "voice grade access" in Section 54.101 of the Commission's rules.[3] The requests were made nearly two years ago in the form of separate petitions for reconsideration of the Commission's Fourth Order on Reconsideration in the above-captioned proceedings[4] filed by the state commissions[5] and an *ex parte* presentation made by RUS.

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[1] The United States Telecom Association, formerly the United States Telephone Association, is the nation's oldest trade organization for the local exchange carrier industry. USTA represents more than 1200 telecommunications companies worldwide that provide a full array of voice, data and video services over wireline and wireless networks. USTA members support the concept of universal service and are leaders in the deployment of advanced telecommunications capabilities to American and international markets.

[2] *Common Carrier Bureau Seeks Comment on Requests to Redefine "Voice Grade Access" for Purposes of Federal Universal Service Support*, DA 99-2985, released December 22, 1999 (Public Notice).

[3] 47 C.F.R. §54.101.

[4] *Federal-State Joint Board on Universal Service, Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Transport Rate Structure and Pricing, End User Common Line*

The state commissions and RUS seek an expansion of the bandwidth requirement for voice grade access from the current frequency range of 300 to 3,000 Hertz (Hz) to a minimum of 200 Hz or 300 Hz to 3,400 Hz or 3,500 Hz. The stated objective of this request is to ensure that rural customers of the public telephone network using 28.8 kilobits per second (kbps) modems[6] to access the Internet and other information services can achieve data transmission speeds reasonably comparable to those achieved by non-rural customers using 28.8 kbps modems. A carrier must offer service that complies with the definition of "voice grade access" found in Section 54.101 of the rules in order to qualify for universal service support.

The Commission's Common Carrier Bureau seeks comment on the requests to expand the definition of "voice grade access," including the technical issues focusing on the relationship of bandwidth with other factors affecting the speed of operation for modems, how a change in the definition would affect carrier eligibility for universal service support, and the financial impact that a changed definition would have on carriers.

USTA is opposed to the requests of the state commissions and RUS for procedural, technical and public policy reasons. They are more fully set forth below.

I. The Definition of Universal Service Cannot be Changed Without Following Statutory Procedures, Including Referral to the Joint Board.

The state commissions and RUS are seeking to change a critical element of the definition of universal service found in Section 54.101 of the rules. This definition was

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Charge, Fourth Order on Reconsideration, CC Docket No. 96-45, Report and Order, CC Docket Nos. 96-45, 96-262, 94-1, 91-213, 95-72, 13 FCC Rcd 5318 (1997) (Fourth Reconsideration Order).

[5] The commissions filing petitions for reconsideration were the North Dakota Public Service Commission, the South Dakota Public Utilities Commission, and the Washington Utilities Commission.

[6] We believe this refers to the earlier version of the V.34 standard. *See* n.16, *infra*.

adopted pursuant to the procedure set forth in Section 254(a) of the Communications Act of 1934, as amended (the Act).[7] That provision required the Commission to institute a Federal-State Joint Board on Universal Service that would recommend changes to federal universal service regulations, including the definition of universal service. That provision also specifically called for the Joint Board to make recommendations to the Commission after notice and opportunity for public comment, which is in accordance with Section 410 of the Act and Section 11 of the Administrative Procedures Act. That process was followed and yielded the current definition of universal service which is for voice grade service.

If the Commission is to entertain any changes in the definition for universal service embodied in Section 54.101 of its rules, it must follow the procedures set forth in Section 254 of the Act. That provision is replete with requirements that the definition of universal service be adopted and modified only after the Joint Board fully considers the proposal after notice and opportunity for public comment. Specifically, Section 254(a)(2) provides for subsequent recommendations from any Joint Board on universal service, after the initial definition of universal service is established, to be completed within one year after the Commission receives such recommendations. Also, Section 254(c)(1) repeats the process including the involvement of the Joint Board by listing certain elements to be considered in determining a definition of universal service. Furthermore, Section 254(c)(2) addresses alterations and modifications by stating "The Joint Board may, from time to time, recommend to the Commission modifications in the definition of the services that are supported by Federal universal service support mechanisms."

[7] 47 U.S.C. §254(a).

These repeated references to the process of establishing and modifying the definition of universal service make it clear that the proper statutory process is for the Joint Board to make recommendations to the Commission only after notice and opportunity for public comment. The request by the state commissions and RUS is a blatant attempt to end-run this statutory process that cannot withstand legal scrutiny. The Commission must reject the requests and involve the Joint Board in any attempts to expand the definition of universal service.

It should also be noted that the petitioners are seeking to introduce a whole new service capability—access to the Internet and other information services—to the existing voice definition of universal service. This clearly warrants full consideration by the Joint Board and the public.

II. Petitioners' Proposals to Specify Voice Grade Bandwidth for Internet Access are Technically Deficient.

As stated above, the state commissions and RUS are attempting to include the technical capability to access the Internet and other information services as part of the universal service support definition by expanding the frequency range for voice grade access. A number of significant technical deficiencies exist with this approach.

The specification of frequency range in the definition of voice grade access in Section 54.101 is incomplete in that no specific standard is stated that provides certainty as to when a given circuit could be said to meet the requirement.[8] Because practical measurements of facilities involve multiple elements, each element must exceed the engineering requirement for the combination to be compliant. Furthermore, there cannot

[8] An example of such a standard is that, in order to meet the requirement, the attenuation at 3,000 Hz must not exceed the attenuation at a reference frequency by more than a specific loss expressed in decibels.

be certainty as to the number or type of elements that will be involved in any specific circuit. The effect of this uncertainty is that designers and equipment manufacturers must build in sufficient margins of performance to ensure that any circuit that may be subjected to measurement will clearly meet the specified performance minimum requirement. An example is the attenuation loss in the LSSGR TR-NWT-000507, Issue 5, December 1993, Table 7.7-4, which specifies a maximum loss at 3400 Hz of 3.0 dB.

The result of this situation over many years of modernization is that the frequency response of the network has been gradually increasing and, in our judgment, it would now be rare to encounter a facility that did not have 3200 Hz of frequency response; most modern facilities will have usable frequency response well beyond that. The effect of increasing the upper frequency limit would have the effect of forcing manufacturers to redesign virtually every element of the equipment used in the network to build in the margins necessary to meet any new standard. Redesign and deployment of equipment in the network to meet an expanded requirement would be extremely costly.

A. Data Throughput is Dependent on Many Factors Other Than Analog Frequency Bandwidth.

The issue of the viability of using a specification of analog transmission bandwidth as a surrogate to ensure certain minimum levels of data transmission has been considered by the Commission before. The Common Carrier Bureau itself recognizes that fact in the Public Notice, where it states, "Although bandwidth affects the speed at which modems operate, modem performance is a function of several factors, only one of which is bandwidth. In that regard, we invite commenters to identify factors other than bandwidth that affect modem performance in rural and non-rural areas."

Clearly, analog bandwidth is a factor in the ability of a voicegrade circuit to handle data—but it is one of many. We realize that it would be convenient if it were possible to discover some simple way to specify a parameter or set of parameters that could be applied to a voice circuit to ensure its data carrying capacity. The Common Carrier Bureau itself recognizes in the Public Notice that petitioners are not asking for a change that has anything to do with the ability of a subscriber loop to effectively transmit voice, where it states, "They do not suggest that the 300 Hz to 3,000 Hz frequency range specified in the Commission's rules is insufficient to ensure appropriate quality of voice transmission over the public switched telephone network."

B. Factors Other Than Frequency Response that Affect the Data Handling Capability of a Loop

1. Attenuation Loss

In a carrier system, attenuation loss is determined by the design of the system, and attenuation loss across the voice range tends to be quite constant until the cutoff frequency is reached. At that point, the response cuts off very rapidly.

Attenuation loss of a physical loop circuit is determined by the amount of signal loss due to the distributed resistance and capacitive effects of twisted copper wires. In physical circuits, the attenuation rises with distance, and the high frequency loss increases more rapidly than at lower frequencies. As length increases, the loss increases, and the disparity in loss between high frequencies and lower frequencies also increases. In loaded physical plant, the insertion of load coils creates a low pass filter, with quite constant loss below the cutoff frequency. Above the cutoff frequency (about 3200 Hz for H-88 loading), the useful response falls off quite rapidly.

In the setup sequence, voiceband modems have the capability to make adjustments in order to compensate for varying degrees of loss. For very long physical loops with increasing loss, the signal level at the receiving end decreases as the transmit modem exhausts its ability to compensate by increasing the transmit level. As a result, as the loss increases beyond the point at which compensation is available, the receive level drops and the data rate decreases. In physical cable, as frequency increases, the disparity of loss between high and lower frequencies also increases.[9]

The Bellcore Report also provides a significant amount of data on test loops and experienced data rates. This shows that experienced data rates with unloaded cables having losses as low as 11.4 dB at 1004 Hz and only one digital conversion and no bridged tap resulted in received data rates of 26.4 Kbps.[10] In some cases, decreased rates have been observed with extremely short loops because of near end echo.[11]

2. Induced Noise

Induced noise in a circuit can interfere with the receiver's capability to correctly distinguish the signal that is intended to be received from extraneous noise which contains no information.[12]

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[9] "It has been observed that most V.34 modems need a level of –40 dBm at the high end of the bandwidth to set the symbol rate and bit rate. For example, if a modem registers a level of –42 dBm at 3400 Hz, it would select a symbol rate of 3200 and use the lower center frequency of 1829 Hz. The data rate would be set at 26.4 Kbps if all other parameters were adequate." Bellcore Memorandum Abstract Number TM-25704, "Guidelines for High Speed Analog Data Transmission in the Switched Network," December 1996, § 3.2 "Receive Level (Carrier Detect)" (Bellcore Report).

[10] Bellcore Report, § 5.3.2 "Local Cable Tests."

[11] "Performance was sometimes improved by adding additional loss to the loop. The underlying factor was poor return loss and some modems could not cancel out the near end echo that was produced. The modems would interpret the echo as noise and adjust the data rate down to compensate." Bellcore Report, §4 "Local Observations."

[12] "Signal-to-noise Ratio (SNR) was the parameter that was needed to be met. The lower limit that has been quoted is 32 to 34 dB. This is the lowest SNR needed to be able to connect at 28.8 Kbps on V.34 modems." Bellcore Report, § 3.3 "Noise Requirement."

3. A/D Conversions

Testing and field experience clearly show the effect of the number of conversions from analog to digital and vice versa in the signal path. In the Bellcore report, it is shown that the data rate is affected adversely as the number of D/A conversions increases.

"As seen in the table, one digital conversion resulted in a maximum connect rate of 28.8 Kbps. However, there was either no loop attached or a very short loop was present. The result was little frequency rolloff at the high end. When an additional conversion is present, the data rate drops in both directions. There is no additional effect with loop length until after the 9 Kft section is reached. The level at 3604 Hz starts to get closer to the –40 dBm point at 9 Kft and at 12 Kft, it is close enough to it that the data rate goes down another level."[13]

In actual measurements made in the facilities of a USTA member company,[14] it can be shown that in cases of carrier systems that are double-ended (two D/A conversions), data rates of 21.6 Kbps and 26.4 Kbps are experienced using V.90 modems. On other facilities having the same voice frequency response and only one D/A conversion, data rates in the mid 40s and higher were measured. In both cases, the manufacturer's specifications and measurements made on the circuits verify voiceband frequency response to 3400 Hz. On other facilities having comparable voice frequency response and only one D/A conversion, data rates in the mid 40s and higher were measured.

[13] Bellcore Report, § 5.3.1 "Test Results with PCM Conversions."
[14] MCT Telecom, Contoocook, New Hampshire.

C. Different Modems Respond Differently to Different forms of Robbed Bit Signaling.

Robbed bit signaling (RBS) is commonly used in digital loop carrier systems in order to convey supervision information. The V.90 standard requires that compliant modems compensate for the presence of RBS. The data speed that a modem can support can vary considerably depending on the type of integrated interface used between the digital switch and the carrier system and how the service is programmed into the digital switch, both of which affect the RBS pattern used and the method used by the modem manufacturer to compensate for RBS.[15]

D. Interconnection Methods Used by Internet Service Providers

The Internet Service Provider (ISP) has options to exercise in the method of connection it utilizes at the central office. In any modem connection at the customer end, in the downstream direction there must always be one digital to analog conversion. If the ISP connection at the central office also involves a D/A conversion, that makes two conversions in the transmission path. In the training sequence, they will be detected and the V.90 will revert to V.34 operation. In order to permit V.90 modems to operate at speeds above the V.34 level, direct digital connections must be used at the central office. As can be seen from the Bellcore test data, other impairments reduce the actual speed below the maximum V.34 rate, 28.8 Kbps.[16]

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[15] Memorandum from Frank Tuhy, Next Level Communications to Paul Hart, USTA dated January 8, 2000.

[16] Since the Bellcore report was done, a later version of V.34 (February 1998) was adopted that provides for operation at a maximum rate of 33.6 Kbps. Within the conditions stated in the Bellcore Report, we believe those results continue to be valid.

E. The Characterization of Networks in the RUS Petition is Oversimplified and is not an Appropriate Basis for Regulatory Action.

The RUS petition stated that "Short urban and suburban loops inherently have a wide voice bandwidth. Most urban and suburban loops do not require loop treatment which restricts bandwidth." We note that the engineering options available apply to circuits with certain physical characteristics and not to forms of labeling such as "urban" or "suburban." The issue is whether a measure of analog frequency response is a useful surrogate for ensuring specific levels of data performance. We believe that it is not and request that the Commission affirm that conclusion.

III. Conclusions

The information presented above verifies that analog frequency response specifications are but one of the factors that affect the data speed that modems can achieve when applied to voice grade telecommunications facilities. Adoption of any universal service standard requiring greater bandwidth could expose carriers and customers alike to significant new costs as well as time delays required to design and implement equipment that would conform to a new standard. It is very likely that any additional bandwidth that might result would not have any noticeable effect on data rates experienced by customers.

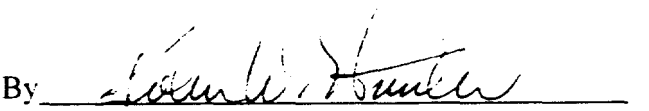
The transmission of data over voice grade circuits is an inherently inefficient process in the first instance. It has reached its current level of performance because of a remarkable effort to utilize existing voice circuits to the maximum capability possible. USTA believes that there is need to continue to make the best use of voice grade circuits well into the future. However, we must keep in perspective the fact that, even in virtually

ideal conditions, for data channels that pass through loop circuits designed for voice service, data rates rarely exceed 52 Kbps. We believe that the Commission should provide incentives to encourage the industry to move to newer technologies in order to provide consumers access to advanced services that will provide data rates much greater than those achievable using voice grade loop transmission. The industry is continuing to upgrade its loops to provide the highest degrees of service available using currently available technology. This can be done within or outside the context of the definition of universal service. If the Commission determines to pursue this as part of the universal service definition, it must do so within the process prescribed in Section 254 of the Act.

USTA strongly urges the Common Carrier Bureau to reject the requests of the three state commissions and RUS to expand the definition of voice grade access as a major component of the universal service definition for the procedural and technical reasons stated above.

Respectfully submitted.

UNITED STATES TELECOM ASSOCIATION

By 

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January 19, 2000

CERTIFICATE OF SERVICE

I, Meena Joshi, do certify that on January 19, 2000 Comments of the United States Telecom Association were either hand-delivered, or deposited in the U.S. Mail, first-class, postage prepaid to the persons on the attached service list.

Meena Joshi