

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

In the Matter of)	
)	
Amendment of Part 2 of the Commission's)	ET Docket No. 00-258
Rules to Allocate Spectrum Below 3 GHz)	
For Mobile and Fixed Services to Support)	
the Introduction of New Advanced Wireless)	
Services, including Third Generation)	
Wireless Systems)	
)	
Petition for Rulemaking of the Cellular)	RM-9920
Telecommunications Industry Association)	
Concerning Implementation of WRC-2000;)	
Review of Spectrum and Regulatory)	
Requirements for IMT-2000)	
)	
Amendment of the U.S. Table of Frequency)	RM-9911
Allocations to Designate the 2500-2520/)	
2670-2690 MHz Frequency Bands for the)	
Mobile-Satellite Service)	

To: The Commission

COMMENTS OF THE NATIONAL ITFS ASSOCIATION

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SUMMARY

The National ITFS Association (“NIA”) represents ITFS licensees and applicants. The Instructional Television Fixed Service was created by the FCC in the early 1960’s to meet educational transmission needs. Since that time, several thousand ITFS licensees consisting of state and local government agencies, colleges and universities, public and private schools, public broadcasters, hospitals and nonprofit educational entities have been responsible and effective stewards of their channels in the 2500-2690 MHz band. Their efforts have advanced the cause of education, which is critical to the future of this country’s society and economy.

Traditional ITFS service has focused on the transmission of varied educational video programming to students in schools and other institutional settings. ITFS has been used as well as to feed educational material to cable headends, making possible the delivery of educational and informational programming to homes. These services have been widespread and effective.

Beginning in 1983, ITFS licensees were allowed and encouraged by the FCC to share capacity on their channels with wireless cable system operators. The educational-commercial relationships that developed made possible more widespread activation of ITFS systems, supported educational programming and services, and provided access to subscribers’ homes. There are now scores of effective partnerships between ITFS licensees and wireless operators, many of which have extended to the development of efficient compressed digital video systems.

More recently, ITFS licensees have worked with commercial system operators and the FCC to enable ITFS and MMDS to be retooled for two-way communications, making it possible for the 2500-2690 MHz band to be used for wireless broadband services, including high speed Internet access. These broadband data systems are now being rolled out across the country.

There is increasing recognition that education in the information - age economy of the United States must be a life-long endeavor. To be effective, education must be available whenever and wherever a learner is available. It must also be interactive. For these reasons, learning at all levels is increasingly becoming Internet-based, and it increasingly requires broadband Internet access. The rollout of broadband wireless services in the 2500-2690 MHz band can and will be a vital link between this country's educational needs and its capability to satisfy those needs. Broadband wireless access in the 2500-2690 MHz band will bridge the Digital Divide, and is thus critical to both education and the U.S. economy.

NIA therefore opposes any reallocation of the 2500-2690 MHz band for advanced, or 3G, mobile services.

Proponents of such services must demonstrate that the spectrum now available for mobile services, together with the 160 MHz of spectrum already proposed to be allocated by the FCC for advanced fixed and mobile services, is not adequate for 3G needs. In considering the issue, the FCC cannot take for granted that particular amounts of spectrum in particular bands are required for 3G, as recent events have cast significant doubt on consumer acceptance and the commercial viability of 3G services.

If additional spectrum is required beyond the 160 MHz of spectrum identified by the FCC, that spectrum needs to be found elsewhere than in the 2500-2690 MHz band. In view of the 3G plans of the United States' neighbors in the Western Hemisphere, which are moving towards using the 1.7 GHz band for 3G, the 1.7 GHz band represents a better alternative for 3G in the United States. International travel to and from the U.S., and international trade, is heavily weighted towards our Canadian and Mexican neighbors, rather than Europe and Asia, which may (or may not) choose the 2.5 GHz band for 3G.

If the FCC comes down to a “head to head” comparison between ITFS/MMDS and 3G mobile for the 2500-2690 MHz band, there is no doubt that ITFS/MMDS should be fully protected. The educational services of ITFS licensees and the rollout of wireless broadband services by ITFS/MMDS licensees and their commercial partners are critical to education and to the U.S. economy. The choice between bridging the Digital Divide and ordering pizza or checking stock quotes on cell phones should not be a difficult one to make.

If the FCC were to decide to the contrary, and reallocate any spectrum from the 2500-2690 MHz band for 3G (including any band segmentation plan), the result would be devastating for a large number of ITFS licensees, whose ITFS operations would be wiped out. Any loss of spectrum in the band would mean the end of educational – commercial partnerships and result in the termination of broadband services in the band.

Finally, the NIA does not support adding a mobile allocation in the 2500-2690 MHz band, even if there is no mandatory relocation of incumbent licensees. It is clear that 3G mobile services cannot co-exist with ubiquitous fixed wireless broadband services. Given the commitment of licensees in the 2500-2690 MHz band to fixed wireless broadband, there is no purpose to be served by adding a mobile allocation. Indeed, doing so would only delay the rollout of fixed broadband services.

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To: The Commission

COMMENTS OF THE NATIONAL ITFS ASSOCIATION

The National ITFS Association ("NIA") submits these comments in response to the *Notice of Proposed Rule Making and Order* in the captioned proceeding, FCC 00-455 (released January 5, 2001) ("NPRM"). In the NPRM, the Commission explores the possibility of introducing new advanced mobile and fixed services in various frequency bands, including the 2500-2690 MHz band currently allocated for and used by stations operating in the Instructional Television Fixed Service ("ITFS") and the Multichannel Multipoint Distribution Service ("MMDS").

NIA supports the Commission's goal to provide for the introduction of new advanced wireless services consistent with Section 706 of the 1996 Telecommunications Act, 47 U.S.C. § 157, and to promote increased competition among terrestrial services. NIA believes those goals can best be accomplished by retaining the entire 2500-2690 MHz band for ITFS/MMDS, thereby making possible both the continuation of pervasive and invaluable licensed uses by stations in these incumbent services and the expanding rollout of advanced wireless broadband services to schools, homes and businesses. NIA believes that the Commission has identified, and can make available, other spectrum fully adequate to satisfy demand for other advanced services such as Third Generation ("3G") mobile, to the extent that such demand actually develops, without any incursion into the 2500-2690 MHz band.

National ITFS Association

The National ITFS Association, established in 1978, is a non-profit, professional organization of ITFS licensees, applicants and others interested in the Instructional Television Fixed Service. The goals of NIA are to gather and exchange information about ITFS, to act as a conduit for those seeking information or assistance about ITFS, and to represent the interests of ITFS licensees and applicants. NIA and its members have participated in virtually every FCC proceeding affecting ITFS. It has a particular interest in this proceeding, which considers certain allocation changes that would threaten the very existence of its members' ITFS operations.

The Instructional Television Fixed Service and its Licensees

The ITFS was created by the FCC in 1963 to meet the needs of educators for the transmission of visual and aural instructional material to students enrolled in courses of formal

education.¹ There are now thousands of ITFS stations authorized by the FCC, operating in the 2500-2690 MHz band across the United States, and serving literally millions of students and lifelong learners. Approximately 1,275 entities hold about 2,400 ITFS licenses for stations utilizing some 8,000 ITFS channels. Nationwide, ITFS stations serve over 70,000 locations that are registered as receive sites, most of which are schools and other learning locations (such as hospitals and community centers). However, because registration has never been required for a site to receive ITFS programming (and indeed, the FCC no longer even registers receive sites), NIA estimates that the actual number of locations at which ITFS programming is viewed is in the hundreds of thousands, and it expects the number of locations to increase dramatically as line of sight problems are resolved with new two-way, digital technologies. Furthermore, ITFS educational programming is received by hundreds of thousands of subscribers to wireless cable systems operating on ITFS and MMDS channels and by millions of cable TV subscribers via ITFS feeds to local cable system headends.

The licensees of ITFS stations² are numerous state government agencies, state universities and university systems, public community and technical colleges, private universities and colleges, public elementary and secondary school districts, private schools (including

¹ ITFS in 1963 was originally allowed to use all 31 six MHz channels in the 2500-2690 MHz band on a shared basis with Operational Fixed Service (“OFS”) stations. In 1971, the FCC gave 28 channels exclusively to ITFS and three H Channels to OFS. In 1983, the FCC reallocated 8 of the ITFS channels (2596-2644 MHz) to create the MMDS band. ITFS now uses 2500-2596 MHz and a portion of 2644-2686 MHz (sharing it with MMDS channels), although there are grandfathered ITFS stations in the reallocated MMDS band. In addition, because the FCC recently authorized channel-swapping between ITFS and MMDS licensees, ITFS licensees may in the future operate anywhere in the 2500-2690 MHz band.

² The FCC’s rules for ITFS limit eligibility for licenses to accredited educational institutions, governmental entities engaged in formal education (such as school districts) and nonprofit organizations that exist to provide educational and instructional television services to schools. The rules require that ITFS stations be used primarily to further the educational mission of

Catholic school systems in a number of metropolitan areas), public television and radio stations, hospitals and hospital associations, and private, non-profit educational entities.³

Federal and state governments and the private sector have invested substantial funds and vast effort in the development and use of ITFS. Federal support has come largely from the Public Telecommunications Facilities Program (“PTFP”) of NTIA, and the federal government maintains an interest in many PTFP-funded facilities. Other federal support has been provided by the Department of Education. State support has come directly from state legislative appropriations and from institutional support from public educational institutions. Private sector support has taken the form of investment and support by nonprofit licensees and ITFS licensees’ business partners.

The Value of Education in the United States

The Commission cannot make spectrum decisions in a vacuum. Any consideration of reallocating and relocating ITFS licensees from the 2500-2690 MHz band must be made with an appropriate understanding of the importance of education and training, not just to ITFS licensees or the students they serve, but to the U.S. economy as a whole. There is no doubt that our economy is well along in a transition to a “knowledge- and information-based, intellectually oriented and increasingly service-driven society.”⁴ This development “necessitates continued

accredited schools providing formal educational and cultural development to enrolled students. However, capacity on ITFS stations may be shared with third parties for other uses.

³ Nearly 60% of all ITFS licensees are public and private K-12 schools and school districts. They hold nearly 900 ITFS licenses. About 25% of ITFS licensees are colleges and universities who, because they often hold multiple licenses, hold nearly 1/3 of the total licenses. The other licensees (about 16% of the total) are governmental entities, public broadcast stations and non-profit organizations that support instructional activities at accredited educational institutions.

⁴ Jerry R. Herman et al., First Union Secs., Equity Research Dep’t, *The e-Education Industry* 110 (May 2000) (“*First Union*”).

lifelong learning and skills enhancement to remain productive and competitive.”⁵ Workers on average are estimated to change jobs seven to ten times during their careers due to rapid obsolescence of technology, services and products.⁶ This “greater propensity to change jobs or career paths (either voluntarily or involuntarily) has produced a continued need for skill acquisition and/or updating.”⁷

The manner in which education is delivered to students and workers is being fundamentally changed by the Internet. As the bipartisan Congressional Web-Based Education Commission concluded in its December 2000 report to the President and Congress, formal education at all levels is in transition as the “Internet is bringing us closer . . . to mak[ing] learning—of all kinds, at all levels, any time, any place, any pace—a practical reality for every man, woman, and child. . . . There is no going back. The traditional classroom has been transformed.”⁸ Technology and education are converging to create unparalleled change and opportunities.⁹ “The proliferation of technology in education, and the creation of *e-Learning*, is transforming the way teachers teach, students learn, [and] schools operate”¹⁰ In the face of this reality, the Web-Based Education Commission called for adoption of an “e-learning agenda”

⁵ *Id.*

⁶ *See id.* at 111.

⁷ *Id.* at 111.

⁸ The Web-Based Education Commission, Report to Congress and the President, *The Power of the Internet for Learning: Moving from Promise to Practice* 1 (December 2000) (“*Web-Based Comm’n Report*”).

⁹ “Two key trends, we believe, will together ultimately make e-Learning the ‘killer app’ on the Web: the Internet, which is the fastest growing mass market media in history, is here to stay, only increasing in usage and bandwidth; and training and education, which represents over 10% of the U.S. Gross Domestic Product, continues to be at the forefront in U.S. society.” Robert W. Peterson et al., U.S. Bancorp/Piper Jaffray Equity Research, *e-Learning: Helping Investors Climb the e-Learning Curve* 11 (November 1999).

to assist local, state and federal authorities, higher education institutions and the private sector to “maximize the power of the Internet” for teaching students and training teachers.¹¹ Just in terms of its financial impact, the importance of education to the health of the nation cannot be overstated. Education and training account for approximately \$815 billion, or more than 9% of the U.S. gross domestic product, ranking only behind healthcare as the largest component of GDP.¹² The “education market is an integral component of the U.S. economic fabric,” one that is growing at an annual rate of 7%.¹³ First Union estimates that the U.S. education and training market consists of 230,000 providers, serving 138 million students from child care/pre-primary education, through, K-12 and post-secondary education and worker training.¹⁴

As demonstrated in these comments, ITFS has addressed the country’s need for education and training and, so long as the Commission does not destroy it, will continue to do so with increased effectiveness and scope. Through such education and training, and through the provision of wireless broadband services, ITFS will help enable the U.S. to realize the potential of the information age.

The Story of ITFS: Effective Access to and for Learners

Traditional Video Programming. ITFS stations were traditionally used to deliver point to multi-point educational video and audio programming. Contrary to myths recently perpetrated by parties who would like to see the 2500-2690 MHz band taken for other purposes, ITFS licensees’ record of stewardship in the use of their frequencies is strong. ITFS usage for

¹⁰ *First Union* at 9.

¹¹ *Web-Based Comm’n Report* at 129.

¹² *See Web-Based Comm’n Report* at 8.

¹³ *First Union* at 9.

¹⁴ *See First Union* at 21-22.

traditional video instruction has been widespread and effective. ITFS has provided a critical “last mile” distribution channel for a wide variety of valuable transmission services, including the provision of formal telecourses (on the K-12, secondary and post-secondary levels) to schools, hospitals, workplaces and other places of learning; transmission of other educationally valuable programming into schools (such as news, public affairs, history and similar material); provision of professional and worker training (often for teachers, health professionals and public safety officers); transmission of teleconferences for educational and training purposes; and transmission of other administrative communications by schools. Generally, the transmissions are received directly at the intended educational sites. However, ITFS stations often also transmit educational programming to cable television headends in their service areas, making it possible for cable systems to transmit the programming both to additional institutional sites and to subscribers’ homes.

It would be impossible in these comments to relate the stories of the numerous ITFS licensees that have successfully utilized their channels to deliver traditional instructional programming and other valuable services. NIA has attached an appendix to these comments, however, that provides information on a number of illustrative ITFS operations across the country. These anecdotes provide a sense of the nature, scope and value of these ITFS activities.

For example, South Carolina Educational Television Commission, an agency of the State of South Carolina, is perhaps the nation’s single largest ITFS user. Its network, paid for by nearly 30 million dollars of public funds made available by the State of South Carolina, consists of 64 ITFS stations consisting of 49 ITFS transmitters, 15 ITFS studio to transmitter links and 35 Distance Education Learning Centers. It reaches 793 public schools in the state, serving over 417,000 students. Recognizing that 63% of the state’s students reside in rural areas, and that

other factors affect the specific educational needs of particular districts, SCETV's network was designed to give each school district some control over local scheduling and programming availability. All programming used in the schools is approved by the State Department of Education, and each of the Learning Centers receives about 1500 hours of new programming each year. Through the Learning Centers, studio facilities are also available for each local ITFS station to provide live, interactive classroom instruction using one-way video and two-way audio.

Stanford University, one of the oldest and most respected educational institutions on the West Coast, operates an ITFS-based distance learning system that has become indispensable to Silicon Valley's high technology industry, which requires highly trained employees. Using five ITFS channels, Stanford provides 250 graduate-level courses every year to over 6,000 workplace learners employed by about 350 different companies. No alternative technology, including cable television, is as effective as ITFS in reaching these corporate locations, which extend throughout the Valley to San Francisco and the East Bay. One of Stanford's "customers," Cisco Systems, offers Stanford courses to its employees, and has seen enrollment double each year over the past three years. Cisco has found Stanford's ITFS-delivered courses infinitely better than previously utilized courses, including courses offered online, which did not offer the flexibility of recordable televised instruction and which were slow and often interrupted during downloads.

The WHRO Center for Public Telecommunications, a public television and radio station in Norfolk, Virginia, uses three channels of its ITFS station to provide instructional programming to students in 27 school districts, in addition to on-demand programming for teacher training. These channels also provide multiple channels of programming to the Virginia Tidewater Consortium for Higher Education, composed of 14 colleges and universities (both

public and private) in the Hampton Roads area. This programming is received at 150 locations. In addition, these channels are used to distribute college credit courses to area cable system headends, making it possible for almost a half a million cable subscribers to take or audit these courses in their homes. Finally, one channel in the system is used for a cutting edge tele-medicine network that connects doctors in Maryland, Virginia and North Carolina. Funded by the Virginia Health Care Foundation and based at the Eastern Virginia Medical School, this channel reaches 19 sites including hospitals, rural health clinics, colleges, community health centers and private practice physicians with medical training programming and consultations.

Shared Capacity with Wireless Operators/Digitization. Beginning in 1983, new opportunities arose for ITFS licensees in the use of their stations. In order to support the delivery of instruction over an expanded ITFS service and spur multi-channel video competition that would result from the activation of “wireless cable” systems, the FCC permitted and, indeed, encouraged ITFS licensees to share capacity on their ITFS stations for non-ITFS uses. Under typical contractual arrangements, ITFS licensees obtained constructed ITFS facilities, operational support and royalties. They also were able to take advantage of commercial partners’ systems that would transmit ITFS services directly to people’s homes. The early wireless cable systems were analog, but in the last decade, a number of ITFS/MMDS systems were deployed using digital technology, making possible the transmission of literally hundreds of commercial video channels alongside of dozens of educational channels. These educational/commercial systems, both analog and digital, have provided and continue to provide substantial service in the public interest.

For example, in Tucson, Arizona, the University of Arizona has partnered with People’s Choice of Tucson, now a subsidiary of Sprint, to build a wireless system on ITFS and MMDS

channels serving educational sites, homes and businesses. The University, thanks in significant part to the operational and financial support of PCTV, provides educational programming over the system to over 25,000 students in 35 K-12 schools, in addition to hundreds of University and community college students each semester. The system is used to link the medical staff at seven Tucson area hospitals and at the Federal prison in Tucson, as well as numerous doctors in private practice, to medical lectures and courses. The system also enables PCTV to serve over 20,000 subscribers to its video/data system in Tucson, making both their commercial service and educational fare (credit courses (including those leading to a GED) and professional training) available to the public in their homes. The University and PCTV, working together, are now rolling out high speed Internet access services for education and for the public, making Tucson one of the early successes in two-way fixed wireless broadband.

In California, the Long Beach Unified School District with 95,000 students in 94 K-12 schools, has been a long-time ITFS licensee, offering instructional programming, literacy programs for adult learners, staff development for teachers and administrators, and even some college level programming for District high schools. Principals and administrators also use the ITFS system for meetings and workshops. In the mid-1990's, running out of capacity on its four analog channels, the School District entered into an arrangement with Cross Country Wireless, now a subsidiary of Worldcom, to convert the ITFS station (along with stations licensed to other educators with similar arrangements) to digital service, thereby increasing the number of channels available to the Schools while making possible the construction of a digital wireless cable system serving the entire Long Angeles and Orange County metropolitan area. That digital system has been operating now for years, generating substantial revenues used by the School District to fund its educational activities. The parties are also now working out arrangements for

the conversion of the system to provide two-way broadband data services, while preserving several highly compressed digital video channels for continued instructional video programming.

In Texas, Austin Community College, working with its partner Nucentrix Broadband Networks, operates an ITFS station as part of a wireless video/broadband system developed by Nucentrix. The College uses the ITFS station to provide a variety of telecourses to over 2,000 students per semester. The College also uses ITFS as a communications vehicle to its students, providing college news, class schedules, campus updates, as well as videoconferences and special campus events.

Wireless Broadband Data Networks. Although ITFS stations have traditionally provided educational service in one-way video configurations, ITFS licensees are already working with their commercial partners under the Commission's new rules to roll out two-way broadband data services and they anticipate explosive growth in the use of their channels for wireless broadband. After literally years of hard work and consensus building within the 2500-2690 MHz band user communities, the FCC recently authorized ITFS and MMDS channels to be used on a two-way basis. Several dozen markets are already being provided with wireless broadband service.¹⁵ Moreover, nearly 2300 applications for two-way facilities, including for ITFS stations, have been filed and will shortly be granted.¹⁶

¹⁵ In ¶ 60 of the NPRM, the FCC notes that about 25 companies are already providing high-speed Internet access service in at least 43 markets, and wireless operators have announced plans to offer the service in additional markets.

¹⁶ According to ¶ 60 of the NPRM, there were 2,267 two-way applications filed during the August 14-18, 2000 filing window. According to the automatic grant provisions of the FCC's two-way rules, unless there are petitions to deny or other reasons requiring the FCC to hold up approval, these applications will be granted on April 3, 2001, paving the way for even wider rollout of wireless broadband services on ITFS and MMDS channels.

The commercial partners of ITFS licensees have stepped forward with the necessary capital, technical expertise and ability to prod technology developers and equipment manufacturers. In partnership with these companies, ITFS licensees have made their channels available to test, and now roll out, broadband Internet access services. As a result of having the right spectrum (the 2500-2690 MHz band), the right FCC rules and application processes, the right commercial partners, and the right technology, ITFS licensees are beginning to bring fixed wireless broadband service to market, making possible the greater use of interactive video, audio and data services by students and lifelong learners in their classrooms, homes and places of business.¹⁷ These services will be integrated into two-way systems constructed and operated by commercial wireless companies. By participating in the development of these new services, ITFS licensees will be helping the country achieve an important goal of the Commission – the development of a competitive broadband environment in the United States through wireless technology.

Many ITFS licensees are in the process of moving into the broadband world. For example, as noted above, the University of Arizona in Tucson is working with a subsidiary of Sprint to bring wireless broadband service to that community. In San Diego, a group of educators including the San Diego County Office of Education, three K-12 school districts, two community colleges and a campus of the California State University System, are working with a subsidiary of Worldcom to roll out both digital educational video and two-way broadband service in that market, following up on the area's long-standing analog ITFS service. San Diego

¹⁷ “Access may take place in the school or college or adult literacy classroom, in the library or after school center, in the community center or workplace, or in the home.” *Web-Based Comm'n Report* at 21. “[The] Internet enables education to occur in places where there is none, extends

County Superintendent of Schools and San Diego State University filed applications in the August, 2000 filing window for upstream data facilities for the two-way system. As reported in the Comments of the Catholic Television Network in this proceeding, the Diocese of Brooklyn has filed applications with the FCC during the August, 2000 window seeking permission to operate its own independent broadband Internet access system.

Education and Broadband

As noted above, the need for life-long education is exploding, and it has become a critically important component of the success of the United States economy. The Web-Based Commission estimates that “50% of all employees’ skills become outdated within 3 to 5 years” and that in response, business is increasingly turning to Web-based training.¹⁸ The total size of the job training and development market for large U.S. companies alone is estimated at more than \$63 billion, serving some 60 million workers. In this context, the traditional model of going to a classroom for learning fails for many because of constraints of time, availability, distance and/or expense. These constraints will become more pronounced in the future. Therefore, educators need to take “school” to the student. In addition to workplaces and public educational centers, the ability to reach students in their homes is of critical importance. “Home access is important for students doing research, taking online courses, and communicating with

resources where there are few, expands the learning day, and opens the learning place.” *Id.* at iii. It gives “teachers and students multiple paths for understanding.” *Id.*

¹⁸ *Web-Based Comm’n Report* at 8, citing Moe Blodgett et al., Merrill Lynch & Co., Global Fundamental Equity Research Dep’t, *The Knowledge War* 229 at endnote 21 (2000). The Commission also found that 85% of all U.S. jobs are now classified as skilled and that the country faces a critical shortage of information technology workers, nearly 720,000 in 1999. *Id.*

teachers and other learners. For parents, online access means new kinds of communications with their children's schools, with their children's teachers, and with other parents.”¹⁹

Distance education has been offered for well over a century in the U.S., starting with correspondence courses in the 1800s, moving more recently through real time transmission technologies and videotapes, and now utilizing interactive digital media such as CD-ROMs and the Internet. It has become clear, however, that one-way, non-interactive instruction cannot match the effectiveness of interactive instruction. As the Web-Based Commission makes clear, interactive digital instruction is the future of distance learning. The Internet promises to enable education to “center learning around the student instead of the classroom, to focus on the strengths and needs of individual learners, [and] to make lifelong learning a practical reality.”²⁰ Educators are therefore struggling with the problem of how to deliver the digital interactive material to students, in an effective manner, when and where they are ready to use it.

The narrow pipeline offered by a typical dial up Internet line (maximum 56 kbps), cannot provide the richness and quality required for an effective interactive digital education experience. Broadband speeds are required to provide effective video and audio, videoconferencing, video on demand, and responsive interaction. “Access is fundamental.... For education, broadband access means the elimination of time and distance from the learning equation. Broadband carries with it powerful multimedia learning opportunities, full interactivity of instructional content, and the quality and speed of communications.... [T]he level of broadband capacity determines the degree to which access to rich, engaging online content is possible.”²¹ Widely available

¹⁹ *Web-Based Comm'n Report* at 26.

²⁰ *Web-Based Comm'n Report* at iii.

²¹ *Web-Based Comm'n Report* at 22. “The benefits and ramifications for the education industry and the proliferation of e-Learning are considerable. Enriched content, more engaging content,

broadband access would make it possible for education to follow students from the classroom, to their homes, to their places of work or even to hotels while they travel. Students could “attend” class, work with other students, access rich educational content and communicate with their instructors, much as they would if they were on campus. The Web-Based Education Commission’s first priority in its e-Learning agenda “call to action” is to “[m]ake powerful new Internet resources, especially broadband access, widely and equitably available and affordable for all learners.”²²

Thus, there are a number of substantial advantages to a broadband Internet model for education, particularly distance learning. Broadband enables teachers and learners to access and use a richer set of instructional tools. It enables better interaction (whether student/computer, student/student, or student/professor), a truly desirable goal in education. It is supportive of a common distribution model that works across all transmission media, thereby saving schools, colleges and universities development and distribution costs. Education modules and services built on IP can be delivered through whatever medium is available to a student or faculty member. If students have cable modems, they can connect. If they have digital subscriber line (DSL) services from local phone companies, they can connect. And, if they have fixed broadband wireless over ITFS/MMDS, they can connect.

Unfortunately, if learners cannot obtain broadband connections, they simply cannot avail themselves of effective interactive digital instruction. NIA believes that ITFS and MMDS, operating in the 2500-2690 MHz band, is one of this country’s best options for enabling learners

new and more effective delivery methodologies, more enjoyable and potentially rewarding learning and/or communication experience are all made possible by the growth in high-speed access to the Internet.” *First Union* at 54.

²² *Web-Based Comm’n Report* at iii.

to connect. NIA contends that, if there is any loss of ITFS/MMDS capacity in the 2500-2690 MHz band, the education of our students and training of our workers will be materially harmed, and the adverse consequences for our country will be substantial and widespread.

ARGUMENT

ANY IMPLEMENTATION OF 3G SERVICES IN THE UNITED STATES MUST TAKE PLACE WITHOUT REALLOCATION OF THE 2500-2690 MHz BAND OR RELOCATION OF ITFS AND MMDS LICENSEES

NIA's fundamental and inalterable position in this proceeding is the following: if the United States chooses to implement 3G services, it can and must do so without reallocating any of the 2500-2690 MHz band or relocating any ITFS or MMDS station. Based on the clamor in certain sectors for 3G spectrum (much of which is undoubtedly hyped), NIA assumes for the purposes of these comments that certain 3G mobile technologies and/or services may serve the public interest and that such services may need to be accommodated in frequency bands below 3 GHz. However, before any incumbent U.S. spectrum users (private or public) are displaced from their current allocations, proponents of 3G mobile services must clear several high hurdles: they must prove that they would offer services that the public does in fact want and need; they must show that to satisfy that demand they need the amount of spectrum they claim they need; they and other mobile providers in the United States must be using their existing spectrum in the most efficient manner and should roll out 3G services in those bands to the greatest degree possible; and they must prove that the proposed services cannot be accommodated in spectrum the FCC is already proposing in the NPRM to make available for advanced communications services. NIA believes that no party can make these showings.

I. Proponents of 3G Services Must Demonstrate that Adequate Spectrum Is Not Now Available or Already Proposed to be Allocated For 3G Services

In the NPRM, at ¶ 4, the FCC acknowledges a resolution of the 2000 World Radiocommunications Conference (“WRC-2000”) stating that approximately 160 MHz of additional spectrum will be needed in order to meet the projected requirements of IMT-2000 services in those areas where the traffic is highest by 2010. WRC-2000 identified the 806-960 MHz, 1710-1885 MHz and the 2500-2690 MHz bands for possible terrestrial use for IMT-2000.²³ The FCC states that the U.S. committed to studying the feasibility of using these bands.

However, there is absolutely no legal or other mandate for the U.S. to make available 160 MHz of new spectrum for 3G by virtue of the WRC-2000 resolution or any other actions taken by that international body, nor is there any mandate to make any or all of such capacity available in the bands identified by WRC-2000. Indeed, there is no obligation for the U.S. to accept the notion that 160 MHz of additional 3G spectrum is needed at all.

In fact, events subsequent to WRC-2000 suggest that 3G mobile services are not likely to be as attractive consumers as planners once thought, and that the ardor among providers (particularly those in Europe recently facing auctions) to roll out 3G mobile systems has cooled. This places in doubt the rosy demand projections on which the 160 MHz number was based. For example, recent trade press reports have detailed the waning interest in 3G spectrum. This has been fueled in part by financial market and carrier concerns that the prices paid for some 3G licenses at European auctions are economically questionable. But there also is a concern over the technology itself. A January 30, 2001 Reuters article reported that 3G is an “unproven

technology” and that “investors are impatient amid worries that [3G] speedy mobile data has been over-hyped and that customers may shun high tech phones.”²⁴ There is a real question whether consumers will find the advantages of 3G appealing enough to scrap existing equipment and pay for new, more expensive units. Even the Executive Vice President and Chief Technical Officer of Verizon Wireless was quoted in the Wall Street Journal only yesterday as saying that “[f]or the next three or four years, I don’t see the need to move rapidly toward 3G.” Upgraded 2G technology “is exactly what we need to satisfy the customer.”²⁵

One knowledgeable Web professional recently said in a New York Times article that “[a]ccessing the Internet on anything without a decent-sized monitor is like reading a book on Post-it notes.... I’m not saying that wireless things aren’t great; I’m addicted to my cell phone. But I couldn’t image a visually appealing way to surf the Web on screens that are so small.”²⁶ Furthermore, the Times article noted while DoCoMo has had notable success in Japan since the introduction of its i-mode wireless Internet service, DoCoMo’s customers’ first access to the Internet was via cell phones. In contrast, more than 55% of U.S. Internet users already access the Internet via desktop computers.²⁷ Further clouding the value of extrapolating the Japanese

²³ This is in addition to the 1885-2025 MHz and 2110-2200 MHz bands, which were identified in 1992 for possible 3G systems, and the 698-806 MHz and 2300-2400 MHz bands which were identified at WRC-2000 for countries that wish to use them for IMT-2000. *NPRM* at ¶ 4.

²⁴ Reuters, *Nokia, Ericsson Fuel Mobile Data Doubts* (Jan. 30, 2001), available at http://www.telecomdirect.pwcglobal.com/telecom/direct:TIH/Telecom_Buzz/Wireless/.

²⁵ David Pringle & Davin J. Delaney, *Next Generation of Cellphones Becomes Murky*, Wall St. J., Feb. 21, 2001, at B4.

²⁶ Simon Romero, *Weak Reception: U.S. Lagging Behind in Wireless, And That May Be Just as Well*, N.Y Times, Jan. 29, 2001, at C1, available at <http://www.nytimes.com/2001/01/29/technology/29WIRE.html?printpage=yes>.

²⁷ *Id.*

experience to the U.S. is the fact that “Americans spend less time on public transportation than Japanese and Europeans, meaning there is less of a market for services that help pass time.”²⁸

There is also doubt whether 3G will live up to the capabilities claimed by its fervent proponents. For example, a vice president of Bell South Wireless is quoted as stating that “nobody is going to get 384Kbps as an individual [3G] user, and another little secret is that the further out you are from the base station, your speed falls off.”²⁹ According to Martin Hale of Pequot Capital Management, Inc, quoted in the same article, 3G will likely reach no more than 56 Kbps. “You have a better chance of winning at the slots in Las Vegas than getting the promised 3G speeds.”³⁰ Morgan Stanley Dean Witter has noted that 3G phones will have poorer and less reliable connectivity than desktop access to the Internet, increasing the likelihood of lost data; that bandwidth will disappoint consumers, and that 2.5G and higher phones will face significant battery constraints in part because sending data from GPRS handsets requires 20 times the power currently consumed for receiving.³¹

All this has led some analysts to question whether the increment in 3G services above those of GPRS or 2.5G phones will be significant enough to prompt consumers to purchase “considerably more expensive” 3G units “with only marginally better functionality” than 2.5G

²⁸ *Id.*

²⁹ Theresa Foley, *Spectrum Shortages Urge Caution for the Major US Wireless Carriers* (Dec. 6, 2000), available at <http://www.mformobile.com/main.asp?pk=8723&pollid=x>, or search site for author.

³⁰ *Id.* See also Angela Dean et al., Morgan Stanley Dean Witter, Equity Research, Global, *Mobile Phone Industry: Transition Time* 54 (Jan. 19, 2001) (“*Morgan Stanley*”) (“The user experience will be critical to success and may initially disappoint”). Similarly, the *Financial Times* concluded late last year that “Now some of the hype about 3G services is beginning to meet gritty reality. Capacity constraints are likely to limit the volume and speed of data transmission.... Battery technology needs to improve significantly to allow services that are permanently active.” *Third-generation jitters*, *Financial Times* (London Ed. 1) (November 24, 2000).

phones, especially if there is strong consumer acceptance of the latter.³² Nicholas Negroponte concluded that “3G isn’t good enough. And it isn’t good enough in the context of GPRS. When GPRS comes on line, people will have 64 kbps and they are going to love it. People are going to say ‘Wow. GPRS is really great!’ Which will lead them to ask the question about 3G: ‘What is so much better than GPRS?’ 3G is not good enough, and I believe it will not see the light of day.”³³

In view of these doubts, the FCC must require proponents of 3G mobile services to demonstrate that existing and future demand justifies the additional spectrum they seek. Given that both providers and consumers are showing doubt about 3G services, proponents should be required to articulate the extent to which their demand projections, and their service plans, really amount to little more than a desire to provide more mobile voice service. Proponents should be required to state their commitment, on any new spectrum, to activate the sort of advanced systems that they claim justify the drive toward vast new spectrum allocations.³⁴ Under any

³¹ See *Morgan Stanley* at 55.

³² *Even More Uncertainty for 3G Wireless*, Precursor Group (October 10, 2000). Morgan Stanley Dean Witter believes that GPRS phones will become ubiquitous by 2003 so that it “may be hard to justify an upgrade to a 3G phone. The applications we associate with 3G that could drive that upgrade tend to focus on video streaming, but these are very bandwidth hungry. . . . Ultimately, we are not sure that consumers really want these kinds of applications.” *Morgan Stanley* at 56.

³³ Eugene Lacey, *Negroponte: ‘3G will not see the light of day,’* (September 14, 2000) available at <http://www.zdnet.co.uk/news/2000/36/ns-17861.html>.

³⁴ We note in this respect that, in ¶ 33 of the NPRM, the FCC states it is not proposing to reserve any spectrum exclusively for advanced wireless systems, much less for 3G mobile systems, making additional spectrum available generally for mobile and fixed use as proposed in the *Policy Statement*, 14 FCC Rcd 19868 (1999). Thus, new spectrum could (and indeed might likely) be used for traditional voice services, and thereby the allocation would not provide the purported benefits of 3G technology that have been so thoroughly touted in some quarters. The “big carriers” will use 3G spectrum “to make more voice calls rather than dedicating the spectrum to high-speed data” because it provides the carriers with a “clearer revenue source”

other conditions, a reallocation of spectrum that displaces existing users would constitute a naked spectrum grab for traditional mobile spectrum, benefiting one class of existing communications providers at the expense of others.

Moreover, proponents of 3G mobile services must be required to show in detail why, if they and other incumbent mobile providers in the United States were to transition their existing First Generation and Second Generation systems to more efficient technologies, they would still need additional spectrum for purposes of providing 3G services. Fundamental fairness requires that, before any party can stand before the FCC seeking to take away another's valuable spectrum, the proponent first must show that it cannot accomplish its legitimate, stated goals using spectrum already available to it. Any claims by 3G proponents that a transition of 1G and 2G systems to 3G is either unnecessary or unworkable must be viewed with extreme skepticism by the FCC, given that major players in the U.S. mobile industry are now on record as believing they can implement 3G services in their existing spectrum bands.³⁵

Finally, if proponents of 3G can show that demand for 3G justifies additional spectrum, and that mobile providers cannot meet that demand by upgrading existing 1G and 2G systems, they should look first to additional spectrum that the FCC is already identifying and making available for advanced mobile and fixed services.

In ¶ 34 of the NPRM, the FCC notes that approximately 70 MHz of spectrum that has already been allocated for mobile and fixed services and could be used to deploy advanced

enabling them to offer “more voice minutes under a flat rate plan than a competitor. . . .” See *supra* note 28.

³⁵ See David Pringle & Davin J. Delaney, *Next Generation of Cellphones Becomes Murky*, Wall St. J., Feb. 21, 2001, at B1 (“Mr. [Oliver] Valenti, [Sprint PCS’s chief technology officer], says Sprint already owns enough spectrum to deploy 3G . . .”); *Docomo Bolsters AT&T Wireless Data*

wireless systems, and that such spectrum has yet to be auctioned in many parts of the country. Approximately 40 MHz is in the 1850-1910 and 1930-1990 MHz bands, currently used by cellular, SMR and PCS services, and approximately 30 MHz is in the 746-806 MHz band, which was recently reallocated for fixed and mobile services.

In ¶ 41 of the NPRM, the FCC proposes that the 1710-1755 MHz band be allocated for mobile and fixed services, allowing this 45 MHz of additional spectrum to be used for the introduction of new advanced systems, including 3G systems. This is spectrum that NTIA has already identified for transfer to the FCC for private use, effective in 2004.

In ¶ 50 of the NPRM, the FCC notes that the 2110-2150 MHz band has been required by Congress to be reallocated to private use and assignment by competitive bidding by September 30, 2002. The FCC proposes that the 2110-2150 MHz band, plus 2160-2165 MHz,³⁶ a total of 45 MHz of spectrum, be designated for the provision of advanced mobile and fixed communications services as well, under which such spectrum would be available for 3G services.

Thus, in the bands currently allocated for mobile or proposed to allocated for fixed and mobile services and identified for assignment by competitive bidding over the next several years, the FCC has identified 160 MHz of new spectrum that could be used for 3G. This includes 70 MHz in the 700 MHz and PCS bands, 45 MHz in the 1.7 GHz band, and 45 MHz in the 2.1 GHz

Plans, Communications Daily Vol. 20, No. 232 (Dec. 1, 2000) at 5 (“No new spectrum is needed [for AT&T] to get full-blown 3rd generation wireless services in most markets”).

³⁶ In the top – 50 U.S. markets, the 2160-2162 segment is used for MDS Channel 2 (2156-2162 MHz). Given that MDS Channels 1 (2150-2156 MHz), 2 (2156-2162 MHz) and 2A (2156-2160 MHz) are used as the initial upstream frequencies and therefore are critical components of the fixed two-way wireless systems now being rolled out by ITFS and MDS licensees across the country, NIA would support using 2160-2162 MHz for 3g only in those areas outside the top 50 markets.

band. This 160 MHz, the very same amount of spectrum claimed to be necessary by proponents of 3G mobile, is available without having to disrupt and relocate any other existing users, either in the government band at 1755-1850 MHz or the ITFS/MMDS band at 2500-2690 MHz. NIA believes and urges that there is no basis for any claim that even more spectrum is required.

II. If Additional Spectrum Is Required Beyond the Now Proposed 160 MHz, the Spectrum Needs to be Found Elsewhere than 2500-2690 MHz

In the event (believed by NIA to be extremely unlikely) that proponents of 3G mobile can prove facts justifying allocation of spectrum in the United States for mobile services in excess of the 160 MHz that the FCC has already proposed in the NPRM, the additional spectrum must be found in bands other than 2500-2690 MHz.

Although NIA is reluctant to point to any other incumbent's spectrum, just as it is unwilling to sacrifice its own, NIA is compelled to point out that, for good reasons, the 1755-1850 MHz band is a better alternative for additional 3G mobile spectrum than the 2500-2690 MHz band. The reasons are clear: the 1755-1850 MHz band is immediately adjacent to 45 MHz in the 1710-1755 MHz band already proposed to be reallocated for fixed and mobile services and scheduled to be auctioned. The 1755-1850 MHz band is a better alternative for reasons of international coordination of frequencies for roaming, given the likelihood that Canada, Mexico and other nations of the Western Hemisphere will choose the 1.7 GHz band for 3G mobile services.

With respect to the international roaming issue, NIA points out that the U.S. can expect far more 3G roaming traffic from its closest Western Hemisphere neighbors than from Europe or Asia, and that it therefore makes more sense to coordinate 3G spectrum in this hemisphere, even if there is a decision by some nations in Europe or Asia to use the 2.5 GHz band for 3G. For

example, travel statistics issued by the U.S. Department of Commerce for 1999 show that, when U.S. residents travel abroad, they overwhelmingly travel to Canada and Mexico, and not Europe or Asia. Nearly 60% of all foreign trips are to Canada and Mexico, with only 22% to the United Kingdom, France, Italy, the Netherlands and Spain combined. Trips to Asian nations of Japan, Hong Kong, Korea, China and Taiwan amount to less than 7% of trips of U.S. residents.³⁷ Similarly, approximately 49% of all trips inbound to the U.S. by foreign residents in 1998 were from Canada and Mexico.³⁸ Foreign trade statistics reinforce the reality that the U.S.'s international interactions strongly lean toward its neighbors in Canada and Mexico. Canada and Mexico are the U.S.'s number one and two trading partners, generating \$562 billion in trade during 1999, 34% of the U.S.'s total foreign trade value. Germany, United Kingdom and France, the only European countries in the top 10 trading partners of the U.S., generated only a combined \$204 billion in trade (12.3%). The top five Asian countries, Japan, China, Taiwan, Korea and Singapore, combined, generated \$426 billion (less than 26%).³⁹ Frankly, given these statistics, it's difficult to understand why 3G mobile proponents would *want* to have the U.S. allocate frequencies other than those contemplated by Canada and Mexico.

³⁷ Out of a total of 58,358,000 foreign trips in 1999, U.S. residents took 17,743,000 trips to Mexico and 16,036,000 trips to Canada. The totals to the European countries noted above were 12,657,000, and those to the Asian countries noted above were 3,884,000. See U.S. Department of Commerce, ITA, Tourism Industries, October, 2000, *available at* http://tinet.ita.doc.gov/outreachpages/outbound.general_information.outbound_overview.html.

³⁸ Out of a total of 46,395,000 trips by international travelers to the United States in 1998 (the latest year available), 13,422,000 were from Canada and 9,276,000 were from Mexico. See U.S. Department of Commerce, ITA, Tourism Industries, May, 1999, *available at* http://tinet.ita.doc.gov/outreachpages/inbound.general_information.inbound_overview.html?ti_cookie=20010221.131608.00914.

³⁹ U.S. Department of Commerce, ITA, United States Foreign Trade Highlights, September, 2000, *available at* <http://www.ita.doc.gov/td/industry/otea/usfth/aggregate/H99t09.txt>.

III. In any “Head to Head” Comparison Between ITFS/MMDS and 3G Mobile for the 2500-2690 MHz Band, ITFS/MMDS Must Be Favored

In the unlikely and unfortunate event that the only way additional spectrum can be found for 3G mobile is by having ITFS/MMDS give up some or all of the 2500-2690 MHz band, it is clear that the FCC should prefer ITFS/MMDS services over 3G mobile services, and that no spectrum in the 2500-2690 MHz band should be reallocated. The entire 2500-2690 MHz band is needed for the provision of fixed wireless broadband services, which are more important to the United States than additional cell phones, even if those cell phones can receive low-bit rate 3G data streams. This is an issue of broadband vs. narrowband, of bridging the digital divide vs. receiving stock quotes or ordering pizza on cell phones.⁴⁰

Initially, NIA points out that 3G mobile is *not* broadband. Despite claims by some of its proponents, the FCC’s own *Interim Report*,⁴¹ at 6, makes clear that 3G mobile system standards contemplate bit rates of 144 kbps for vehicular traffic, and 384 kbps for pedestrian traffic, which is not broadband. Moreover, as noted above, industry observers suggest that actual data rates will be much less, little more than rates now achievable over telephone lines.⁴² Further, the FCC does not intend to require new spectrum made available in this proceeding to be used for 3G or broadband services. Given studies suggesting that consumers are not excited by the prospects of

⁴⁰ “In South Korea, women can use their cell phones to calculate their ovulation cycles. In Britain, the user of a mobile phone can book restaurant reservations by laboriously linking to a Web site by typing on the phone’s keypad (even though it would probably be faster to call the restaurant). And in Finland, . . . consumers can use phones for such edge-of-the envelope experiences as buying a soft drink from a vending machine.” *See supra* note 25.

⁴¹ FCC Staff, *Interim Report on Spectrum Study of the 2500-2690 MHz Band: The Potential for Accommodating Third Generation Mobile Systems* 6 (ET Docket No. 00-232, DA 00-2583, Nov. 15, 2000).

⁴² *See supra* note 28.

3G services, any bands made available for mobile services will likely not be used for anything more than traditional voice telephone service, perhaps with ancillary low bit-rate data capabilities. More spectrum should not be made available for these purposes at the expense of the educational and fixed wireless broadband services that ITFS and MMDS licensees, in partnership with their commercial providers, will increasingly deliver in the 2500-2690 MHz band.

The United States needs wireless broadband services being rolled out by ITFS/MMDS. As noted above, the education of our country's students, from K-12, through higher education, and most particularly including working adults, increasingly requires access to broadband services. Fixed wireless broadband will advance U.S. technological leadership, support U.S. industry and commerce, and it requires no new or speculative migration path – the rules, technology, capital, players and spectrum (2500-2690 MHz) are in place.

There is a Digital Divide in the United States. On the education side, the Web-Based Education Commission concluded that “[i]n the final analysis, if the Internet is to raise the quality of education for some of our nation's learners, it should do so for all.”⁴³ Accordingly, one of the key legs of the Web-Based Education Commission's “e-learning agenda” for the country is a call on federal and state governments to make extension of broadband access to all students and learners a primary national telecommunications policy goal. “We urge . . . a policy framework that will help accelerate broadband deployment in education quickly and effectively

⁴³ *Web-Based Comm'n Report* at 30.

. . . at our nation's educational institutions, particularly for those communities of learners on the other side of the 'Digital Divide.'"⁴⁴

More broadly, there are tens of millions of persons in rural and insular urban and suburban areas that cannot obtain broadband services, regardless of whether they could "afford" them. Terrestrial landline facilities – principally cable modems and DSL lines, do not and will not in any reasonable future time frame provide broadband in all these areas. Fixed wireless broadband by ITFS and MMDS can provide that service, thereby bridging the Digital Divide.⁴⁵ Moreover, competition from ITFS/MMDS-based fixed wireless broadband in areas where cable modems and DSL exist should result in lower prices for broadband services, thereby making them more readily available to all.

For the reasons noted in the previous paragraph, the services being rolled out by ITFS and MMDS in the 2500-2690 MHz band cannot be replicated by landline facilities. No one foresees that cable or DSL will be ubiquitously available throughout the United States in any reasonable future time frame, and bringing broadband services to students and workers in their schools, homes and places of employment is the essence of what ITFS and MMDS licensees, in partnership with their commercial providers, are beginning to provide.

⁴⁴ *Id.* at 129. "But digital inclusion must work wherever the learner and learning opportunities come together—at home, at school, and on the college campus." *Web-Based Comm'n Report* at 25.

⁴⁵ Fixed wireless subscribers are expected to increase from 200,000 today to 9.4 million by 2005. "Geographic limitations plaguing DSL and cable, along with lengthy installation times, are giving ISPs the foresight to look into fixed wireless. In addition to the geographic restrictions DSL and cable contend with, the two high-speed technologies also are at the mercy of existing wiring in buildings subject to whatever exterior forces affect those wires." *ISP Business News, Fixed Wireless May Sate ISP Hunger* (Feb. 8, 2001), available at <http://www.telecomdirect.pwcglobal.com/telecom/> (excerpted from the Feb. 5, 2001 issue of *Communications Today*), or search site using title.

Finally, neither the FCC nor any party has suggested any alternative spectrum band that would accommodate relocation of ITFS and MMDS and allow the replication of licensing structures and service capabilities of the 2500-2690 MHz band and continuation of the ITFS/MMDS shared network. With respect to licensing structures, any replacement band would need to be able to accommodate multiple transmission channels for multiple licensees, including licensees that currently co-exist on co-channels and adjacent channels in the same areas.⁴⁶ To a significant degree, replication of the number, locations and service areas of existing licensees could only be possible in a band offering similar technical characteristics. In addition, any replacement band would have to have propagation characteristics similar enough to those in the 2500-2690 MHz band, thus allowing ITFS/MMDS transmissions to provide wide-area service on an economically viable basis.

Given the complete lack of identified, viable alternative bands for relocation of ITFS/MMDS, NIA is incapable of responding in any manner to ¶ 65 of the NPRM, in which the FCC seeks information about alternative bands, relocation procedures or costs. These questions are impossible to answer without knowing what bands are being considered, and no alternative bands appear to exist that could accommodate ITFS/MMDS licensees and their shared-system partners, regardless of relocation procedures or the costs.

IV. Any Reallocation of Spectrum from 2500-2690 MHz Band Would Be Devastating to Individual Licensees and End the Rollout of Fixed Wireless Broadband Services

⁴⁶ There are 20 ITFS channels in the 2500-2690 MHz band, often licensed in interleaved groups of four channels per license. However, any scheme that somehow accommodated only 5 licensees in any given area would not replicate the complexity of the existing structure, as many areas have more, sometimes many more, than 5 licensees, either because some licensees have as few as one channel, or because, over the years, transmission patterns have developed allowing more than one licensee to provide service over a given channel in a metropolitan area.

In ¶ 69 of the NPRM, and in the *Interim Report*, at 56-62, the FCC considers possible band segmentation plans for the 2500-2690 MHz band. The NPRM reflects an “Option 3” whereby 45 MHz at 2110-2150/2160-2165 MHz would be paired with 45 MHz reallocated from 2500-2690 MHz. Although the NPRM does not suggest where in the 2500-2690 MHz band the paired 45 MHz would come from, the *Interim Report* contemplated several basic possibilities—taking segments from the bottom of the band, the top of the band, and/or the middle of the band.⁴⁷

Any of these segmentation options for the 2500-2690 MHz band are completely unacceptable to the NIA. Each of them would terminate the operations of numerous individual educators and effectively destroy both ITFS and the prospect of fixed wireless broadband in the United States.

The FCC has correctly stated in the NPRM, at ¶ 61, that “MDS and ITFS spectrum use is an amalgam of different channels and geographic boundaries that vary from location to location,” making a segmentation approach exceptionally complicated. That is certainly true. For example, reallocating the bottom 45 MHz of the band would wipe out all channels in the four-channel ITFS A group, as well as 3 ½ channels of the interleaved four-channel B group. (Indeed, if the segmentation plan contemplates a 6 MHz guard band, all of Channel B4 and ½ of Channel C1 would also be lost.) This would result in the elimination of all licenses on the A and B channel groups. Based on the FCC’s database, NIA has counted 516 ITFS stations (22% of

⁴⁷ *Web-Based Comm’n Report* at 56-62. The segmentation proposals in the *Interim Report* each contemplated that 90 MHz of the 2500-2690 MHz band would be considered for reallocation for 3G. *See id.* The NPRM has backed the 3G segment size down to 45 MHz. *NPRM* at ¶ 68. As shown in these comments, the loss of even 45 MHz would be devastating to ITFS licensees, education and the rollout of wireless broadband services. Obviously, any of the segmentation plans in the *Interim Report* are even more problematic.

all ITFS stations) on the A group and 461 stations (19% of all ITFS stations) on the B group. Thus, a substantial number of all ITFS stations -- about 41% of all licensed ITFS stations -- plus their respective receive sites and learners, would be directly and adversely affected by the reallocation of ITFS spectrum.⁴⁸ This is not a case of some large, nationwide licensee suffering some substantial yet survivable diminution in its overall transmission capacity. This would “kill” over 40 % of the educational ITFS operations of school districts, community colleges, universities, state and local governmental entities and community-based nonprofit organizations across the United States.

While fewer ITFS stations would be affected by segmenting the top of the 2500-2690 MHz band (459 stations, 21% of ITFS stations, are on the G group),⁴⁹ channelization plans being implemented by broadband wireless operators in the 2500-2690 MHz band consistently require use of the interleaved A and B Channel Groups and/or the interleaved G ITFS Group and MMDS Channel H1, H2 and H3 as “upstream” capacity, to be combined with downstream capacity on the other groups. The use of the “ends” of the 2500-2690 MHz band in this manner facilitates the frequency separation necessary to roll out two-way broadband data service on an interference-free basis where there are substantial and pervasive incumbent one-way operations (which, in most system plans, will be consolidated by private agreement to the C, D E and F groups along with downstream data transmissions). Taking more than half of the upstream

⁴⁸ There are also 459 ITFS stations on the C group, which also would be affected by the loss of C1 to a guard band. Thus, potentially, the 45 MHz segmentation plan at the low end of the band would adversely affect 60% of ITFS stations.

⁴⁹ A top-end segmentation plan would also wipe out the 125 kHz response I channels in 2686-2690 MHz associated with each ITFS channel, and used by a number of ITFS licensees for return audio paths from their receive sites. NIA does not have specific numbers for I band users, but some ITFS licensees rely heavily on I band response stations.

capacity (as well as over 40% of the entire ITFS band) for 3G would do severe damage not only to existing operations over the country, but to the rollout of wireless broadband data services.

Wireless broadband system operators have made clear to ITFS licensees that, if any portion of the 2500-2690 MHz band is reallocated for 3G mobile services, their fundamental technical and business plans for the provision of fixed wireless broadband services in the band will be so seriously compromised that the rollout of such services will come to an end. Without the support of these system operators, even ITFS licensees whose spectrum is not taken (those in the band segments retained for ITFS) will lose technical, operational and financial support for their educational operations.

Thus, taking any of the 2500-2690 MHz band, as contemplated in the FCC's segmentation options, will result in the near total loss of the educational value provided by ITFS, as described earlier in these comments, and of the commercial and public value of fixed wireless broadband services.

V. NIA Does Not Support Adding a Mobile Allocation in the 2500-2690 MHz Band

In ¶ 64 of the NPRM, the FCC invites comments on the public interest costs and benefits of adding a mobile allocation to the 2500-2690 MHz band without any mandatory relocation. The FCC's notion is that the FCC might thereby facilitate a secondary market in the band to allow it to evolve to its highest valued use, whether that use is fixed broadband, mobile allocations or some other use.

NIA does *not* support adding a mobile allocation to the 2500-2690 MHz band, even if there is no mandatory reallocation. NIA believes that the FCC correctly suggested, in the *Interim Report*, that mobile services cannot share this spectrum with the ubiquitous fixed service

operations in the band. Thus, any addition of a mobile allocation would likely be of little consequence, as fixed services would continue to be offered rather than mobile services.

More importantly, NIA does not believe that it is in the interest of ITFS licensees, educators, students, adult learners, the general public seeking broadband access, or even the United States economy, to facilitate any attempt to substitute mobile services for fixed wireless broadband and educational video services that are now being deployed in the 2500-2690 MHz band. Even the regulatory or business uncertainty or delay caused by the mere addition of a mobile allocation to the 2500-2690 MHz band, and the inevitable resulting push to adopt new rules accommodating mobile use, would be contrary to the public interest.

Conclusion

The educational community represented by the National ITFS Association states its unequivocal objection to having any portion of the 2500-2690 MHz band re-allocated to mobile or any other service.

Respectfully submitted,

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Amarillo Independent School District

Summary. The Amarillo Independent School District, an applicant for an ITFS license, is an excellent example of a school district seeking to leverage the ITFS spectrum to balance the need for educational technology against the high costs associated with that technology. In keeping with the latest findings that integrating web-based instruction in K-12 programs is crucial to prepare students for university-level instruction, the District has aggressively moved to make Internet access universally available in its schools. In conjunction with their commercial partner, Amarillo plans to use its ITFS license, when approved, to bring broadband capabilities to its current network and enhance its curriculum through teacher training and two-way teleconferencing capabilities. A commercial partnership gives the school district the technical support to make broadband a reality, as well as extra revenues to pursue the district's ambitious technology goals.

The Internet: An Essential Learning Tool. The importance of the Internet in the classroom cannot be underestimated; the Report of the Web-Based Education Commission to the President and the Congress of the United States found that the ability to use the Internet is an essential skill if students plan to pursue a College education. The Amarillo Schools have met the challenge by building a Wide Area Network (WAN) that links forty-nine campuses and several office locations. This network provides every one of its almost 30,000 students with Internet access. The District also transfers educational content electronically between schools and other educational resources. In addition, parental involvement, a key variable to school success, has increased substantially through the use of e-mail. The success of the WAN has been so enormous that the Amarillo school system needs to expand bandwidth; demands for use will continue to escalate as new applications are implemented.

ITFS to the Rescue. Recognizing that its needs are now greater than the WAN can meet, the District has turned to the ITFS spectrum to expand its capabilities. The District plans to use ITFS to give its schools additional broadband Internet access. In addition to enhanced Internet capabilities, the District plans to use the two-way capabilities to augment the current classroom instruction, offering a wide range of classroom programming to students. Furthermore, they anticipate a reduction in administration costs using ITFS. Teachers will have access to continuing education courses on the ITFS system, enhancing pedagogical skills while also allowing teachers to stay in the classroom, providing students with greater continuity and higher quality education. Teleconferencing will enhance the district's efficiency, allowing the superintendent to meet with principals without wasted travel time, and Internet telephony should reduce the District's telephone bills.

The broadband system is already in the process of being tested, thanks in part to agreements already in place between Nucentrix Broadband Networks and other ITFS licensees in the area. District technology personnel have been a key part of Nucentrix's beta testing, and are excited about the possibilities of bringing this broadband technology

into Amarillo's classrooms. Furthermore, in a community where DSL and cable modems are not universally available, Nucentrix will be offering the public high-speed Internet access and providing much-needed competition to keep broadband costs down for consumers. In addition to making broadband Internet access available to the public, this service will also allow home-bound students to participate in their classes from home and to be a part of the larger learning experience, as well as permitting teachers to tap into the rich multimedia educational content on the Internet.

Making the System Self-Financing. The District is currently exploring an ITFS-based partnership with Nucentrix Broadband Networks. Nucentrix would lease space on the ITFS spectrum from the District, providing a revenue stream capable of funding increased access and implementing additional technologies for the District without further burdening the community financially.

Arizona State University

Summary. Thanks to ITFS, Arizona State University has been able to meet the diverse educational needs of its local booming community. A local Native American school district has used ITFS to train teachers on the Internet, private industry uses ITFS classes to refine workers' skills, and 45,000 students – one of the largest full time student bodies in the country—benefit from the flexibility of ITFS distance learning classes. A partnership with Sprint Wireless Broadband Group has generated substantial revenues for this extensive program, improved the technology available to students, and given members of the Arizona State University community broadband Internet access at low prices. The connectivity afforded by this high-speed Internet access helps to keep this diverse community together.

Reaching the Indian Children with the Internet and Training. Three years ago, ITFS began offering opportunities to the isolated schools of the Gila River Indian Community, located forty miles (and an entire world) from Arizona State's main campus in Tempe. Without ITFS, the 25 teachers spread across the vast community could not receive courses designed to train them on how to apply the Internet to their classroom. Using equipment and free wireless cable services donated by Sprint Wireless Broadband Group (formerly People's Choice TV) these teachers are entering the digital age and bringing their students with them. The importance of the Internet in the classroom cannot be underestimated; the Report of the Web-Based Education Commission to the President and the Congress of the United States found that the ability to use the Internet is an essential skill if students plan to seek a university education. ITFS programs like this are essential to bringing new opportunities to these desperately underserved communities where traditional wired broadband remains a pipedream.

Serving a Growing Community. 45,000 students are enrolled at Arizona State's Tempe campus, and more attend classes at additional campuses and remote locations. Over 7,400 students are enrolled in the 239 ITFS-based classes, of which 70% are full time students. The flexibility of being able to take classes via the broadband Internet system or at fixed locations via the digital network makes these courses available to a varied spectrum of students.

In addition, Arizona State University anticipates that ITFS is going to be key to its ability to meet the growing educational needs of the expanding local population. College enrollment throughout the state has been growing substantially in recent years, and between 2000 and 2020 enrollments are expected to jump an incredible 48%. In light of limited budgets and space, this kind of educational pressure will certainly require that the University leverage its ITFS capacity to serve as many students as possible.

Responding to Industry's Needs. A number of companies also make use of ASU's ITFS system. Motorola, for example, has been extremely satisfied with using Arizona State's ITFS courses to train its employees. Over 500 of its engineers have participated

in “e-learning” classes made possible by ITFS; these engineers find the classes essential to keeping their skill set current in the fast-paced world of technology.

Bringing Broadband to the Community. Sprint Wireless Broadband Group has partnered with ASU to provide the ITFS-based services. In exchange for extensive technical and financial support, Sprint Wireless Broadband Group leases some of the spectrum from ASU to provide broadband Internet services to the community. As part of the leasing arrangement, students, faculty, and staff of ASU are able to subscribe to high-speed services at a discount. This gives students, faculty, and staff high-speed access to the resources of the University from home as well as on campus. In addition, broadband services are available to residents throughout the community, including many borderline rural areas. These areas are getting their first broadband access options through Sprint Wireless Broadband Group’s high-speed ITFS-based service.

Austin Community College

Equal Educational Opportunity. Austin cherishes its reputation as “the most educated city” in the United States. Residents routinely seek adult education to improve their professional status or obtain advanced degrees. These adult students require scheduling flexibility, ease of availability, and course diversity and many schools have responded to their requirements. However, the cost of attending many of these colleges is prohibitive for the poorest students, and Austin Community College (ACC) has responded to their needs through ITFS. Each semester, ACC’s distance learning program gives over 4,000 students access to over 135 courses via ITFS, cable television and the Internet, giving this underserved population access to the education it requires to succeed in today’s economy.

Affordable Education Through ITFS. Austin Community College provides the most cost-effective education in the area, meeting the unique demands of urban residents through a variety of course options that extend beyond the traditional classroom setting. ITFS is one of the technologies used to provide this flexible approach to education; over 2,000 students per semester to attend classes by watching programs on their cable television systems. An arrangement with Nucentrix Broadband Networks, a wireless provider, provides students with educational programming 24/7 with 37 different courses offered. Students may record their courses to “attend” at their convenience or review the material by watching the class again, responding to today’s overriding need for flexibility in education.

Many Austin Community College courses are state approved Core Curriculum courses, for which up to 42 credits may be transferred to any other Texas institution. In addition, the college provides “workforce education” classes. These classes lead to more than 140 certificates and Associate of Applied Science degrees in more than seventy occupational and academic areas. According to Mary Lou Cummings, Director of ACC’s distance learning program “connecting students to college courses using cable television is a way to make the most affordable college education even more affordable to all Austin residents.”

ACC also uses its ITFS system to post campus information, class schedules, and other important student information. In addition, ACC downlinks from satellite resources supplemental programming for individual classes or broadcasts community building special events from its campus.

Meeting a Wide Variety of Needs. Austin Community College serves a diverse population through its ITFS-based system; single parents, the disabled, workers, and those with limited transportation options are all granted access to higher education thanks to ITFS. In addition, high school students may enroll at the college while still in high school and take college courses from their high school classrooms, earning college credit while keeping engaged and challenged.

Partnering with the Private Sector for Affordable Education. Recognizing the need for higher education, Nucentrix Broadband Networks is an active proponent of education in Austin and other central U.S. urban areas. As the result of an agreement between Nucentrix Broadband Networks and Austin Community College, Nucentrix Broadband Networks is able to utilize ACC's excess capacity on the ITFS system to provide both a wireless cable TV service and wireless broadband to customers in the Austin area. ACC uses the fees from Nucentrix to support its dynamic and growing distance learning project.

California State University, Long Beach

Summary. Through ITFS, exceptional civil servants in California receive the training they need to ensure high-quality public administration. Cal State Long Beach's Masters in Public Administration has trained a broad range of civic leaders throughout the state, from local city administrators to state transportation officials, contributing to improved services in essential areas. These talented public servants have been able to hone their administrative skills even as they work, thanks to the convenience and flexibility offered by ITFS. In addition, ITFS broadcasts provide a valuable forum for communication between the University and the community in which it resides.

A Community University With a Long Reach. California State University at Long Beach—also known as Cal State Long Beach—is largely a commuter campus, serving 30,000 full and part time students. ITFS is a critical part of the University's mission to deliver educational opportunities to this large area. Recognizing the need to give exceptional civil servants the training they needed to provide top-notch public services, Cal State Long Beach, several municipalities, and other agencies together developed a Masters in Public Administration (MPA) program. Each year approximately thirty to fifty local government workers and civil servants attend courses from their work place or other conveniently located sites. Current "rising stars" at the Police Department, the Orange County Department of Transportation, and several mayors' offices were all students of the MPA program.

In fact, ITFS has extended the reach of this powerful educational resource beyond Orange County. Cal State Long Beach, in partnership with CALNET (an ITFS-based network), is now providing its MPA programming throughout Southern California. This expanded reach creates the kind of student critical mass necessary to attract top instructors in public administration. "It is professionally rewarding to provide course content that is such an asset to the communities as well as to the individual student," said Mat Kaplan, Director of Technology and Distance Learning for University College and Extension Services at the University.

Providing Training to the Public and Private Sector. In addition to producing and transmitting the MPA programming, students and administrators on campus broadcast training seminars and conferences for corporations and government agencies using the University's ITFS capacity. Cal State Long Beach regularly creates programs for McGraw-Hill Publishing and the Department of Justice's National Institute of Corrections, often reaching more than 1,000 training sites and over 10,000 trainees statewide.

Enhancing Town-Gown Relations. Cal State Long Beach's ITFS system also carries programming for residents of Long Beach and nearby communities 24 hours a day, 7 days a week. University President Robert Maxson believes that, "the technology that accompanies our ITFS bandwidth has benefited our campus and our community in

numerous ways. Along with the distance learning opportunities we are able to provide by utilizing this bandwidth, we offer a weekly program, called Beach View, that is broadcast through large areas of the greater Long Beach/Los Angeles area. Our topics are meant for general audiences and have covered everything from helping children succeed in school to ways seniors can prevent osteoporosis to the Southland's heritage, languages and cultures.”

Corporate Contributions to Community Education. The ITFS capacity used by Cal State Long Beach more than doubled when the University began sharing the spectrum with a commercial partner, then a subsidiary of Pacific Bell. In exchange for some capacity, Pacific Bell implemented digital technology transmission, installing new equipment on campus and at receive sites. The digital conversion has allowed Cal State Long Beach to double its ITFS programming while still freeing up excess capacity to share with its successor corporate partner, WorldCom Broadband Solutions, in order to support both the distance education program and community outreach efforts.

California State University, Fullerton

Summary. Using its reliable, flexible and cost-effective ITFS system, California State University at Fullerton (CSUF) trains teachers and nurses during a time of shortage, gives educational opportunities to a diverse and dispersed community of learners, and delivers courses to corporate sites to help workers stay competitive. Since 1986, a network of five ITFS channels have been the backbone of Cal State Fullerton's outreach to 900 learners a semester in Southern California. In addition, ITFS programming is available on the region's cable companies, providing enriching cultural programming 24 hours a day.

The elimination of ITFS would severely hamper CSUF's ability to achieve its goal of bringing educational opportunities to a diverse community of learners. In addition, it would cause the loss of almost \$4 million invested in equipment and technical expertise; require an expensive reinvestment in new technologies; end a substantial revenue stream used to support distance learning; and create enormous disruptions in classes available to students.

Distance Learning for Credit and Career Development. CSUF is largely a commuter college, and runs several satellite campuses. Students at these off-campus sites rely on ITFS-delivered courses to complete degree program requirements in such areas as engineering, communication, nursing, business, history, religion, and more. Professionals at area corporate locations, such as Boeing and Raytheon, participate in timely training opportunities and learn important job skills essential to keep these workers competitive.

The following are just a few examples of special programs offered by CSUF that have targeted the unique needs of specific populations in southern California:

- In-service training for K-12 teachers at their schools with necessary continuing education course work for their credentials. ITFS courses cut down on substitute time, easing the burden on already strained local school budgets.
- Early college course enrollment for high school students provided at their high school locations.
- Course enrollment at military facilities for staff improvement.
- Advanced Engineering course work delivered to industrial sites throughout Southern California
- ESL courses delivered to schools, adult education facilities, and work places.

ITFS: Making Distance Learning Cost Effective. The current ITFS system is the only practical and cost effective way for CSUF to deliver valuable and timely educational programs throughout Southern California. Sites can be set up quickly, with relatively little cost compared to competing technologies. For example, a new, non-university, codec site would cost nearly \$40,000 for equipment and connectivity to the network, and additional annual costs of approximately \$18,000 for fiber connectivity. On the other hand, with ITFS, there is a one-time installation cost of \$2,300 with no annual fees. As a

result, CSUF is able to respond flexibly and promptly to changing learning requirements, offering engineering courses at an industrial site one semester and nursing courses at a hospital the next. This flexibility is a key component of CSUF's plans to keep up with the face of change in Southern California's economy.

An Investment in Education. Cal State Fullerton stands to lose almost \$4 million invested in its current ITFS system if it loses its license. These monies have been used to build and equip television classrooms, a television studio, network operations center, and to pay for thousands of hours of expert labor. If ITFS technology were no longer available CSUF would have to suspend delivery of credit courses, rebuild classrooms to accommodate other means of delivery, expand landline network capabilities, and make major investments in training and development. Local businesses that rely on the ITFS network would also be hit with significant costs. Also, CSUF gets a substantial revenue stream from leasing its excess ITFS capacity to Worldcom Broadband Solutions. That revenue directly supports the development and maintenance of distance learning programs and allows CSUF to continue to expand and bring its unique resources to an ever-growing community of learners.

A Dynamic, Expanding Program. The university is currently planning several additional off-campus sites and new distance education programs, all of which will utilize ITFS for course delivery. For example, because of an alarming shortage of nurses, the Cal State Fullerton Nursing program is expanding its degree programs in southern California to meet the direct needs of the community. ITFS will provide healthcare organizations the opportunity to become part of our delivery network immediately, at low cost, to take advantage of this timely and essential program.

California State University, Sacramento

Summary. California State University Sacramento (CSUS) has a model ITFS system, providing 4 channels of educational programming 24 hours a day, 365 days a year in association with a consortium of local school districts, junior colleges, and universities. ITFS courses also are aired on local and regional cable television systems as a part of the basic cable programming package, providing continuing education to the general population. In addition, CSUS is working with a commercial partner to make wireless broadband available throughout the Sacramento area, and expects to have a fully two-way system available in Spring 2002.

Serving a Large, Diverse Community. CSUS is one of the flagship institutions of the California State University system, a group of 23 state universities located throughout California, providing educational opportunities to over 375,000 students. CSUS, with a student body of over 27,000, serves the state capital and surrounding areas, which includes impoverished urban neighborhoods, wealthy suburbs and rural farmlands. The university's commitment to distance and distributed education has spirited an expanded schedule of approximately 60 courses in the 2001/02 academic year. A movement from analog to digital technology in the next year will provide an even greater number of program and course offerings.

As a member of the Sacramento Educational Cable Consortium (SECC), CSUS broadcasts a variety of lifelong learning programs to the local school districts, community colleges and the audiences they serve. In addition, ITFS airs educational programming to a potential audience of 350,000 on local and regional cable television systems, all of whom carry the ITFS signal live. This programming is carried on the least expensive tier of the cable television systems, making it a truly "public" resource.

By broadcasting to this wide network of sites, the ITFS system has expanded the reach of high-quality teaching, and has saved many students from lengthy commutes in a traffic-clogged region, expanding the overall attendance of these otherwise inaccessible classes. The ITFS system also reaches many local businesses, such as Hewlett Packard. This increases the educational opportunities for students who are already in the workforce or cannot easily travel long distances to attend on-campus classes.

Each quarter, several thousand students take courses for credit over the ITFS system, while members of the public also "audit" courses from home. The majority of this programming – 15 hours a day – is classroom-based educational programming, while non-classroom educational programming runs after hours.

Through the ITFS system, high school students are able to take a wide variety of courses not available in their schools, ranging from English as a Second Language (ESL) to American History, Civics, English, GED test preparation, and basic skills. Many of Sacramento's recent immigrants to the United States take advantage of the ESL classes

through adult learning programs. The system also broadcasts a wide range of traditional K-12 programming used by elementary and secondary school students. For example, primary school children will participate in the national “Jason Project,” a program aimed at enhancing environmental awareness through live “field trips” to sensitive coastal areas, access to unique panel discussions, and lectures by top scientists. Cable viewers are able to audit classes, watching at their convenience classes that assist learning, help move people into the information age (e.g., Communications courses focused on the internet and its capabilities), and enrich their lives.

Moving into the Future. Experts agree that high-speed Internet access and two-way transmission significantly enhances distance learning and increases the productivity and effectiveness of both educators and students. To this end, CSUS plans to develop an Intranet and expand its video-based services through digital technology. Working with its commercial partner, CSUS is moving aggressively to bring two-way wireless broadband to students, faculty, and the local community. Although they have not finalized the details of their arrangement with IP Wireless, they expect to be able to provide at least 1,600 of the 2,200 faculty and staff members with minimal cost wireless broadband service into their homes. This will allow them to telecommute to and from campus, develop online resources for students, and instantaneously access information resources available on campus. In addition, CSUS wants to ensure that its students – most of whom live in the surrounding community– will be able to connect to the University and its resources through broadband service. As a result, CSUS is negotiating an arrangement to allow students to purchase wireless broadband access at a reduced rate. These students will be connected directly into CSUS’ backbone network, which will include high-speed webcast versions of many of the classes broadcast via the ITFS system.

In addition to being extremely robust, the technology used in this network will be portable. The wireless modem is smaller than a pack of playing cards, allowing students, faculty, and other subscribers to attach it to a laptop and use it virtually anywhere in the region. Students, faculty, and staff with laptop computers will be able to connect from home, work, and school without significant variations in the quality of service.

Bridging the Digital Divide. CSUS plans to use some of its wireless broadband to also link local school districts and adult learning centers into its “intranet,” thereby giving them greater access to its information resources. Several urban and rural areas in the CSUS region only have limited, if any, access to the Internet. The university plans to develop partnerships with school districts in order to provide them with broadband capability. In areas with no access to DSL, CSUS also plans to give other community organizations, such as libraries and civic-minded businesses, access to wireless broadband in partnership with IP Wireless, demonstrating once again ITFS’ importance as a major resource for community building.

IP Wireless intends to offer an array of wireless services targeting areas that meet the needs of the residential consumer and small business environment. At this point, they

plan to offer service ubiquitously throughout the area – meaning that those neighborhoods that have been bypassed by cable modem and DSL providers (a significant portion of the area) will be able to receive broadband Internet access at home. Although the marketing plan will focus first on those neighborhoods that do not have access, IP Wireless will also compete with cable modem and DSL service in the region. This wireless bridge across the digital divide will be the first (and only) choice for broadband Internet service for many residents and business establishments.

Central Dakota Telecommunications Consortium

Summary. The Central Dakota Telecommunications Consortium (CDTC) has successfully connected students in North Dakota to creative distance learning via a wireless ITFS-based system. In a state where the distances between schools can reach 50 miles, ITFS has proved the only way to connect students and teachers in an efficient and cost-effective manner. The system has been created with an original investment of one million dollars in federal and state grants, and a dismantling of ITFS would not only disconnect the North Dakota population from the access they need, but throw away the hard earned money that went into implementing the system.

A Shortage of Teachers. In the past, North Dakota school districts have found it very difficult to provide students with courses in foreign language, upper division mathematics, psychology, sociology, art, and agriculture. Individual districts were often too small to support a full-time position in these fields, and were forced to cut staff or drop the subjects entirely. ITFS has resolved this problem by allowing districts to “team-up” in hiring full-time teachers and share these talented teachers and provide students access to quality instruction in a number of districts at the same time. Additionally, this technology keeps good teachers teaching in North Dakota, rather than relocating to other areas in search of full-time work.

Better Selection for Students. Hundreds of high school students are now benefiting from enhanced course selection and high quality teacher instruction due to CDTC’s ITFS system. The consortium provides live Spanish and French classes, as well as Advanced Placement classes which otherwise would be impossible to accredit and administer. According to Superintendent Kerwin Borgen, “The very important function the system provides our students is the availability of courses in Art, Vocational Agriculture, Advanced Math, Home Economics and Foreign Languages. The system has worked very well for us.”

Others Who Benefit. Training and coordinating bus drivers for North Dakota’s schools has become easier and more efficient due to ITFS. According to Mr. Borgen, “Our school district has used the interactive system for about three years to train bus drivers. It saves money for both the district and the bus contractors. Our training eliminates the need for them to drive long distances for training (at one central site),” he said.

ITFS In Action. CDTC has established a two-way Interactive Television (ITV) system that transmits live, high quality audio and video between several sites at once. An instructor at the home site can interact and receive questions from students at any of these destinations. Twelve ITFS channels are used two at a time to bring each school district 16 courses daily. An additional three channels are shared with a wireless cable television company called Central Dakota TV, in exchange for the tower space needed to broadcast programming.

The Need Continues. “More often than not, schools in North Dakota are struggling to survive, because many young people are moving out of North Dakota”, said Kathy McCracken, Telecom Coordinator for the consortium. ITFS is needed to provide the quality educational instruction that all students in the state deserve and retain the teachers who have the ability to provide it. Broadband access is usually impossible to implement due to the rural location and small size of individual schools in need of wiring. ITFS solves this problem by wirelessly and economically serving North Dakota.

Chicago Instructional Technology Foundation

Summary. Chicago Instructional Technology Foundation (“CITF”) transmits 80 hours of instructional programming per week to 47 schools serving more than 30,000 students in the Chicago area. Schools include Chicago Public Schools, plus alternative, private and church-affiliated schools. Other less traditional CITF partners include a children's hospital and an after school media resource center. Programming covers core subject areas and is tied to current state and national standards. Additional programming is chosen to correspond to holidays and other nationally recognized events that are often the subject of classroom lessons. There is no charge to participating schools. As a result, students in these schools have access to award-winning instructional programming that would otherwise be beyond the scope of school resources. CITF partners are encouraged to tape offerings to use in the classroom, library and at home. Teachers can make requests to have programs scheduled at convenient times. CITF continuously surveys schools to learn which programs are being utilized, and how they are used. In addition, it encourages teachers to evaluate programs and make requests for programs that relate to curriculum needs. Formal and informal surveys show that its schools utilize programming in a variety of settings and situations.

Extensions. Video programming is augmented by teacher guides, a companion web-site (www.citf.org) and through a variety of seminars, workshops and other opportunities for teacher training. When a school becomes a CITF partner, it qualifies for a variety of offerings including technical assistance, taping assistance, and in-service workshops that preview programming and otherwise explore the use of CITF in the classroom. Sometimes schools with limited resources have qualified for assistance in receiving televisions, video recorders blank tapes and stipends for parents who find time to tape programs to create a video library. In addition CITF schedules an annual seminar where teachers come together to exchange ideas regarding CITF programming. Over the years seminar presentations have included presentations from teachers, librarians and administrators.

Serving The Community. CITF sponsors a Youth Film and Video Festival which honors the work of youth and teenage filmmakers from the Chicago area. Often referred to as the "Teenage Film Festival, this festival, is one of fewer than ten similar events nationwide. Prizes are awarded to approximately 13 films each year. Currently in its sixth year, the festival continues to grow. This year over 100 submissions were received from individuals and groups. Winners will be announced at a daylong film festival, open to the community, held in downtown Chicago. The festival teaches young filmmakers to become critical viewers of film and video while helping them to express themselves. Students from rich and poor Chicago neighborhoods come together to share their mutual interest in filmmaking. CITF is proud to be in the forefront of a national trend to encourage student filmmaking while providing a showcase for films produced by local schools and community organizations by airing winning films over ITFS.

Dallas Community College District

Summary. The Dallas County Community College District (DCCCD) provides the courses on five Instructional Television Fixed Services (ITFS) channels to provide better accessibility of courses for 27,345 students enrolled in the DCCCD.

Professional Development is Academic. One ITFS channel is dedicated to delivery of staff development programming to 11 community college locations and to K-12 school sites and administrative buildings in the Richardson School District and the Dallas Independent School District during school hours. Another channel broadcasts live programming into corporate locations from one of three teaching studios or the main studio. Students at their work locations use a phone line to call in questions.

Degree Options. DCCCD broadcasts college courses for cable television distribution on two ITFS channels. Students can achieve a degree without having a physical presence at any one of the campus locations. Classes broadcast are primarily in core curriculum courses such as English, health, nutrition, business, history, and psychology. Over 12,000 students are registered in these telecourses each year. Several thousand students are also enrolled in online courses, some using streaming video. DCCCD is careful to select the distribution medium that best fits the content of the course.

Corporate Support Broadens Access. DCCCD partners with WorldCom Broadband Solutions for use a portion of the ITFS channels' capacity. The funding from this arrangement provides for new equipment and ongoing maintenance. WorldCom has also announced a technology trial of broadband services in the Dallas area. WorldCom intends to provide a competitive broadband access product to the greater Dallas area. In some cases, the WorldCom broadband service would be the only service available, as some areas of Dallas are not served by DSL and cable modem alternatives.

Continued Use of ITFS. In the future DCCCD plans continued class conversion to online and implementation of streaming video, as students have better access to broadband capacity.

Denver Public Schools

Summary: The Denver Public Schools have overcome their budget limitations for specialized resource teachers by using the ITFS system to bring live classroom programming to its students in Math, Science, and the Arts. In addition, the ITFS system is used to provide essential continuing education for its workforce, and to maximize the potential of its teaching body. The future of Denver public education depends on this essential educational medium.

Spreading Expertise. Carolyn Williams is a “team teacher” in the Denver Public Schools System. One of six special resource “TV teachers,” Carolyn complements classroom teachers at 89 elementary schools in the area. As few elementary school teachers are expert in all educational subjects, the ITFS-based “team teaching” approach gives curricula greater breadth while efficiently providing professional development for classroom teachers. The “TV teachers” give lessons in Science, Spanish, French, Art, Social Studies and Math that are exciting and dynamic; they provide a springboard for classroom teachers, and energize students with ideas and materials that would be otherwise unavailable to individual classes. Up to eight groups may participate at once and the lively interaction is encouraged by the two-way audio connection.

Keeping Professionals Up-To-Date. ITFS also provides on site teacher training. Denver-specific courses are developed in the District’s studios to complement the training offered by Harvard University, the Smithsonian Institution, and other organizations. Over 4,000 teachers have convenient access to the incremental training they need to stay current on educational trends and substantive issues. The programming is available eighteen hours a day, increasing their utilization and cutting down on substitute costs for the school system.

Professional development courses are not limited to teachers. Secretary training has been taped in the district studios and is broadcast over the system. Efficiency is enhanced through courses on payroll, purchase/requisition, ordering and receiving, finance, contract release, SFG software, and other software programs. Some school principal meetings originate in the studio and are broadcast to their offices, eliminating the need for principals to leave the school site during school hours. Each principal can see the origination site and hear other locations.

Educating Students of All Kinds. Four Denver schools serving neighborhoods with concentrations of immigrants broadcast ITFS-based ESL classes. Taking advantage of the fact that 78% of the 72,416 students in the district qualify for breakfast before school, ESL classes are broadcast early in the morning; while their children eat breakfast, parents and their pre-schoolers “attend” Carolyn’s ESL class. The results are that more adults pass English competency tests and become US citizens, and parents feel more linked and invested in the school, a crucial factor for school success.

Extended Education. The financial troubles that plagued the Denver Public Schools forced it to eliminate the district's elementary art program. Thanks to ITFS, Art is now available with one teacher, Bunny Eyer, broadcasting art instruction to the district's 89 elementary schools. Using a document camera in her studio, students in the classroom are able to see procedures for the day's lesson and participate in their own classrooms in real-time. ITFS "is essential to my class," Bunny said. "It is the most effective and economical way to teach art in a large school district like Denver." Bunny has approximately two hundred young artists and up to eight teachers watching her in each session. When she isn't in her studio-classroom teaching art, Bunny visits her students personally.

Corporate Partnerships. The Denver Public Schools System has signed a contract with Sprint Wireless Broadband Group to lease two of its ITFS channels. In exchange, Sprint Wireless Broadband Group pays the district a monthly fee and installs and maintains the school receive sites. The funding provided by Sprint Wireless Broadband Group is used entirely to help offset the costs of running the ITFS-based educational program.

Future Plans. Jeanne Ross, Associate Director for the Distance Learning Curriculum, is looking forward to future enhancements. "With 2-way video, we won't be limited to eight classrooms linked to a teacher," she said. "Once the signals are digital, and we can build another studio and we can expand the number of class sessions in each subject," she explained. In addition, two-way digital technology will be used to enhance the Internet connectivity at 25 schools.

Debbie Stidham, Lead Teacher at the Guilliam Youth Center, would also value expanded ITFS capability. She directs the instruction of twelve to seventeen year old students who have been truant or committed crimes. Her students only spend, on average, fourteen days at her school, at which point they are moved to foster homes, detention centers, or treatment facilities. ITFS-based two-way Internet access for her students would allow these at-risk students to maintain a consistent course schedule for the semester. Another studio would be used to develop short subject training for after school and evening viewing, all designed to meet her students' unique needs.

Eastern New Mexico University

Summary. Eastern New Mexico University has provided interactive distance education courses using its ITFS capacity to the rural communities of Eastern New Mexico since 1978. Today the University provides about 135 upper division and graduate courses each year to five locations throughout New Mexico, each of which is located in a different county; the combined population of these counties is less than 200,000. Further, through its cooperation with an area community college, Eastern New Mexico University (ENMU) provides evening courses in education that reach another five counties with a combined population of less than 21,300. ENMU also uses ITFS to provide limited freshman level courses to five rural area high schools.

Reaching Underserved Populations. Taken together, these counties extend along the entire eastern side of the state and represent a rural area, with the largest county having about 60,000 people. Additionally, students are attracted from other nearby counties, and some students drive 70 miles each way to reach an ITFS site – and that ITFS site is the closest location for taking upper division or graduate level coursework. Significantly, many of these counties are expecting a decline in population, and community leaders look to ITFS-based distance education as a means of maintaining the vitality of the community.

ITFS students differ somewhat from the campus population. There is a greater likelihood that the student is female (79% ITFS versus 73.5% on-campus). ITFS students differ somewhat in terms of ethnicity when it comes to minority populations: they tend to include a greater percentage of Hispanics (29%) and Native Americans (3.8%) than on-campus students (26% and 2.5%, respectively).

Beyond the general educational function that the University's ITFS program serves, it provides the state with highly qualified personnel in shortage-stricken professions such as special education teachers and allied health professionals. A Bachelor of Science in Nursing completion program is available, as is a master's degree in communicative disorders (including undergraduate prerequisite coursework). Programs are also offered in business, English, education, and a number of other topics. Using ITFS to deliver these courses and programs as they are being taught on campus allows ENMU to provide the same high quality instruction in a highly cost-effective fashion to students who are unable to come to campus.

A real measure of ITFS' success in New Mexico is the nature of the students who enroll via ITFS. For example, one student is a single mother of an elementary school-age student and wants to become a teacher, yet there are no four-year programs in her area. She currently works at a private school, and must keep her job to provide for her family. ITFS courses allow her to stay in her community and maintain her full-time job while working toward her goal. This story is typical of the many students served by ITFS

programs. Many of these students are working adults seeking to improve their lives, and ITFS is the only vehicle that will allow this kind of education to happen.

Two other students decided to return to school after losing their jobs in a downsizing at a local Head Start program. These students had already taken several college courses thanks to Head Start's emphasis on educating its staff. The ITFS program allowed these students to complete their degrees during the time in which they were still receiving benefits. Without leaving the region, they graduated and are today teaching in local public schools.

Focus on Education, New Orleans WLAE

Summary. Focus on Education provides two channels of educational programming to some of the poorest K-12 schools in the nation and thousands of home using ITFS frequencies. The source of educational material is lifeblood to the Orleans and Jefferson Parish School districts and an inspiration to residents of New Orleans who can watch the programming on Cox Cable or Bell South Entertainment (wireless) cable television services.

After School Help. High School and Junior High students at 40 Orleans Parish Schools benefit from homework assistance during the hours of 4:30pm – 6:30pm, Tuesdays, Wednesdays and Thursdays. The Homework Assistance Program (HAP) broadcast on cable is just one of the ways Focus on Education provides assistance to these K-12 students. WLAE, a public broadcasting station, in part commonly owned with Focus on Education, recognizes high school students who excel in Math, by using them on camera to respond to homework questions. WLAE facilitates the telecast, as well as all of the programming appearing on channels licensed to Focus on Education.

Making a Difference to K-12 Students. Orleans and Jefferson Parish Schools broadcast ITFS live interactive courses, using telephone lines for the audio component. Virtual classrooms using this technology are the only way some of these students obtain foreign languages and AP courses, due to small concentration of students or lack of qualified teachers in many schools. The focus on some programming is on Math and Science. From 3:30pm – 5:30pm teacher development is provided to teachers. Teachers conveniently acquire the training without having to miss important classroom time. If need be, the course content can be taped for later viewing.

A grant, obtained by WLAE, made possible the installation of a microwave infrastructure, allowing origination of programming from multiple school sites directly into the educational channels.

External Augmentation of Instruction. ITFS also provides “last mile” access for educational programming distributed over satellite. Administrators and students participate in Department of Education monthly meetings, communications to school administrators and teachers, Annenberg programming, electronic fieldtrips, and courses contracted from TEAMS, produced by the California Department of Education to provide teachers with training and Internet related curriculum. The Jefferson and Orleans Parish school boards broadcast monthly meetings over ITFS.

Wanting to do More. Recognizing the benefits to students, Focus on Education continues to reach more students. The ITFS coverage area extends about 42 miles, and Focus on Education seeks to install receive facilities in additional schools so that more students will have access to transmitted courses. An agreement with Bell South to use

ITFS capacity in exchange for a monthly fee provides funding to maintain the educational program and lease tower space. Bell South, as a part of the agreement, has paid for receive facilities at most of the Orleans Parish schools. Bell South also converted the ITFS station to digital transmission, creating more capacity for additional programming. Continued partnerships like the one with Bell South, will enable more students to benefit from two-way fully interactive courses.

George Mason University

Summary. Reflecting its unique location near the Nation's Capitol, George Mason University (GMU) utilizes ITFS both to enlarge participation in the Washington policy-making process and to expand access to higher education. GMU's "Capitol Connection" airs a wide variety of policy-relevant channels, including CSPAN, CNBC, and committee hearings from crucial agencies such as the FCC and FERC. Its clients include Cabinet-level Secretaries, prestigious news organizations, embassies, powerful trade associations, and other educational institutions. GMU, in cooperation with a local community college, also offers over 50 college courses a semester for credit; the courses reach 425,000 cable homes in the greater Washington DC area. Shrewd partnerships with the private sector and leasing of excess bandwidth has helped make ITFS an important source of revenue for the otherwise publicly-funded university.

Promoting Better Public Policy. In 1981, GMU became the first and only 24 hour a day C-SPAN affiliate. Later, GMU's business television service, The Capitol Connection, expanded to include CNN, C-SPAN2, and CNBC, along with the open meetings of the FCC, the FERC and the NTSB. Currently, The Capitol Connection serves patrons in more than 570 office buildings in Metropolitan Washington, with more than 1,750 patrons, and over 25,000 television sets connected to our service. Subscribers include Federal Cabinet Level Secretaries and Undersecretaries, news organizations like The Washington Post and the New York Times, trade associations, law firms, communications and energy companies, embassies, and educational institutions. The Capitol Connection maintains microwave point-to-point STLs on each agency's rooftop, and controls cameras in the meeting rooms. In addition, subscribers to The Capitol Connection can view courses offered by GMU on its ITFS system. About two courses a week are aired to government employees using this system.

College Courses for Credit. Since 1985, George Mason University has broadcast graduate and undergraduate courses on ITFS for credit. In addition, GMU allows Northern Virginia Community College to use its ITFS system to air a combined total of over 50 classes a semester, airing seven days a week. Several hundred students are currently enrolled in these courses. These courses reach more than 425,000 cable homes in Arlington, Fairfax, Loudoun, and Prince William Counties, as well as the city of Alexandria, Virginia as cable channel GMU-TV. The far reach of this system is made possible by the over 20 transmitters maintained by GMU in Maryland, Virginia, West Virginia, and The District of Columbia.

Keeping America Informed. GMU courses for credit and other GMU-TV programming 24/7 are streamed on the World Wide Web using Real Networks audio/video technology. Subscription access to the FCC, FERC, and NTSB meetings are available via the Internet. Some important events are streamed on the Internet free of charge; last fall GMU streamed the NTSB's final deliberations on the TWA 800 disaster, and the NTSB's four day hearing on the Alaska Air crash that occurred off the California Coast were "in the

clear" for all interested parties to watch. In addition, The Capitol Connection teleport uplinked the four-day Alaska Air hearings for satellite distribution to relatives of the crash victims in California and Seattle. The Capitol Connection is sensitive to cutting edge issues of concern to policy-makers; in mid-December GMU carried the FERC meetings on the California Electric Utility Industry on the ITFS system as well as via the Internet to interested parties in Washington, D.C. and across the United States.

GMU also participates in Research TV, a consortium of Universities that air on ITFS and satellite systems outlining academic achievements and issues of interest to the general public. Described as a Discovery Channel of the University setting, Research TV airs enriching and intellectually stimulating programming via ITFS hook-ups and through local cable networks from Washington, DC, to Seattle, Washington.

Providing Revenue to an Expanding University. GMU leases excess capacity on its system to WorldCom Broadband Solutions, contributing substantial financial benefit to the University. Since the initial \$14,000 investment in 1981, The Capitol Connection has returned over twenty years nearly two million dollars to directly support the University, and every year provides nearly \$900,000 in in-kind benefits to GMU in the form of microwave television support services, engineering services, and television studio equipment and maintenance. Though George Mason University is a state supported institution, The Capitol Connection receives no state funds and is an entirely self-sufficient operation of the non-profit George Mason University Instructional Foundation, Inc.

Going Global. The Capitol Connection is currently in negotiations to go global via satellite. A joint venture agreement with Multicast Media will stream Capitol Connection programming, including GMU courses for credit and possibly C-SPAN, CNBC, MSNBC, FCC, FERC, NTSB, and other regulatory agencies via satellite to ISP's around the world (which will, in turn, provide high speed LAN connectivity to office buildings via fiber). Given the highly mobile, and international, nature of the Washington, DC population, this capacity would allow students, including U.S. military and foreign service personnel, to continue to pursue their educational goals even as they live or serve abroad.

INTELECOM

Summary. At ground zero of the information revolution, California has found that its higher education needs far outstrip its existing infrastructure and budgetary abilities. With demand for community college education estimated to grow by up to 500,000 students over the next decade, INTELECOM Intelligent Telecommunications, which operates southern California's Community College Instructional Network (CCIN), has stepped up to meet this immediate challenge by providing quality college courses through an ITFS system. CCIN offers 35 courses to 4,500 enrolled students seven days a week using ITFS links to the local cable systems and community college campuses. Surveys show an additional 45,000 "audit" classes through the ITFS-based system.

Adult Distance Learning. The educational needs of California are extraordinary as the demand for highly educated workers escalates. A recent statewide study (reported in the Orange County Register, *UC Plans to Boost Graduate Student Enrollment*), illuminates how critical high-tech students are to California's economy. Southern California high-tech business leaders are worried that the critical shortage of technology workers threatens the region's economic well-being. CCIN's classes put students on the educational path that is essential to produce more competitive and productive workers.

INTELECOM is a consortium of 48 community colleges in Southern California. INTELECOM produces distance learning, lower division, and undergraduate courses known as telewebcourses. With 32 years of experience in distance learning, INTELECOM and CCIN bring a richness of experience that has put its coursework in high demand throughout the country. In addition to providing programming to member institutions in Los Angeles, Orange, Riverside and San Bernardino counties in Southern California, CCIN's parent non-profit corporation, INTELECOM, leases courses to schools around the country. For the southern California area, CCIN provides 35 ITFS telewebcourses, broadcasting seven days a week. Daily, seventeen hours of educational content are broadcast on one channel to a number of cable companies in the greater Los Angeles, Orange, Riverside and San Bernardino Counties; over 500,000 homes have access to the courses offered. Approximately 4,500 students a year enroll in the community college courses distributed by CCIN and surveys show that for every student enrolled, approximately one hundred additional cable customers are watching for their own edification. The programming has become so popular that only one cable company in the program's fourteen-year history has dropped the programming, and that was due to channel capacity limitations.

Serving A Diverse Community. California's growing need for flexible, affordable education is part of a national trend. According to the recently released Report of the Web-Based Education Commission to the President and the Congress of the United States, students over the age of 24 increased 235% between 1970 and 1993. These students require flexible responses to their growing learning needs and CCIN's ITFS program has risen to the challenge. In addition to the typical student needs, CCIN has

found that its ITFS programming is especially helpful to those with special needs. The ability to tape and replay a program, sometimes several times, allows students with learning disabilities and those with limited English skills the time and repetition they need to learn.

A Partnership with Industry. INTELECOM's agreement with WorldCom Broadband Solutions is a win-win situation. Since 1996, INTELECOM's commercial partner has brought state-of-the-art digital systems to INTELECOM and has helped INTELECOM offset the significant costs of the distance-learning program. In exchange, INTELECOM leases the excess ITFS capacity to provide better services to its local customers.

Kirkwood Community College

Summary. Kirkwood Community College's use of ITFS system is a shining example of the benefits these licenses can bring to a rural, education-hungry region. Kirkwood Community College serves seven counties in east central Iowa, covering 4,300 square miles and a population of over 350,000 people. Given this enormous area and the low population density, ITFS is the ideal low-cost, high impact delivery mechanism for both degree seeking students and those in search of continuing education opportunities. In addition, Kirkwood Community College plans to leverage its excess ITFS capacity to bring affordable high speed Internet service and Video On Demand to K-12 schools and its own Learning Centers in its seven county area.

College Courses to a Dispersed Population. Higher education in this rural area can be difficult to access given the large distances between communities and colleges. Therefore, Kirkwood Community College broadcasts 60 hours a week of live, interactive (through two way audio) classes that can be applied towards a general Associates degree. In the spring semester of 2001, 519 students are taking 18 classes, with the vast majority attending class at remote receive sites. Kirkwood also broadcasts 7 hours per week of live, interactive Continuing Education courses. The continuing education classes enrolled 1200 students enrolled in 25 Continuing Education classes during the year 2000.

Through ITFS links with cable TV, this valuable educational programming is available to communities in a 35-mile radius from the main campus in Cedar Rapids, and can be seen in over 81,000 homes subscribing to cable television. The central objective of this cable TV network is to offer college credit tele-courses both in semester and block formats, allowing students to earn college credit at their own pace and in their own homes. 347 students are enrolled in credit courses via this ITFS cable channel, and untold numbers have access to high-quality, educational programming at their leisure.

Bringing Broadband to Schools. Kirkwood Community College is currently negotiating with private telecommunications companies to lease its excess ITFS capacity in exchange for providing affordable high-speed Internet access to K-12 schools in the seven county area. While some of these schools currently receive Internet service from a state owned fiber optic system, that wire usually terminates at the local high school building, leaving districts with the daunting task of connecting each of the schools in the district. As a result, some school districts cannot deliver the Internet to its other buildings, including lower and middle schools. Kirkwood's partnership with a private telecommunications company would bring higher quality Internet to most local schools than is currently available. The importance of the Internet in the classroom cannot be underestimated; the Report of the Web-Based Education Commission to the President and the Congress of the United States found that the ability to use the Internet is an essential skill if students plan to seek a university education.

Video Access on the Horizon. Kirkwood also hopes to expand its ITFS system to provide video on demand in the future. Currently instructors and students located at Cedar Rapids can request an instructional videotape to be played on the campus's cable TV system for viewing. However, the 10 remote learning centers connected to the network do not have access to the 2000 tapes in this impressive video library. With the advent of two-way digital services, Kirkwood plans to use its ITFS capacity to offer on-demand video programming to off-campus students and instructors. This capacity could also be used to bring video content directly to local K-12 schools.

Leveraging ITFS. The revenues that Kirkwood will earn by leasing its excess capacity will go to supporting and expanding its distance-learning project, a sustaining infusion for the cash-strapped community college. In addition, the savings realized by local public schools with broadband Internet access will only be outstripped by the immeasurable educational benefits enjoyed by the students.

Las Vegas KLVX Communications

Summary. Clark County, Nevada has one of the fastest growing populations in the country. In order to meet the explosive growth in educational needs, Clark County has turned to ITFS as one of the means for providing all members of the community with the quality educational experience they need.

Serving Clark County. For over ten years, the Clark County School District has used its ITFS capacity to serve as a valuable educational resource for southern Nevada communities. High school classes, educational programming, professional development, literacy programs, and family and community education are among the ways in which the District maximizes its ITFS capacity. The KLVX Communications Group, which runs the programming for the district and is a PBS (Public Service Broadcasting) affiliate, reaches approximately 250,000 statewide using ITFS and other critical educational media.

Bringing Courses to the K-12 Community. KLVX maintains 12 channels for the educational institutions of Clark County and the use of classroom teachers, school librarians and other instructional staff in the community. KLVX offers a wide range of programming over these channels, including classroom instruction and educational videos aimed at specific course needs. The Clark County School District – like the rest of Clark County – has experienced explosive growth in recent years. This growth has far outstripped the availability of qualified teachers in the area, particularly in specialized subjects such as language and higher mathematics. ITFS programming is used in classrooms throughout the district to allow highly trained teachers in one location to serve students located throughout the district, making educational opportunities available to students regardless of where they go to school. In addition to working with students in school, KLVX also airs Ready To Learn programming (such as Wishbone) each weekday to provide families a tool at home for extending the learning conveyed during the school day.

Making Learning Available to Adults. A number of adult educational programs are also available via the ITFS system. KLVX offers many for-credit distance learning courses for continuing education students. Most of these students are busy adults, and having the flexibility to participate in an ITFS-based course package instead of needing to be on campus is extremely important.

The ITFS system is also widely used for professional development of teachers such as ESL and other teacher certification courses. Although the County is very dispersed, ITFS allows teachers throughout the county to interact with one another and with instructors during professional development sessions.

Bringing Educational Opportunities to the Entire State. In addition to its ITFS-based programming, KLVX uses the Nevada Distance Learning Satellite Service to distribute

its programming to the more insular areas of Nevada. As a result, the programming made possible by KLVX's ITFS system enjoys widespread use throughout the state.

Providing an Irreplaceable Service. If the ITFS capacity that this region depends upon were to re-purposed or altered, the impact could potentially be devastating. High school dropout rates along with illiteracy would rise, teacher professional development would be stymied and educational resources for classrooms would be vastly reduced. And a vibrant educational and community-building tool could be lost.

Mississippi EDNET

Summary. More than any other state in the union, Mississippi needs the benefits of broadband Internet access. Ranked last in the nation for the number of households connected to the Internet, and nearly last in education, ITFS is essential to Governor Ronnie Musgrove's economic development plan to jump-start Mississippi's economy and educational system through a privatized distance learning system. Partnering with the private sector, Mississippi is now on the road to making broadband Internet service available to every home and business, a remarkable accomplishment for the largely rural state.

Distance Learning through ITFS. Mississippi is the only state to have a statewide learning consortium of ITFS licensees whose programming serves the entire state. Through an alliance of K-12 schools, community colleges, universities, Mississippi Educational Television, the Attorney General, and the Governor, Mississippi formed EDNET, which provides programming via ITFS to schools, universities, and community organizations across the state. EDNET has constructed more than 900 educational receive sites throughout the state, and more are being added all the time. EDNET also has local production studios at 11 educational institutions throughout Mississippi.

Bringing the World to the Classroom. EDNET transmits extensively to K-12 classrooms, drawing from a wide variety of sources, including PBS and a growing video library. Special programming aimed at specific groups is now a key part of children's curricula; these programs help invigorate the children and make abstract subjects concrete and exciting. For example, the popular "Jason Project," which brings scientific expeditions into the classroom gets students engaged in the world of science and technology as they explore, in real time, volcanoes, coral reefs, and rainforests. Similarly, "NASA Connect," a NASA designed program emphasizes math and science skills, gives children the opportunity to see "real life" applications for their academic studies. Use of these kinds of dynamic programs are becoming a centerpiece progressive curricula across the nation, and EDNET plans to provide a centralized library of resources that teachers can request "on demand" to further expand academic horizons and options.

Educating Adults. EDNET is actively working to incorporate distance learning courses and programs from all Mississippi public colleges and universities. It also includes extensive GED programming, which allows students to earn a high school diploma without having to go back to school. EDNET also carries special training programming for firefighters, teachers, and other professionals. Two way audio capabilities at some sites allows for the dynamic interaction that enhances the quality of distance education.

EDNET is currently available in thousands of households across Mississippi on the Wireless One cable system. This allows citizens with Wireless One service to benefit

from EDNET's programming by making distance learning classes more convenient for those busy students who can't always arrange their work schedules around class times.

Bringing Broadband to the Masses. The capstone of Mississippi's plan to leverage ITFS licenses is to bring broadband services to the entire state, including rural areas. Concerns about the digital divide are especially significant in Mississippi, which ranks at the bottom of many surveys of Internet connectivity, use, and infrastructure. Governor Musgrove has a strong commitment to technology in general and to educational technology in particular, and he understands the importance of connectivity to the state's economic prospects. His emphasis on the link between technology and education is well founded; the Report of the Web-Based Education Commission to the President and the Congress of the United States found that the ability to use the Internet is an essential skill if students plan to seek a university education. Therefore, a central component of the Governor's economic development plan is to use the state's ITFS spectrum – in conjunction with commercial partners – to make broadband Internet access universal; students, schools, families, and businesses throughout Mississippi will all cross the digital divide together.

Partnering with Industry. Discussions are under way with WorldCom Broadband Solutions – which is headquartered in Jackson, Mississippi – to make this plan a reality. WorldCom Broadband Solutions has already rolled out broadband services in some areas, and is currently talking with EDNET to bring broadband to the rest of the state. EDNET and its member state government agencies plan to act as anchor tenants on the network, ensuring that educational resources are widely available. This ubiquitous broadband availability should give Mississippi-based businesses room to grow and compete in the global marketplace.

New Orleans Educational Telecommunications Consortium (NOETC)

Summary. The New Orleans Educational Telecommunications Consortium (NOETC) provides one 24 hour a day channel of programming via ITFS, which is also carried on the Bell South wireless cable service, called Bell South Entertainment and on Cox Cable. Residents of the greater New Orleans area who subscribe to the services may view telecourses from one of eight universities and community colleges that are part of the consortium. Courses originate live from the studios on each campus, are captured from satellite or are ones prerecorded and rebroadcast on the channel. The ITFS signal is received at the Cox Cable headend, the Bell South wireless cable headend, at Jefferson, St. John, St. Charles, St. Bernard and Orleans Parishes K-12 school sites, and at the eight institutions of higher education and 20 additional administration and corporate sites.

University Access. The city of New Orleans is blessed to be the location of excellent institutions of higher education. The NOETC consortium, a non-profit corporation, uses Instructional Television Fixed Services (ITFS) capacity to provide access to the significant educational advantages these institutions provide. Using one ITFS channel, courses are transmitted live or rerun from 9am to midnight. The rest of the day fine art programs are transmitted to inform and entertain viewers. High school, college, and university students can take courses from the University of New Orleans, Tulane University, Loyola University, Southern University at New Orleans, Delgado Community College, Nunez Community College, Dillard University and Xavier University. Five hours a week, math courses are offered to motivated high school students capable of doing college work, but unable to get AP courses at their rural or small high schools.

Working together. A Board of Directors, comprised of the Presidents of these institutions provides oversight of NOETC. The consortium is organized to lead and facilitate the development and application of telecommunications technologies for the goals and purposes of higher education in the Greater New Orleans area. NOETC is funded through membership dues, grants and services rendered to outside entities. One such source of funding comes from its partnership with Bell South.

Corporate Partnership. Bell South shares NOETC's ITFS capacity in exchange for fees and services in support of the ITFS operation. The funding is used to subsidize the consortium growth. In the future, the consortium hopes to implement point-to-point two-way digital capability between the eight institutions of higher education. Each university and community college in the consortium currently has an ITFS connection between the eight sites. Students have access to courses located on each campus from any other campus, using a telephone line to verbally interact with the classes. In the future, with upgraded technology, their participation could be completely interactive. NOETC also desires to implement the newly available two-way ITFS services, providing broadband Internet capacity that would enable it to reach more students.

Pikes Peak Community College

Summary. Pikes Peak Community College's ITFS transmitter sits high in the Rockies, sending classes to students in modern one-room schoolhouses, military personnel serving their country, and students eager to improve themselves. Through ITFS, high school students in this sparsely-populated, difficult-to-navigate territory have the same opportunities as students in other parts of the country. Sixty hours of ITFS programming brings college prep math courses, challenging classes for gifted students, and special instruction for those with learning disabilities to students throughout the region. The military also takes advantage of this ITFS system with enlisted men and women earning credits that allow them to serve their country more effectively. In the future, a partnership with a private telecommunications company will hopefully bring broadband Internet to rural enclaves with no Internet access.

Serving Underserved High Schoolers. Only 3.8 million people live scattered over 104,247 square miles in sparsely populated Colorado. There are many towns in Colorado where only a handful of students graduate from high school each year. High schools with small student populations can't provide qualified teachers to teach each subject; most electives and even some college requirements are not taught at all. Gifted and disabled students are the hardest hit, missing a broad range of opportunities.

The ITFS-based distance education program at Pikes Peak Community College is trying to bridge this divide for students in the area, offering math intensive programming including Algebra, Advanced Placement courses and other mathematics content that provides high school students with essential pre-college math. In addition, the University of Colorado, in Colorado Springs, offers courses on this channel that is received in high schools, community centers, and broadcast on some cable networks. These live math courses are also replayed on local cable TV after 3 p.m. so that high school seniors can get a jump-start on their college courses.

Making a College Education Possible. Pikes Peak also serves adult learners in the community. Taking advantage of Pikes Peak's On-Line College, students may select from over 50 courses towards their AA degrees and Certificates without ever going to campus. One woman took advantage of this accessibility to earn her Associates degree while caring for her five children, all under the age of five, without paying for a babysitter or leaving them alone.

The Navy and Army both have facilities that receive ITFS classes and, recognizing the importance of improving enlisted personnel's education, encourages their taking ITFS courses. The program has been so successful that officials from military installations in other states have contacted Pikes Peak about making courses available to their troops.

Bringing Broadband to the Rockies. Pikes Peak Community College hopes to translate its ITFS capabilities into broadband Internet access in the near future. Negotiations with

a telecommunications company now under way would allow reduced price broadband Internet to be sent to a variety of rural schools and military bases that otherwise would have no Internet access.

Region IV (Houston)

Summary. The greater Houston metropolitan area (Region IV) contains 25% of the student population of the entire state of Texas. With 54 school districts serving almost a million students daily, educators continuously struggle to provide equal opportunities for all of the diverse students. ITFS has helped them tackle this challenge successfully by providing a path for high speed Internet access and distance learning. With the upcoming completion of conversion to digital transmissions, ITFS will connect every one of the 1,100 schools in the region.

Various Needs. Region IV represents schools within the urban environment of Houston as well as its rural surrounding areas, and airs a broad range of programming to meet their diverse needs. For instance, underserved schools in inner-city Houston that have not been wired for high-speed broadband Internet access are able to use the wireless ITFS system to connect their students to the Internet, while rural school districts in the region use the video programming to augment their curriculum. Region IV provides all of the schools in the region with a broad range of courses, enrichment programs, and teacher development between 8am and 5pm, Monday through Friday.

Creating Opportunities. These distance learning courses are integral to providing students with access to course material which they otherwise would not receive. A specialized foreign language or Advanced Placement teacher is often unavailable or unaffordable for small school districts. ITFS allows Region IV to consolidate their resources and hire the teachers necessary for instruction. For example, Mary Kay Stewart, a French teacher located in San Antonio, broadcasts her lessons throughout the area. Her teaching is held in high regard by teachers and students in such remote locations as Liberty Independent High School, 30 miles outside of Houston. Without ITFS, Liberty High would not be able to provide a French class, let alone one with world-class professional instruction. ITFS makes these learning experiences possible.

A Strategic Partnership. The Region IV consortium leases a portion of their ITFS spectrum to the Sprint Wireless Broadband Group. The lease revenue covers the complete cost of the distance education programming and allows for greater expansion of services. Because content control comes from educators, the fundamental aims and usage of ITFS are not lost but only enhanced with the benefit of this partnership.

A Continuation Of Success. ITFS has become an integral component of education throughout Region IV. ITFS has given every school in the area with access to a wide array of classes, the best instruction, and a connection to the high speed Information Superhighway. District administrators, teachers, students, and local businesses are all invested in the continued use of ITFS as an educational tool for success.

Sequelle

Summary. Based in the Mid-Ohio Valley, Sequelle is a not-for-profit communications alliance on the verge of bringing wireless broadband infrastructure to the largely rural areas of Marietta, Ohio, Parkersburg, West Virginia, and surrounding communities. Without ITFS, this remote area would be irretrievably left behind in the digital revolution.

The Need for Speed. The Mid-Ohio Valley is rural, sparsely populated, mountainous, and on the border between Ameritech's service area (in Ohio) and Verizon's service area (in West Virginia). This combination has discouraged the telephone companies and other telecommunications vendors from making the significant investment need to provide broadband infrastructure to these communities, making what little bandwidth is available inordinately expensive.

This shortage of broadband infrastructure has the potential to strangle the region's economy. Rural communities are quickly recognizing that, like communities that were bypassed by the Interstate highways 50 years ago, communities without broadband will have difficulty attracting and retaining businesses and residents in the area. Recognizing this need for speed, the Sequelle alliance was founded by the Washington County, Ohio Community Improvement Corporation (a longstanding public/private partnership) to bring broadband infrastructure to Washington County and Woods County, West Virginia, as well as surrounding communities. With support from local government, Congressional representatives, and the governors of Ohio and West Virginia, Sequelle officially opened in August, 2000, and will begin serving local customers in mid-2001.

Deploying fiber throughout the area would be prohibitively expensive and inefficient, costing millions of dollars and bypassing much of the community. By using wireless technology, Sequelle will be able to serve the entire region with an investment of only a few million dollars. They will do this through a unique partnership with Mountain State College, an ITFS licensee serving the region.

Bridging the Digital Divide. Sequelle will initially provide broadband access in the Marietta, Ohio and Parkersburg, West Virginia area to local businesses. Over the next few years, the network will expand dramatically to include surrounding counties and communities, including the surrounding Appalachian communities. Local business leaders are hailing Sequelle as a critical step in ensuring the economic future of the area. Banks, colleges, and manufacturing plants are all among Sequelle's initial subscribers.

Sequelle's wireless network will allow subscribers to set up wide area networks, linking facilities. For educators, this will allow both K-12 schools and colleges throughout the region to broadcast classes out over the airwaves to other schools in the region, allowing schools to pool their resources and share classes. In a region in serious danger of being left behind, this capability will provide students with essential web skills; the Report of

the Web-Based Education Commission to the President and the Congress of the United States recently found that the ability to use the internet is an essential skill if students plan to seek a university education.

In addition to companies, Sequelle is planning on selling bandwidth to Internet Service Providers, who can in turn resell service to individual consumers. Unlike cable modem service and DSL – neither of which is widely available in the Mid-Ohio Valley – Sequelle’s wireless broadband service will be ubiquitous. Furthermore, wireless broadband service will be affordable for individuals as well as businesses because Sequelle can supply different amounts of bandwidth to different customers, rather than forcing customers into a one-size-fits-all solution.

South Carolina Educational TV

Summary. Because of South Carolina Educational TV's (SCETV) vast ITFS network, educational opportunities are blossoming and limited budgets are being leveraged throughout the state to allow students to thrive. SCETV serves primarily rural and working class areas that are educationally disadvantaged. Through ITFS, high schoolers take college level courses and college prep math classes, adults pursue continuing education classes, and teachers get better training. ITFS also promises to bring broadband Internet to areas without any Internet access. Through ITFS, South Carolina's students are expanding their reach and opportunities.

Reaching the Unreachables. South Carolina is a largely rural state, home to just over 4 million people, of which 669,342 were students in 1999. 63% of these students live in rural areas. SCETV reaches these students, providing them unique resources, including access to centralized video libraries. Before ITFS, many school districts couldn't get these valuable programs, and for those that could, the non-ITFS distribution system was expensive and cumbersome. Now over 400,000 students have access to interactive programs such as college level math courses, taped student enrichment classes, the SAT Question of the Day, the Literacy Festival Showcase, and many more.

ITFS also brings these students a broad range of classes they otherwise couldn't attend. In McClellanville, Advanced Placement (AP) Government and AP Economics offered by Charleston's ITFS system provide students access to college-credit courses that would otherwise be unavailable. In Marlboro last semester, 116 8th graders had access to high school Algebra I and English I. Furthermore, many of the courses broadcast live can be applied for college credit, allowing gifted high school students to get a jump on their college education. The advantages are enormous: students get a trial-run at college, giving them the confidence to succeed, and the credits they earn result in substantial savings of college tuition. For the 71% of students at one high school who qualify for free or reduced lunches, the money saved can mean the difference between completing college or not.

Training Better Educators. Many teachers in rural areas are isolated from both their district management and continuing education opportunities. ITFS has brought both of them closer, allowing teachers to attend district-wide meetings and giving them access to essential continuing education classes. Still teachers in some rural areas are waiting for planned expansion plans to overcome the enormous geographic obstacles they face; isolation is a danger for teachers hoping to keep rural students motivated, engaged, and college-bound.

Without ITFS, Irreparable Losses and No Broadband. South Carolina has invested over \$28 million since 1973 in an ITFS system that delivers 256 channels, has 49 transmitters, 15 Studio-to-Transmitter links, and 35 specially outfitted Distance Education Learning Centers, all of which would be useless without the ITFS licenses. In

addition, South Carolina has plans to expand the system to cover the nearly 30% of schools who don't currently have access to ITFS. Most important, however, is the opportunity for ITFS to bring broadband Internet to rural areas. A plan to partner with a private telecommunications company would allow South Carolina to digitize and bring broadband to underserved areas, including some of the most isolated school districts, libraries, and civic-minded small businesses.

Stanford University

Summary. As one of the oldest and best-respected educational institutions on the west coast, Stanford University brings a unique set of resources to the San Francisco and Palo Alto communities. Located in the heart of Silicon Valley, Stanford's ITFS-based distance learning system has become indispensable to the region's high-tech industry which requires highly trained employees to thrive and innovate. Every year approximately 350 corporations use Stanford's ITFS programming, with over 4,000 employees enrolled in 250 graduate-level courses transmitted directly to their workplaces.

Responding to Silicon Valley's Needs. Stanford's use of ITFS began after local technology and engineering firms requested that the University provide timely graduate training to their engineers. Today approximately 350 corporations—including many leading Silicon Valley firms—enroll employees in graduate courses offered by Stanford. This year 4,000 students enrolled in one or more courses broadcast to their workplace. Given this enormous demand, Stanford has expanded its course offerings substantially, with 250 courses now offered annually. Two-way audio capabilities allow questions and productive interactions between professors and off-campus students. The enormous popularity of this program has made the ITFS program completely self-financing, funded entirely by subscribing companies.

Meeting a Critical Need. In California, a recent study reported in the Orange County Register, *UC Plans to Boost Graduate Student Enrollment*, illuminated just how critical high-tech graduate students are to California, and the nation's, economy. Throughout the state, owners of high-tech companies worry that a shortage of tech-savvy graduates threatens the state's economy. According to Ted Smith, founder of FileNet, "education and supply of qualified people is the number one problem in the high-tech industry." He added, "we're importing foreign nationals to do these jobs instead of training our own citizens, and even so there's a bigger demand than we can fill."

Nationwide the number of jobs in the computer and technology industries increased 75 percent over the last 10 years, while the number of electrical engineering and computer software degrees declined. Given the enormous demand for engineers and the high opportunity costs for students to study full-time, ITFS has been an ideal solution. ITFS allows these highly-prized workers to continue in their challenging careers while giving them the opportunity to expand their essential knowledge and skills. Given the explosive growth and demand in the Stanford area, adding a building or even department to meet this need was too costly and not immediate enough; ITFS allows the University to respond quickly and flexibly to the extraordinary needs of the local high-tech community.

Alternative technologies are not as effective as ITFS at reaching corporate locations. The Stanford Center for Professional Development is able to transmit to the entire Silicon

Valley, San Francisco, and to the East Bay using ITFS technology's scope that extends well beyond any one of the multitude of cable systems in the area.

A Win-Win Situation. Access to graduate programs at Stanford has been a major attraction for mobile tech workers, helping Silicon Valley firms to attract and keep the finest professionals. According to Andy DiPaolo, the Executive Director of Stanford's Center for Professional Development, "our program helps companies maintain competitiveness while at the same time it enhances employees' career vitality."

A dramatic illustration of this ITFS-facilitated partnership is Stanford's relationship with Cisco Systems, a leading Silicon Valley firm. Cisco employees take ITFS engineering courses at their offices, avoiding difficult and time-consuming commutes to the Stanford campus. According to Daniela Naumburg, Cisco Education Manager, "we bought the program to stay competitive." Naumburg describes the challenge of hiring and retaining employees in the Silicon Valley as "difficult at best." "Engineers move all the time," she explains, "to keep them or to hire them, we need to have the courses available for them to complete their degree program without interruption." As a result, Cisco has increased the size of their corporate training center by threefold this year and allows employees to take whatever courses Stanford offers. Over the last three years Cisco has seen enrollment in the Stanford courses double each year. Cisco has found Stanford's ITFS system infinitely better than previously utilized online courses which did not offer the flexibility of recordable televised courses and which were slow and often interrupted during download.

Looking to the Future. Stanford hopes to use its ITFS capacity to expand options for students, including more high-speed Internet programming. Courses utilizing ITFS are the best solution to the area's escalating educational needs; according to Stanford's DiPaolo, "ITFS is the most efficient and cost effective method for reaching the most students possible." Stanford intends to expand the number of courses offered, and plans to provide two-way video, allowing students at remote locations to participate more fully and enhance the quality of these highly-prized courses.

St. Bernard Parish Schools, New Orleans

Summary. From state of the art studios at Shalmette High School, St. Bernard Parish in Louisiana originates broadcasts of staff development for teachers, school board meetings, K-12 courses, and PBS programming to 21 parish schools, using ITFS frequencies. Six different program tracks are available to students and teachers. Smaller, teaching studios are located at all other schools in the parish. Some of the smaller studios are being upgraded as funds are available.

Educational Sources. Live courses and content originating from the St. Bernard Parish studio integrates students from various schools with rich educational content. Educational pre-recorded programs for K-12 students are also acquired from NITV, for a local New Orleans consortium of educational institutions. School officials from all schools in the region meet quarterly to agree upon broadcasting goals for the future. A technology subcommittee identifies the appropriate technology desired to meet various needs between the members.

The studio is also considered a teaching studio for high school students at Shalmette High School. At the “communications academy” students enroll in one of two courses, teaching them the mechanics of operating a television studio. For some broadcasts, the approximately 60 students produce, film and edit programming. In other cases, they serve as the crew. One class produces a six minute daily morning announcement, highlighting student accomplishments and current events.

Developing Students and Staff. Staff development appears on Cox Cable and on Bell South Entertainment, both originating on ITFS channels. Teachers can tape or watch training in their own homes and without interruption to classes. ITFS is used to distribute educational programming and field trips downloaded from satellite, and to broadcast programming to other K-12 school districts in New Orleans.

Corporate Contributions. Bell South, St. Bernard Parish Schools’ wireless partner, converted the St. Bernard Parish ITFS channels to digital. Bell South pays St. Bernard Parish Schools a monthly fee to use capacity in connection with its wireless cable alternative, Bell South Entertainment. The lease revenues have paid for much of the technology currently available to the Parish. Continued growth and development of technology in Parish classrooms depends upon this relationship.

Tarrant County College

Summary. Tarrant County College has used ITFS to create the largest community college distance education program in Texas. Via ITFS, college courses are broadcast seven days a week to campus satellite locations and private residences in and around the Fort Worth region, serving more than 6,600 students. TCC can effectively reach their widely dispersed student body at low prices, thanks to ITFS, helping to keep tuition affordable for students. With over thirty years of distance education experience, TCC educators have found ITFS to be the answer to their distance education needs.

Diverse Course Offerings. TCC's students are older than stereotypical college students, and most are balancing education and employment. TCC's course offerings reflect both their need for course programming compatible with their work schedule and for coursework relevant to their professional lives. Classes are therefore available between 6am and 11:30pm daily. Although courses are currently tied to the actual campus semester schedule, changes are underway to create a staggered schedule in which students can begin instruction at any time. Many students who cannot find the time or are physically unable to visit a satellite campus location are able to take classes from home, thanks to the ITFS system's reach.

Strategic Business Partnerships. TCC has leased a portion of their ITFS spectrum to WorldCom Broadband Solutions in exchange for technical and financial support. The money received from this relationship is reinvested in TCC's distance learning program, helping to fund technical assistance, add new programming, and bring down the general cost of student use. In the rural areas surrounding Fort Worth, businesses as well as educators are receiving services that would be completely unattainable without wireless ITFS.

Multiple Solutions. Bob Frost, Director of Instructional Support Services at TCC, sees ITFS as the key to providing effective course material through the Internet as well. Students need reliable cost-effective broadband access to use bandwidth-intensive course materials and video programming. Where students and school districts are not wired for this capability, ITFS provides the most cost-effective solution, and, in many rural outlying areas, ITFS provides the only broadband solution likely to come along in the foreseeable future.

University of Arizona

Summary. The University of Arizona has been involved in distance learning for more than 20 years and its widely varied uses make it a shining example of the public benefits accrued from ITFS. 25,000 K-12 students use the system for special "field trips;" hundreds of college students use ITFS to go to school; the Arizona Health Sciences Center use it for medical education; and community centers use ITFS for GED classes and other special needs. One channel is used to supplement the local PBS channel's programming, making ITFS in Arizona a truly public resource.

Serving Students. In cooperation with Tucson Unified School District and Pima Community College, the University coordinates educational programming for the K-12 and adult communities on multiple ITFS channels. The ITFS signal reaches 35 schools that encompass over 25,000 K-12 students, 100-500 college students each semester, as well as 20,000 cable subscribers. More than 320 hours of courses are offered for credit, including medical programming and general informational programs.

Specialized Programming for Everyone. Along with the Arizona Health Sciences Center, the University distributes approximately ten hours per week of Grand Rounds and Medical Lectures, reaching seven area hospitals and numerous physicians in private practice. No other avenue exists for these doctors to receive this professional education. In addition, community groups can request specific programming from the extensive tape library. Special series have included all the "Literacy" specials produced by PBS, and a collection of Electronic Field Trips for K-12 schools. The ITFS system is also able to reach several remote sites with unique needs, including a federal prison and juvenile detention center.

Unique Programming. With the support of People's Choice TV of Tucson, a subsidiary of the Sprint Broadband Wireless Group, the University has expanded beyond medical and business education into programs such as Classic Arts Showcase, Deutsche Welle TV, NASA Select, and the Annenberg/CPB channel, all of which have generated overwhelmingly positive viewer response. These programs are not available on any other cable or broadcast service in all of Tucson. Other programs include "GED on TV" and "Workplace Essential Skills."

One University-licensed ITFS channel is utilized as a second "public broadcasting station," offering programs which could not fit in the regular broadcast schedule, such as Small Business 2000, Microeconomics, and Macroeconomics. And to meet the needs of the University's astronomy students, the ITFS system is also be used to link the community with a closed-circuit network to distribute programming direct from NASA.

Expanding Educational Opportunities. The wireless frequencies of the University of Arizona's ITFS system serve as a "last mile" solution for reaching students in underserved areas, and it is imperative that a two-way service be made available soon to

increase participation and access. With the assistance of its commercial partner, the University plans to digitize its ITFS capacity in order to be able to increase its general educational offerings. In addition, working together, the University and People's Choice are now rolling out high speed Internet access services for education and the public, making Tucson one of the early success stories in two-way fixed wireless broadband.

Devastating Losses without ITFS. The impact of any displacement of the University's ITFS capacity could be devastating to the broad community which depends upon it. Medical personnel at remote sites would have to come to a central location to attend lectures, thereby reducing patient time. Teachers across Arizona would lose an important media resource for their classroom. Students relying upon ITFS for higher education opportunities would be forced to come to campus (if possible), thereby increasing the need for costly, and currently unavailable, classroom space. The general public would lose access to the many quality educational programs that are currently distributed free of charge. Finally, the emerging offering of two-way high speed broadband wireless would be lost.

University of Colorado

Summary. The University of Colorado uses ITFS to promote a variety of important educational and community building goals. The University's Center for Advanced Training in Engineering and Computer Science (CATECS) uses ITFS as a distance education program that reaches hundreds of students in the Denver area. The University of Colorado Health Sciences Center uses the spectrum to broadcast state-of-the-art medical training to numerous area hospitals. Finally, the University's School of Journalism and Mass Communication uses ITFS to broadcast campus events; journalism students produce the television programs and the community benefits from the live coverage of local news, sporting events, University-sponsored lecture series, and other general interest programs. A partnership between the State of Colorado and private industry could expand the reach of ITFS by bringing broadband Internet to rural and hard-to-reach areas.

Distance Education for Students on the Colorado Front Range. CATECS is an ITFS-based distance education program that offers about 30 courses each semester. Courses are broadcast to over 30 sites in the Denver Metropolitan area. The program has a total enrollment of 1600 students per year, more than 300 of which rely exclusively on ITFS broadcasts to view the courses. A pioneer of distance learning since starting in 1969, the CATECS distance education program continues to innovate, now developing two-way video transmission capabilities that will allow for real-time interaction between the receive and transmitting sites. This capability will enhance classroom interaction and discussion.

Sharing the Latest Medical Research. ITFS broadcasts of the University of Colorado's Health Sciences Center's Grand Rounds to numerous local hospitals (e.g., National Jewish, Denver Health Medical, Children's, Rose, and Presbyterian St. Luke's Hospitals) allows this premier teaching hospital to share its latest research with area medical professionals. Several thousand doctors and medical students participate in continuing professional education offered over the ITFS system, providing busy health-care professionals with easy access to the new medical information they need to maintain high standards. A program to introduce two-way teleconferencing will allow for live interaction among the participants, allowing off-site professionals to participate more fully.

Community Building While Educating. The Boulder community enjoys live ITFS-based programming of athletic and campus events broadcast through ITFS to the ATI cable headend. Transmitting to 9000 ATI cable subscribers, these programs strengthen the University's ties to the community. Programming ranges from the World Affairs Conference to Women's Volleyball and Basketball games. In addition, these transmissions provide about 100 students a semester with the opportunity to learn about television production and broadcasting – an invaluable experience that these journalism students need for their education and future jobs.

CU also uses ITFS to transmit educational programming 24/7 to over 50,000 residents in Boulder and 2,000 University and 26,000 K-12 students. This programming appears on Research TV, a consortium of higher education institutions producing programming on critical topics in research.

Expanding the Reach of ITFS through Compatible Technologies. The availability of ITFS frequencies throughout Colorado provides an excellent opportunity to expand the reach and service of CU teaching and research efforts. The State of Colorado has an effort underway to build a high-speed fiber optic network, called the Multi-Use Network (MNT). The MNT strategy is to aggregate the telecommunications requirements of state and local government to leverage the development of an advanced telecommunications infrastructure. As designed, the MNT will link 70 high volume access points in county seats and other select locations. The hundreds of locations not directly linked to the MNT but within the 35-mile radius of a local ITFS licensee could then receive educational programming and materials from any of CU's campuses.

A Glimpse of the Future: Advanced TeleHealth Applications. The University of Colorado is the State's only academic Health Sciences Center and its School of Medicine is the only medical school within 500 miles. Through its myriad hospital affiliates, rural health care centers, community outreach programs, and a renowned program in telemedicine, CU's Health Sciences Center delivers a range of programs and services to communities statewide, including correctional institutions. With medical consultations in particular, the ability to transfer high quality images is essential, but often is limited by lack of an adequate telecommunications infrastructure in many regions of the state. The two-way broadband capabilities of the next generation of ITFS service would support a wide range of telehealth services, including genetic oncology consultations, bone marrow transplant consultations, ultrasound and echocardiogram interpretation and consults, teleradiology image transfers, correctional care consultations, and ongoing patient assessment and monitoring of patients who are unable to travel to Denver.

Plans for Broadband. Implementation of wireless broadband services at the University of Colorado could span locations along Colorado's Front Range. For example, a high-speed wireless infrastructure will allow the University of Colorado at Colorado Springs to deliver content to rural schools in the Pikes Peak region that may not have access to broadband connections to the Internet. The plan is to build on three highly successful programs that already exist, including outreach programs for K-12 schools, teacher training in math and science, and college math classes for gifted high schoolers. With a high bandwidth network linking CU's four campuses, these programs, and in fact any CU-originated programs, could be carried over the network and retransmitted over the ITFS systems in Boulder and Colorado Springs.

Generating Revenues for Education. The University leases its excess capacity to ATI/Sprint Wireless Broadband Group, earning substantial revenues that help support its distance learning and community service programming.

University of Maine System

After Mary Ruth Galvin serves breakfast to her two children and sends them off to school each morning, she walks fifteen minutes to the local community center. There she is enrolled in college courses broadcast from the University of Maine System over the Instructional Fixed Television Service (ITFS). Mary Ruth is a single mother and fits the profile of most distance education students at the University of Maine System. Caring for two children, one an eleven-year-old daughter with Downs Syndrome, the local community center is as far as Mary Ruth can go for the education she desperately needs to support her family.

The lives of islanders off the coast of Maine revolve around the weather, the tides, and the ferry that connects them to the mainland once a day. The majority of these isolated citizens lack a college education and many live below the poverty line. Their connections to the University's ITFS service, which transmit educational programming throughout the state, are invaluable lifelines that hold the key for brighter, more remunerative, futures.

Bringing an Education to Rural Maine. In the early 1980's, the University of Maine System began a distance education program to reach the state's dispersed populace. Today, ITFS frequencies are used to transmit courses from 7 University of Maine System campuses to 13 university locations and to 70 additional sites throughout the state, linking thousands of students who previously had been out-of-reach. The University offers 7 associate degrees, 6 bachelor degrees, and 4 master degrees programs over ITFS. Each year, over 28,000 credit hours are taken by voracious learners all across the state.

Working to Broaden Economic Opportunities. ITFS has allowed the University to bridge the chasm that prevents geographically separated students from obtaining the education they need to progress economically. "Without the campus viewing location on the island, it would be impossible for me to have an education," Mary Ruth explained. Many other students at the center are also grateful for the access to courses. While the island was once exclusively dependent on the fishing and lobster industries, today many are seeking new careers as they economically diversify their community.

ITFS Bridging the Gap Between People and Opportunity. Other areas of the state are as far from educational facilities as the islands. Jackman, Maine is a two-to-three hour drive from the closest University campus. The small population has no broadband access to the Internet, and where there is access, in most cases this consists of slow 56K dial-up. Yet residents of Jackman, the islands, and other remote areas around the state all have access to live ITFS programming in a variety of subjects.

April Kalloch appreciates the opportunity she had to attend University of Maine System courses at the local Katahdin Area Training Center. April lives over an hour from the nearest movie theatre, shopping center, and the university campus. Obtaining her AA

degree at the center was a huge accomplishment for someone with four children and a home to manage. “I was a non-traditional student,” she said, “I liked easing back into the educational arena in an environment of other women like me. We were a support group for each other.” The Center maintains a library of reference materials, computers and a lab. April continues to take courses from the University at this remote site, and plans to ultimately relocate her family to the University’s main campus where she will complete her degree in Education.

ITFS has also been a valuable resource for Maine’s private sector. For years, companies like Maine-headquartered financial giant MBNA have provided their employees with the opportunity to achieve their degrees in the workplace. ITFS has also served to provide continuing professional education for state employees, such as those at State Mental Health Institutions.

Giving Back to the Community. Mary Ruth Galvin has two years left in her degree program. She has used the time saved not commuting to a mainland campus to write a grant for funds for a drug and alcohol awareness program that she will implement at the high school her son attends. “The island has a terrible problem with youth and alcohol,” she said. “I want to use available funds to persuade my son and his classmates to make the right choices when it pertains to drugs and drinking.”

Mary Ruth stays on the island because she sees it as a haven for her Downs Syndrome daughter. All her neighbors know her daughter. The safety, security, and informal community assistance provided by fellow island dwellers have been critical to their family’s happiness. Yet ITFS has ensured that neither Mary Ruth, nor any of her fellow islanders, is cut off from educational opportunities that they will use to make Maine a better place to live even as they improve their own economic prospects.

University of Minnesota

Summary. The University of Minnesota has delivered high-quality educational programming to distance learners for thirty years. In addition to traditional classes for degree and non-degree students in the greater Minneapolis-St. Paul area (including neighboring Rochester, MN and Chippewa Falls, Wisconsin), ITFS has allowed for a unique partnership between the University and industry to promote the lifelong-learning that experts agree is essential to keep workers competitive

Keeping Workers Competitive. UNiversity-Industry Television for Education (UNITE) grew out of the pressing need of employers in the area to provide employees with rigorous, ongoing professional education. Currently, employees at the 31 member companies — including IBM, 3-M, and Seagate – obtain credit and noncredit courses at 38 corporate sites. The courses offered by ITFS have become an invaluable resource that local companies use to attract and retain valuable employees.

Corporate students are kept abreast of the latest technological advancements by viewing non-credit short courses, colloquia and seminars originated from various college departments, and advanced technology management programs from the National Technological University Satellite Network. As needed, the live broadcast material is supplemented by the purchase of prerecorded programming which UNITE member companies may borrow at any time from this growing library.

Responding to Changing Educational Needs. This ITFS-based program responds to a pressing need to give older, non-traditional students access to education. According to the recently released Report of the Web-Based Education Commission to the President and the Congress of the United States, students over the age of 24 increased 235% between 1970 and 1993. These students require flexible responses to their growing learning needs.

In keeping with this national trend, Minnesota's distance education students are generally twenty-five to forty-five year old people who never attend classes on campus. Nonetheless, live ITFS broadcast classes allow distance learners to attend class simultaneously with campus-based students with voice interactivity using the audio response channels associated with ITFS channels. This interaction between off-site and on-site students has proven invaluable; the campus-based students benefit enormously from the "real world" experience of the remote students and class discussions are lively and productive.

Annually, on average, 700 professionals register for courses. Without this program, students ninety miles away from the University of Minnesota campus would have no access to courses that can lead to either a bachelors or masters degree in a variety of technical subjects. Degree and non-degree courses are offered in Computer Science, Computer Engineering, Electrical Engineering, Mechanical Engineering, and, beginning

next fall, Biomedical Engineering. Each year approximately 35 students obtain their Master's Degree attending one or more of the approximately 55 courses offered per semester at non-campus locations.

Partnering for Expanded Service. The UNITE program is a completely self-financed program earning revenues from subscriptions, tuition, and now from an agreement with WorldCom Broadband Solutions. In response to the growing demand for ITFS courses, the University of Minnesota has signed an agreement with WorldCom Broadband Solutions to expand the University's ITFS capacity. Through digital technology, WorldCom Broadband Solutions will expand the capacity of the ITFS spectrum giving the University up to four additional channels for new programming. In addition, WorldCom Broadband Solutions will pay the University a fee that will go to support distance learning at the University of Minnesota. WorldCom Broadband Solutions will use the rest of the ITFS excess capacity to bring digital broadband services to its customers in the area.

University of Southern California

Summary. Since 1971 the University of Southern California (USC) has been delivering ITFS-based educational programming to southern California residents. The program has grown from a few engineering classes to a comprehensive program serving 2,500 students per year. USC courses are delivered using ITFS to corporate sites and community programming is shown on local TV cable systems to the expanding Los Angeles community.

Distance Education for a Changing Workforce. USC's student population reflects the national trend of older working adults returning to college, either full or part time. Nationwide, it is estimated that 77 million adults are enrolled in post-secondary coursework; this is the fastest growing segment of American students today according to Arthur Levine's study, *The Remaking of the American University*. Only 16% of students fit the traditional college student profile of an 18-22 year old living on campus and attending full time. One reason for these fluctuating demographics is a job market with more jobs in information technology and fewer in manufacturing. As institutions like USC respond to the changing marketplace, the flexibility an ITFS based distance learning program is required.

Los Angeles students' unique needs require distance learning: urban sprawl, traffic congestion, and long commutes make an education inaccessible for many if they have to travel to USC's campus near downtown LA. Many employers throughout the greater Los Angeles metro area have taken advantage of USC's engineering courses, making them available to their employees, an endorsement of benefits these classes bring to their workforce. As USC has responded to student's growing needs, USC has expanded its ITFS broadcast programs to include; credit and professional development courses from the schools of Business, Social Work, and Education in addition to the graduate degrees bestowed on distance education students from the School of Engineering.

Cable for the Community. USC's community programming has received high marks by members of Los Angeles' diverse community. A 24-hour channel broadcasts on a wireless cable alternative called TeleTV, owned by WorldCom Broadband Solutions, and portions of the daily programming are aired on a community educational channel appearing on several other cable systems. USC is one of five local Los Angeles area institutions of higher education who share the programming time each day. The USC cable schedule reflects USC's Annenberg School for Communication programming primarily during the school day and European programming in the evenings. Occasionally, USC airs presentations by internationally renowned speakers, commencement ceremonies, and other significant campus happenings that enhance relations between the University and the surrounding community.

Partnership of Business and Higher Education. Each year approximately 2,500 students earn USC credit taking courses on more than half a dozen ITFS channels. The

University earns \$3.5 million in tuition a year from courses provided to students on ITFS. USC also earns revenue by leasing excess ITFS capacity to WorldCom Broadband Solutions, who uses the capacity to provide a cable alternative in the greater Los Angeles basin. As a part of the lease agreement, WorldCom installs and maintains the ITFS equipment at locations around southern California. These revenues help to offset distance learning expenses incurred by the School of Engineering at USC.

The University of South Florida

Summary. The University of South Florida (USF) pushes the educational and technological limits of distance learning through ITFS and other supporting technologies to bring educational opportunities to students throughout Florida. Originally conceived as a way to extend programming to its four regional campuses, USF now offers 285 courses to over 12,000 students annually in a wide variety of subjects using numerous delivery systems. Now it hopes to renew the power of ITFS and bring broadband services to both improve and increase student access to USF and lifelong learning.

Access and Accessibility for Skilled Workers. Thanks largely to the success of their ITFS program, the concept of distance education has evolved at USF to encompass a wide variety of options for students. "It's about access and accessibility," explained Lynn Rejniak, Director of Research and Development for Educational Outreach at USF. "Distance learning is no longer just about distance. Time, convenience, and other factors such as customized learning approaches are accelerating the charge for technology integration into education."

In 1984, in an effort to expand program offerings at its four regional campuses, USF obtained ITFS licenses and built a network to provide live classes with audio interaction to students at all four campuses. A few years later the University's College of Engineering began offering degree programs for engineers employed in the private sector and the military. This engendered the creation of the Florida Engineering Educational Delivery System (FEEDS), a cooperative effort among Florida's public universities, the State Legislature, and industry designed to address the need for technical master's degrees to older, full-time employees. ITFS is the primary means for which USF delivers graduate education to working engineers participating in FEEDS; over 700 engineers have earned master degrees since the programs' inception. Today, USF holds 6 ITFS licenses consisting of 24 channels that deliver courses to over 50 site-based locations.

Win-Win Partnerships with Telecommunications Companies. In the early 1990s, USF began entering into lease agreements with wireless cable providers to leverage its ITFS capacity. These agreements resulted in both technological and financial gains for USF. The funds paid to the University contribute to facilities maintenance and equipment repair. In 1995, USF beta-tested one of the first digital ITFS operations. Digital technology has increased the overall capacity of the system and, in a win-win agreement, both the University and the telecommunications company were able to use the expanded number of channels. In addition, further educational technology innovations, such as increasing the reach of the ITFS programming, came as a result of these public-private sector partnerships.

ITFS Bringing Affordable Broadband to the Region. The University of South Florida is also anxious for its corporate partners to deploy broadband services within the

University's 10 county service region. A current contract with Time Warner cable provides USF faculty, staff and students with high-speed access for a discount off the regular subscriber fee. For those that live and work outside Time Warner's service area, the University hopes to have its commercial partner launch a high-speed wireless broadband product. In addition to furthering the opportunities of USF's students, this ITFS-spurred competition could ultimately mean reduced rates for high speed Internet access for many Floridians.

Reaching a Diverse Student Body. Distance education at USF has expanded far beyond engineering coursework. Although engineers continue to obtain graduate degrees, 12,270 students are today offered over 285 courses. Web-based courses, videoconferencing and iTV (interactive television) are just some of the options available to students. Barbara Emil, Dean of Educational Outreach explained, "courses are designed for groups of students who gather in locations convenient to their homes or workplaces and for individuals who prefer a more independent learning model or require 'anytime/anyplace' opportunities for participation. Delivery systems accommodate the educational needs and technology preferences of students who can't wait to get the very latest computer equipment and those who still haven't learned to program their VCRs."

The Future is Now: Expanding Educational Horizons. The University of South Florida is considering implementing two-way educational technology to better utilize its ITFS capacity. "Many of our wired networks along with our satellite system support voice, video, and data services. With the advent of digital two-way, the hope is that ITFS will soon be able to provide that same flexibility," said Ms. Rejniak.

"I look forward to the day when the type of network a student has access to no longer limits what course or course material they have access too. This is an important point to keep in mind as wireless networks are being heralded as first and last mile solutions," says Rejniak. The ever-increasing demand of students constrained by time and/or place requires more robust educational networks. Versatile broadband services can improve the quality of Internet-based learning, including web-based courses using streaming audio and video. Using its valuable ITFS capacity, the University of South Florida will continue to work closely with faculty as they develop new applications designed to ensure that students far and wide will have access to educational opportunities.

WHRO Center for Public Telecommunications

Summary. WHRO, a PBS and NPR affiliate in Norfolk, VA, provides a variety of traditional educational programming to more than two dozen school districts and 14 colleges and universities located in the Hampton Roads area via their ITFS system. In addition to educational programming, WHRO operates an extensive telemedicine network using the ITFS spectrum, reaching medical professionals in Virginia, Maryland, and North Carolina.

Current Capacity. WHRO is a public broadcasting station providing television and radio broadcasting to the Hampton Roads area. Owned by a consortium of 13 school districts, WHRO provides a wide range of ITFS-based educational programming to k-12 school districts, private schools, junior colleges, four year colleges, universities, and the community. Thanks to their partnership with a wireless provider, WHRO was one of the first digital systems in the country, and currently provides 6 channels of programming over its spectrum. Through its broadcast facilities, WHRO reaches from Williamsburg, Virginia to North Carolina's Outer Banks, and to Maryland's Eastern Shore. The vast majority of this broadcast area is relatively sparsely populated.

In the mornings, WHRO provides 3 channels of educational programming to k-12 institutions. This programming reaches 27 districts and private schools in the area, and in addition to regularly scheduled programming, WHRO provides on-demand programming for teachers with specific needs. In the afternoon, these 3 channels broadcast higher education programming to members of the Virginia Tidewater Consortium for Higher Education, a group of 14 colleges and universities (public and private) in the area. Overall, educational programming is received at more than 150 sites, including k-12 schools, corporations, hospitals and other health care facilities, and college campuses. In addition, on their fourth channel, WHRO broadcasts college courses that are rebroadcast to area cable subscribers, giving almost half a million cable subscribers the opportunity to take or audit college courses from home. Much of this programming is provided live, allowing home-viewers to interact with professors in real time. The fifth channel is used for a local weather channel, which is also rebroadcast by local cable companies.

In addition to the traditional educational programming, the system is used for extensive professional development by almost a dozen school districts and a local private school. By broadcasting over the ITFS system, these districts remove teachers from the classroom for shorter periods of time, cutting back the need for substitute teachers and saving the districts significant resources. As this system is modernized for two-way broadcasts, the teachers from all over the region will be able to share educational materials, best practices, and other resources with one another with ease.

Cutting Edge Applications. WHRO's final ITFS channel is used for an exciting telemedicine project that networks doctors in Maryland, Virginia, and North Carolina.

Funded by the Virginia Health Care Foundation and based at the Eastern Virginia Medical School, this channel reaches 19 sites across the tri-state area, including hospitals, rural health clinics, colleges, community health centers, and private practice physicians.

The telemedicine project was spurred by the goal of keeping physicians in this largely rural area connected to their peers and the need to support the training of new primary care providers in the area. This network allows residents from the medical school to practice in relatively rural and isolated areas, such as the Eastern Shore, but still talk to and interact with physicians at the medical school (which is an hour away or further by car), and allows residents to participate in Grand Rounds at the hospital even when they're practicing far from the school. The network also serves as a resource for practicing physicians who need medical continuation credits and consultations. For example, physicians on Virginia's Eastern Shore save three hours of round trip travel time for every class they take over the ITFS system, allowing them to spend more time with patients and to better allocate their extremely limited fiscal resources. It also allows these professionals to participate in a broad range of courses spanning a number of different specialties. Training via ITFS is widely used by doctors to keep up on the latest developments and research in the medical profession, and video-based consults have saved doctors and patients hours of time and thousands of dollars that would have been spent traveling and processing paperwork.

In addition to serving medical professionals, the ITFS-based telemedicine network at WHRO also serves as a resource to the public. Many public health facilities run the programming over their television systems within the facility, allowing members of the public visiting a doctor an inside look at medical information.

Wilson Independent School District

Summary. Because of ITFS, the citizens of Oklahoma have richer, more connected lives. ITFS programming distributed by cable brings community programs, such as “Oklahoma Moments,” into the homes of thousands. This programming reveals the proud history of Oklahoma’s towns and enhances community ties. Through ITFS, teachers get state-of-the-art training, and students get access to classes that can win them scholarships for college educations. Soon, a partnership with Nucentrix Broadband Networks will make fast, affordable wireless broadband Internet access a reality for rural Oklahomans.

Strengthening Community Ties. The residents of Wilson and Ringling know all about the history of their Oklahoman towns because they learn about it on “Oklahoma Moments,” which airs twice weekly on their local ITFS channel, operated by the Wilson Independent School District. The history program “lifts up the people of the community and keeps our history alive for our kids,” explained Correna Wilson, the program’s founder. ITFS has given residents in Wilson and nearby towns the opportunity to meet new members of their community, hear from public leaders, learn about regional history and find out about what fellow students are doing in their communities. “Oklahoma Moments” and other educational programming like it are broadcast around the clock on both the local cable and wireless cable systems. The signal reaches both cable headends via ITFS.

Improving Educational Opportunities. Teacher training and community programming are also regularly produced in-studio and broadcast throughout the District. The Carter County Health Center produces programming on parenting skills, childcare, vaccinations, counseling and sexually transmitted diseases. Computer training and Adult Education programs have also been used to enrich the community.

ITFS is also making higher education a reality for more young people in rural Oklahoma. Wilson Independent School District uses its ITFS capacity to provide eight nearby schools with courses in Spanish and Physics. With the introduction of the OLAP scholarship program, a state-funded program to make college accessible to all, languages have become essential; to be eligible, students must take a “college-bound curriculum” including two years of a foreign language. In a small city like Ringling, Oklahoma, approximately 40 students are enrolled in Spanish (out of 235 students in the 7th-12th grades). “Even if we could find a Spanish teacher, we couldn’t afford to pay them for that few students,” said Mr. Fincher, the principal of the Ringling High School. The OLAP scholarship is the key to these students going to college. Approximately 75% of the students in the District qualify for free or reduced-price lunches, and most cannot afford college without financial assistance. Only “about 40% of our students go to college,” explained Mr. Fincher. Without the OLAP scholarship – which is possible only due to the courses offered via ITFS – the percentage of students attending college would be much lower.

More Educational Programming and Better Connectivity. Next year, ITFS will provide southern Oklahoma high school students with access to German, French, Sociology, Psychology and Math classes, as well as a wide range of Advanced Placement courses. ITFS will also strengthen the partnership which allows some high school seniors to benefit from concurrent class offerings at the local community college by upgrading the high schools to a two-way broadband Internet connection.

A Partnership of the Public and Private Sectors. Nucentrix Broadband Networks leases capacity from the school district in exchange for converting the District's ITFS capacity to digital and launching an affordable wireless broadband product for the region. Although the metropolitan areas of Oklahoma have some broadband capacity available to businesses and residents, much of rural Oklahoma lacks broadband access. The Wilson-Nucentrix partnership has put fast, affordable Internet access on the horizon for the surrounding Oklahoma community.

WLRN-TV

Summary: WLRN delivers instructional programming to 366,000 elementary and secondary school children in the Miami-Dade Public School System. Through the ITFS on-demand system, teachers may request a specific time for a program to air, and WLRN routinely has requests for 7 hours of programming each school day. The extensive WLRN library of programming allows a concentration of expertise; no one school could have as many tapes or the staff necessary to acquire appropriate programming. This valuable program has required an enormous investment by the school system; almost \$10 million in fixed costs were required to make this heavily used system universally available in the Miami schools. In addition, Florida International University (FIU) uses an ITFS channel for its distance learning program.

Bringing the World to the Classroom. The instructional videos available through WLRN allow children access to resources and information they could not acquire anywhere else. The video library's extensive holdings range from Art and Substance Abuse Education to Science and U.S. History. WLRN regularly broadcasts programs in Economics, Spanish, Health, Reading, Social Studies, Geography, French, and Career Education. About 660 new programs are available every two months, reflecting the enormous diversity of teaching needs, requests, and resources available. The catalog of programs is available on two additional ITFS channels, and teachers find the system for requesting videos easy to use, quick, and reliable.

An Irreplaceable System. To make this program universal, WLRN has spent almost \$10 million to outfit schools with television sets, receivers, transmitters, and other essential equipment. Perhaps more significant is the concentration of expertise created by the ITFS system; no one school could possess an extensive library of over 6,000 videos and certainly could not afford the specialized media staff necessary to research and acquire the best and most useful programming. WLRN also realizes large cost-savings as a "bulk" buyer that could not be duplicated if individual schools were making purchases. Only 13 staff members—including field technicians to maintain the equipment—are needed to meet the needs of over 310 elementary, middle, and high schools.

Bringing Two-Way Learning to the Classroom. WLRN plans to expand to develop a two-way system for distance learning. After approval of the two-way license application, WLRN plans to implement interactive programs that would not be available to students otherwise. It will begin with advanced placement classes for high school students; the students qualified for these courses are too dispersed to justify a teacher in any one location. In addition, new plans for digital capabilities will allow WLRN to stream data and video over its system, providing them with invaluable speed and a back-up system to its existent wide area network.

Distance Learning at the University Level. Florida International University offers a variety of classes using one channel of WLRN's ITFS system. Among others, it offers

classes for teachers allowing them to pursue certification, master's degrees, or continuing education credits. In addition, FIU has launched the "Gateway Program," which targets minority and underprivileged high school students and supports their efforts to pursue higher education in the sciences. Using the ITFS system, these students are able to overcome the enormous barriers that this dispersed, diverse, and otherwise underserved group of students face and take these challenging science and engineering classes via the ITFS system.

Serving the Community. In an area with a large Spanish-speaking population, WLRN's ITFS system provides an educational Spanish-language station that links to the major cable networks in the Miami-Dade area. In addition, using ITFS technology, WLRN broadcasts Spanish-language programming, including ESL and high quality news and entertainment programs.

Helping to Support Irreplaceable Programs. The Miami school system has an agreement with Bell South that will allow WLRN to go digital, doubling the number of channels available to the school district and giving Bell South access to the excess capacity for its customers. In exchange, Bell South will pay the school district, contributing substantially to its distance learning budget, as well as funding the conversion to digital that allows the additional channels to be created.