

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

In the Matter of	)	
	)	
Extending Wireless	)	WT Docket No. 99-266
Telecommunications Services	)	
To Tribal Lands	)	
	)	
	)	
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	)	

**COMMENTS OF THE HIGHER EDUCATION PARTIES:**

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## SUMMARY

EDUCAUSE and the American Indian Higher Education Consortium (AIHEC) commend the Commission for its initiative to extend wireless telecommunications services to tribal lands. We urge the Commission to enable the long-term development of advanced telecommunications capability in tribal lands by promoting the deployment of wideband technology: ultra-wideband, Part 15 spread spectrum devices, and microwave systems such as MMDS and LMDS which make use of a wide range of radio spectrum. As discussed more fully below, the Commission should immediately implement a “tribal lands exception” to certain regulations inhibiting the use of wideband technologies for two reasons: (1) such technologies are in need of a larger scale testbed, and (2) such technologies great potential to further the basic telephony as well as the advanced telecommunications capability of tribal communities. The Commission should also open a formal inquiry into the spectrum management ramifications of software-defined radios (SDR).

In summary, the comments of EDUCAUSE and AIHEC address the following issues:

- 1.** Recent developments in wireless and satellite technology can effectively provide tribal lands with advanced telecommunications capability. Basic telephony can then be a small (albeit important) part of a more robust broadband wireless infrastructure by which tribal lands can achieve broadband Internet connectivity – and benefit from much-needed economic development such connectivity can enable. Contrary to the progression of development in urban and other areas that had an entrenched telephony infrastructure prior to the emergence of the Internet, basic telephony for tribal lands should not be viewed as a first stepping stone toward broadband

Internet connectivity. Simply put, the Commission's focus on basic telephony in this proceeding is not ambitious enough.

2. The Commission can do much to enable the deployment of broadband wireless and advanced telecommunications capability in tribal lands. It should remove regulations impeding the deployment of broadband wireless – specifically wideband -- in rural, isolated areas such as tribal lands. It should proceed with inquiries addressing the new generation of software-defined radios, which are increasingly able to efficiently utilize spectrum through flexible software configurations. Tribal lands are an ideal environment in which to test novel means of spectrum management and to observe the implementation and use of new wideband technologies, and the tribal lands themselves would benefit greatly from a larger-scale deployment. A wireless architecture utilizing wideband and eventually SDR technologies in the first mile can effectively leverage natural concentrations of population surrounding educational institutions, furthering both residential and institutional opportunities for Internet-enabled education.

The Commission should act without delay to remove restrictions to the development and deployment of wideband and SDR technology, which in conjunction with other satellite and broadband wireless technologies can enable unprecedented economic development and educational opportunity in tribal lands.

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## I. INTRODUCTION

In this proceeding, the Commission has requested comment on potential terrestrial wireless and satellite policy initiatives to address the telecommunications needs of Indians living on tribal lands. Specifically, the Commission seeks comment on several proposals to encourage existing terrestrial wireless and satellite carriers to extend service to individuals living on tribal lands, as well as new procedures relating to the licensing of new terrestrial wireless and satellite entrants to provide services on tribal lands. In its *Notice* the Commission as a general matter seeks to address the provision of basic telephone service for tribal lands, as opposed to advanced telecommunications capability.

The above parties urge the Commission to focus on how best to promote the deployment of technologies in tribal lands that can provide advanced telecommunications capability, rather than mere basic telephone service. In accordance with Section 706 of the Communications Act, 47 U.S.C. §157 (1998), the Commission should seek to encourage universal advanced telecommunications capability. Recent rapid development in wireless and satellite technology and data networking can enable isolated territories to take advantage of advanced telecommunications. With the presence of an advanced telecommunications infrastructure, basic telephony will ultimately become a side issue.

In addition, we believe tribal lands would best be served by a roughly symmetric data transmission infrastructure. For tribal lands to benefit from economic development opportunities presented in the era of the Internet, including telecommuting and other information services business, upstream data capacity must be robust. When an appropriate selection of symmetric wireless infrastructure is made and deployed, additional opportunities can be provided to economically deprived communities. Educational opportunities become more rich in context and

quality with such systems. Individuals limited to local opportunities for employment gain access to new types of professions. Local retailers have access to the global market. Such opportunities can only be accomplished with an advanced telecommunications capability. Wideband wireless is likely to be the technical and economic method of choice for many remote, rural areas.

Accordingly, EDUCAUSE and AIHEC urge the Commission to not view basic telephony as the first step toward advanced telecommunications; in the absence of an entrenched telephony infrastructure, immediate progress to an advanced telecommunications capability should be preferred. As discussed more fully below, we believe the Commission can best promote the long-term development of advanced telecommunications capability in tribal lands by altering rules and initiating proceedings in furtherance of the development and deployment of IP networks based on wideband radio systems, and on the spectrum management implications of Software-Defined Radio (SDR). Specifically:

1. The Commission should proceed *quickly* to specify Part 15 rule modifications that allow for broader operation and deployment of wideband radio systems – including ultra-wideband -- for telecommunications purposes. Restrictions pertaining to tower height, antenna gain, and transmission power should be liberalized.
2. In the absence of a wholesale Part 15 rule modification the Commission should, in the proposed rulemaking at hand, immediately implement a “tribal lands exception” to Part 15 rules and other restrictions that inhibit the use of wideband.
3. The Commission should consider an “underserved area” modification to its Part 15 and other rules in furtherance of wideband.
4. The Commission should immediately issue a *Notice of Inquiry* into Software Defined Radios.

## **II. STATEMENT OF INTEREST**

The parties to this comment together represent the information technology interests of virtually all of American higher education, including tribal colleges and universities. Our mission includes the desire to facilitate learning anywhere, anytime, and increasing educational opportunities for all. Computer-mediated distance education is a key means by which to further these goals, and we support efforts to increase the telecommunications capability of those who can best benefit from such opportunities.

In addition, it is vitally important that twenty-first century educational institutions themselves have adequate access to the Internet. We support the Commission's efforts to encourage advanced telecommunications capability in tribal lands and we specifically support efforts that promise to increase the telecommunications capability of educational institutions.

The educational institutions represented by EDUCAUSE and AIHEC can play an important role in the deployment of infrastructure in a given underserved area, as they tend to be natural centers of population and community. We look forward to working with industry partners to implement solutions that can serve both educational institutions as well as the surrounding area. EDUCAUSE itself recently was awarded a three-year, \$6 million grant from the National Science Foundation for the NSF Advanced Networking Project with Minority-Serving Institutions (AN-MSI)(No. 9980537). As part of this award, EDUCAUSE and its partners will implement several pilot wireless and satellite projects serving tribal colleges, hispanic-serving institutions, and historically black colleges and universities.

## **III. TECHNOLOGICAL COMMENTS**

EDUCAUSE and AIHEC believe that wideband technologies – including ultra-wideband (UWB), Part 15 spread spectrum, and microwave such as MMDS and LMDS -- should be



strongly encouraged by the Commission as methods to serve the telecommunications needs of persons living on tribal lands. By doing so the Commission will enable commercial providers to test various equipment and architectures, and will have made a significant step toward promoting the advanced telecommunications capability of underserved areas such as tribal lands. There are other existing wireless technologies that can serve rural areas, but we believe the following (1) hold very good long-term potential for an advanced telecommunications infrastructure and (2) are in need of affirmative action by the Commission to realize that potential. Networks using wideband technologies can provide an “Internet radio” infrastructure that can effectively serve the advanced telecommunications needs of persons living in tribal lands, as well as other underserved areas.

**A. Wideband for the First Mile**

Two obstacles rise to the surface when evaluating telecommunications infrastructure in tribal lands. First, the first/last mile issue is exacerbated. Even if a point of presence (provided by a satellite connection, possibly) is available at some population center, it is economically infeasible to rely on last mile solutions (such as cable and DSL) appropriate for more affluent, densely-populated areas. Working together, a combination of wideband technologies (depending on the location and environment) can provide this first mile solution.

Second, wiring within buildings and residences is often lacking in these areas. A wireless LAN – also enabled by wideband – could obviate the need for comprehensive wiring of educational institutions and residences in tribal lands. This will be particularly important as Internet-enabled devices and appliances proliferate. As described further below, a local mesh using wideband (and ideally software-defined radios) can serve this environment very well, providing redundancy and minimizing upstream traffic.

1. *MMDS & LMDS for the First Mile*

MMDS and LMDS systems have significant potential for solving several rural access issues. System cost-of-deployment continues to drop, becoming more economically viable for implementation in remote areas such as tribal lands. These systems can provide complete connectivity for a local environment, as well as the backbone connection to other conduits upstream. MMDS and LMDS offer enough bandwidth to allow more than just e-mail and periodic web browsing; they allow significant educational opportunities to be delivered to the end user. The ultimate addition of voice-over-IP technology makes these systems particularly strong for delivering telephony services.

2. *Part 15 Spread Spectrum*

Part 15 devices are another tool for providing rural areas with needed connectivity. Many of the existing and future devices will fill niches where full deployment of a larger infrastructure (i.e. MMDS or satellite) is not feasible, or where access to a network needs to be offered to just a few individuals from an MMDS or satellite connection (or other high speed backbone).

For example, an MMDS or satellite system could be set up in a community, but some may not have access to the service because of a mesa or other natural obstacle between them and the main installation. The solution could be to install a device on the mesa or another point and then provide Part 15 communication devices in and out of that point.

The same type of technology which can enable VoIP using an MMDS will allow properly-equipped and configured Part 15 communication devices to provide the same basic telephony service. In areas where deployment of a more expensive high-speed MMDS or similar

system does not make sense, Part 15 Internet devices can provide local area networking to and from an Internet connection at an affordable cost.

The potential changes in Part 15 power output and antenna size suggested by this *Notice* will dramatically improve the effectiveness of such technologies, and will deployment and subsequent usage in tribal lands.

### 3. *Ultra-Wideband*

We commend the Commission for its inquiry into Ultra-Wideband Transmission Systems,<sup>1</sup> and urge the Commission to act quickly to encourage the sensible deployment of this technology. Ultra-Wideband technologies show tremendous potential for advanced telecommunications.

Remote areas such as tribal lands provide the perfect environment in which to test and deploy these new systems until such time as the technology can be fit into the FCC regulatory framework. The broad range of potential solutions (from first-mile to the replacement of internal wiring) is impressive, but technology needs to be deployed and tested. We believe ultra-wideband has good potential to meet specific telecommunications needs of those living in isolated areas such as tribal lands, and will be working with others as part of the NSF Advanced Networking for Minority-Serving Institutions (AN-MSI) project to help define where and how this might happen.

## **B. Wideband Technologies from the Backbone to the First Mile**

### *VSAT and Point-to-Point Microwave*

One of the greatest challenges in providing access to rural and tribal lands is the fact that modern-day telecommunication backbones, while having grown faster and larger in capacity,

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<sup>1</sup> *Notice of Inquiry*, Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, Adopted August 20, 1998 ET Docket No. 98-153.

simply are not available to many rural areas. Connections from primary backbones to the rural or tribal lands thus need to be created in many cases.

There are several ways to connect rural areas to national infrastructures, but two methods -- VSAT and microwave point-to-point technology -- appear to be promising for the often-substantial distance from the backbone to the remote area:. Both technologies offer the necessary bandwidth to support the types of access we have discussed in this comment. VSAT technology is rapidly gaining strength as more powerful geostationary satellites are put into orbit that support this technology. The cost of VSAT installation and monthly connection fees are also decreasing as more people begin to use these services. Traditional microwave point-to-point technology can also effectively serve as the connection between a remote area and a backbone.

### **C. Software-Defined Radios**

Underlying radio techniques able to make use of unlicensed ultra-wideband spectrum have benefited from major leaps in enabling technology, namely, the microprocessor. While they are still in a relatively early stage of development, “smart radios” (in which software directly affects the manner in which the device uses spectrum) promise to enable much more efficient use of spectrum with much less potential for interference, enabling ultra-wideband radio systems to be used to the maximum potential.

“Software Defined Radios” (SDR) perform the majority of signal processing in the digital domain using programmable digital signal processors. SDR differs from “digital radio”, which has been around for some time, in that the signal processors for SDR are programmable (leading to the common term “smart radio”). This ability to program the signal processors is key, as it enables SDR to be tailored –via software -- for specific spectrum and network environments. “SDR facilitates the growing user requirement to merge wireless telephony and data

communication with computing capability. . . . The SDR is capable of flexible adaptation to network protocols, billings and accountability requirements, as well as technical parameter selection and control.”<sup>2</sup>

SDR can include both fixed base stations and mobile handsets. Fixed base stations play an important role in connecting end users to the world, including the global public switched telephone network and the Internet. In the potential architecture described below, SDR base stations sited near the center of a population and that include an omnidirectional antenna could serve an entire community with both broadband Internet and basic telephony service.

Software defined radios hold revolutionary potential as an effective tool for broadband wireless in the first mile. As such SDR could be particularly valuable to rural, underserved environments such as tribal lands where wireline is essentially non-existent. SDR scholars predict the deployment of SDR base stations will be limited through 2003, but beginning in 2005 we will see widespread adoption as a core platform by most manufacturers.<sup>3</sup> The time is now for the Commission to take a close look at SDR, and to alter spectrum management and certification policies to encourage its commercial development and deployment.

#### **D. Addressing Basic Telephony**

The Commission’s *Notice* seeks input on how best to provide basic telephony service through wireless. As noted throughout, we suggest the best way to meet this goal is through the implementation of an advanced wireless infrastructure. With voice-over-IP (VoIP), such an infrastructure can provide basic telephony service in addition to advanced Internet access.

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<sup>2</sup> *Software Defined Radio: Spectrum Management and Policy Implications*, FCC Technological Advisory Council Spectrum Management Focus Group, R. Shrum, K. Kontson, B. Davis, August 20, 1999, at p. 4.

<sup>3</sup> SDR Forum Briefing, *Software Defined Radio*, S.M. Blust, BellSouth Cellular Corporation, Chairman, Software Defined Radio Forum, presented 22 June 1999.

VoIP is becoming a pervasive technology, and is steadily being employed in more and more business environments. It is being implemented at the switch to switch level successfully. In the near future we will see handset devices with VoIP capability directly from the end-user. Because end-user VoIP will emerge shortly, the Commission should encourage the deployment of wideband technology using IP networks. Once this infrastructure is in place, end-user VoIP can be added modularly. (Lucent Technologies and other vendors are introducing a new generation of VoIP chips that will be integral in enabling the end-user VoIP module.)

#### **IV. REGULATORY COMMENTS**

EDUCAUSE and AIHEC suggest that the Commission can and should encourage wideband to proliferate, especially in tribal lands where the potential for harmful interference is significantly lower.

(1) We recognize and commend the Commission's recent attention to the topic of Ultra-Wideband (UWB) through its *Notice of Inquiry* issued in Docket No. 98-153.<sup>4</sup> Given the potential of UWB to serve both the basic and advanced first-mile telecommunications needs of persons living on tribal lands and other underserved areas, we urge the Commission to proceed *quickly* in that docket to specify Part 15 rule modifications that allow more widespread operation and deployment of UWB radio systems for telecommunications purposes. It should do so keeping in mind that steady progress in the field of software radio promises to ameliorate potential interference problems that may (or may not) be created by ubiquitous operation of ultra-wideband radio systems.

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<sup>4</sup> Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, FCC 98-208, Docket No. 98-153, 63 Fed. Reg. 50184 (Sept 21, 1998).

(2) In the absence of a wholesale Part 15 rule modification the Commission should, in the proposed rulemaking at hand, immediately implement a “tribal lands exception” to Part 15 and other restrictions that inhibit the use of wideband. The generally remote nature of tribal lands makes such areas ideal for the implementation of wideband radio systems; potential interference will be much less than in other more populated areas of the U.S.

We specifically address the Commission’s request in the *Notice* for “views regarding possible height and power modifications for providers of other services...” *Notice*, ¶ 21. The Commission should modify its Part 15 rules to specifically allow the use of more powerful transmission devices, and should remove restrictions pertaining to antennas. Doing so would enable wideband devices to reach more people living in rural, isolated areas where wireline is not an option.

It is also conceivable that such an exception would also provide a powerful incentive for industry to serve these areas with wideband devices. If the exception is cast as a transitional measure, with a possibility of an across-the-board Part 15 wideband modification down the road, several industry players will likely recognize the value in testing various wideband equipment and architectures as well as gaining a certain amount of market share and exposure, prior to such a wholesale wideband-friendly rule modification.

In addition to enabling a distinctly underserved population to benefit from a promising technology, such a tribal lands exception in furtherance of wideband would allow the Commission and the telecommunications industry to observe a larger scale implementation of a wideband infrastructure. The Commission and other parties would have an opportunity to examine modes of implementation, pros and cons of various architectures, and interference issues.

(3) The Commission seeks comment on whether measures taken to extend wireless telecommunications to tribal lands should be implemented for other underserved areas. *Notice*, ¶ 1. EDUCAUSE and AIHEC agree with this suggestion and recommend that, in addition to the tribal lands exception above, the Commission consider an “underserved area” modification to its Part 15 and other rules in furtherance of wideband.

(4) The Commission should immediately issue a *Notice of Inquiry* into Software Defined Radios. With the principles of “dynamic sharing” and “adaptive spectrum management”, SDR likely calls for an important shift in spectrum management policy:

The control of radio functions by software algorithms embedded into the future “smart” communications device will directly affect the manner in which that device uses the spectrum. However, the positive control over the transmitter’s use of the spectrum has traditionally been the purview of the radio operators, who were guided and trained to follow the rules of engagement carefully crafted during the course of decades to prevent harmful interference to other users. This power of control is now being handed over to the device itself. The obvious question is: How does this transfer of control affect the spectrum management rules and procedures that have been crafted to guide and manage the behavior of the human operators?<sup>5</sup>

SDR scholars note that software radio base stations will become the core platform for most manufacturers as early as 2005.<sup>6</sup> The Commission should begin immediately to explore the potential ramifications of the gradual – but pervasive – adoption of SDRs, including the implications of a more decentralized spectrum management policy. The shift of spectrum compliance to a programmable device such as an SDR or SWR also raises a host of certification issues which the Commission should consider in its SDR inquiry.<sup>7</sup>

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<sup>5</sup> S.M. Blust, *Software Defined Radio*, in R. Shrum, K. Kontson, B.Davis, at 2.

<sup>6</sup> *Id.*

<sup>7</sup> See D.N. Hatfield, Chief, FCC Office of Engineering and Technology, Keynote Address, RAWCON’99, *The Regulatory Challenges of New Wireless Technologies: Ultrawideband and Software Defined Radios*, August 2, 1999.



#### **IV. Conclusion**

As discussed in detail above, the Commission should act promptly to encourage the development and deployment of wideband radio systems and software-defined radios to serve the advanced telecommunications needs of persons living on tribal lands.

Respectfully submitted,

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