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

In the Matter Of:

Mobile Telecommunication Technologies Corporation	)	
Petition for Rulemaking to Allocate 150 kHz in the 930-931 MHz Band and to Establish Rules and Policies for a New Nationwide Wireless Network (NWN) Service	)	RM - 7978 ET 92-100

PETITION FOR RULEMAKING

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for

MOBILE TELECOMMUNICATION
TECHNOLOGIES CORPORATION

Dated: November 12, 1991

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SUMMARY

Mobile Telecommunication Technologies Corporation ("Mtel") urges the Commission to adopt rules and policies providing for the licensing of carriers to operate in a new Nationwide Wireless Network ("NWN") Service. Three nationwide licensees should be authorized. Each of these licensees would employ a 50 kHz channel in the 930-931 MHz band for a two-way, high speed messaging service to portable terminals.

To illustrate the vast capabilities and potential of an NWN service, Mtel also describes in its petition an efficient means for implementing NWN. As operated by Mtel, an NWN facility would feature:

- Nationwide determination of the relative location of subscribers;
- Two-way and one-way high speed data communications;
- Wide area coverage expandable in a straightforward and economic fashion using proven simulcast techniques;
- Spectrum efficient enhanced multitone modulation; and,
- Large regional zoning for capacity re-use.

A high capacity infrastructure and an intelligent architecture to manage the network are the keys to implementing NWN in a modest amount of spectrum.

Mtel predicts that demand for NWN service will prove to be substantial. By 1996, Mtel forecasts an installed base of more than three million units equipped for -- and needing -- the data transfer capabilities that could be provided by NWN. NWN

will address the need for a universal, highly flexible open access data transmission medium. In so doing, NWN will bring to the two-way data market the ease of use and vast coverage now available in the nationwide paging service.

Mtel also has proposed herein a regulatory framework designed specifically to increase substantially the options available for the digital transmission of two-way messages by allowing licensees considerable flexibility to design innovative NWN systems. Sharing the Commission's concerns with regard to speculation and delay in the initiation of service to the public, however, Mtel also has proposed rules in this petition that call for threshold demonstration of applicant qualifications, selection from among competing mutually exclusive applicants by expedited comparative hearings, and limitations on alienability of NWN licenses.

Mtel believes that NWN is capable of satisfying an acute and growing need for wireless two-way data transfer services. As shown in Mtel's petition, NWN services can be made available now, and, unlike many proposals, NWN will not be a stopgap measure. Rather, NWN offers evolutionary capabilities that will allow NWN to remain a viable and functional service for the foreseeable future. Mtel consequently requests the Commission to act favorably upon its petition and initiate a rulemaking to explore fully the potential for NWN service.

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PETITION FOR RULEMAKING

Mobile Telecommunication Technologies Corporation ("Mtel"), by its attorneys, hereby requests the Commission to initiate a rulemaking to allocate 150 kHz in the 930-931 MHz band and to establish rules and policies for a new Nationwide Wireless Network ("NWN") service. Mtel submits that an allocation of 150 kHz is in the public interest because it would permit three licensees to establish high capacity two-way nationwide data networks.

I. INTRODUCTION

A. Mtel Consistently Has Been a Pioneer In Developing And Implementing High Technology Wireless Services

Mtel and its corporate predecessors consistently have been world trendsetters and pioneers at the forefront of messaging developments, with extensive experience in designing, constructing, and operating high technology wireless communications

services. Mtel and its subsidiaries hold licenses in the nationwide paging service, the public air-to-ground service, the specialized mobile radio service, and various marine radio services. Mtel and its corporate predecessors have over five years of experience as nationwide system operators and over fifteen years of experience as wide area system operators.

Mtel consistently has been at the forefront of messaging developments. In 1965, Mtel's predecessor company obtained an FCC license to operate a then state-of-the-art paging service. Seeing the future for messaging services, by 1973 the company acquired nine additional paging companies and applied for and received FCC licenses to operate paging services throughout much of the southeastern United States and in New York State.

In the early 1980's, Mtel was actively involved in the FCC proceedings regarding allocating spectrum for a nationwide paging service. Mtel was convinced that consumers would respond favorably to a high quality nationwide service. Ultimately Mtel's subsidiary, SkyTel, Inc. ("SkyTel"), was awarded the first nationwide paging license at 931.9375 MHz.[1] At that time, three construction permits

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[1] The license was awarded in 1985 to "American Satellite Paging." Since that time, the ownership of the company and the name have changed. The name was officially changed to "SkyTel" in 1989. At present, Mtel owns approximately 91 percent of SkyTel and the remainder is owned by Radiofone, Inc.

for nationwide paging were awarded but Mtel was the first licensee and the only one of the three that successfully built and launched a nationwide paging service.[2]

As predicted, SkyTel's nationwide service has become more and more popular. Business executives who frequently travel have discovered it to be an invaluable tool which provides uninterrupted reachability across the major cities of the U.S. combined with convenience, privacy and security.[3] SkyTel had approximately 19,800 units in service as of December 31, 1988. By September of this year, that figure had grown to over 115,000 units in service, an increase of approximately 580 percent over a 33 month period. Forecasts are for continued high growth and, in fact, one report estimates that the number of nationwide pagers by 1995 will reach 870,000.[4]

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[2] Development of the service involved the creation of sophisticated central computer technology, with toll-free access and a spread-spectrum VSAT satellite interconnection system. Several monitoring and alarm functions also were built into the nationwide paging network to ensure maximum reliability and minimum downtime.

[3] SkyTel typically transmits radio pages to any network city in less than one minute. Callers reach the central computer using a toll-free number. The computer's synthesized "voice prompts" guide the caller through steps to enter messages or to use any of the more than a dozen pager functions. The computer validates subscribers' personal identification numbers, records billing information, formats messages and transmits them to the satellite uplink terminal. The messages are uplinked to a satellite which rebroadcasts them simultaneously to each downlink terminal in every SkyTel network city. The paging messages are then fed to terrestrial transmitters for simulcast transmission to paging receivers on the 931 MHz frequency.

[4] Donaldson, Lufkin & Jenrette has modeled the nationwide paging industry and has concluded that "10-15% of total paging customers will eventually subscribe to a nationwide system. Currently, estimates call for 10-15% annual growth in the current 8 million-subscriber paging population, resulting in approximately 15.1 million paging customers in the U.S. by 1995. Going out to 1995, our model conservatively places aggregate nationwide paging subscribers at 870,000, or 5.7% penetration of total pagers. . ." Donaldson, Lufkin & Jenrette, Company Analysis of Mobile Telecommunication Technologies, June 19, 1990, at 5.

Mtel also is a major shareholder in the American Mobile Satellite Corporation ("AMSC"), the consortium licensed by the Commission to provide mobile satellite service in the United States. AMSC's mobile satellite service will provide a full range of advanced, high technology land, maritime and aeronautical message services, including public safety services.

Mtel's paging innovation continues. In addition to operating the first nationwide messaging network, Mtel recently announced the first 2,400 bps simulcast messaging technology.[5] Even more recently, Mtel announced plans to provide nationwide one-way wireless mailbox service to AT&T's Safari™ computer through the SkyTel network. In this service, AT&T's Easylink™ electronic mail service will be linked to SkyTel via a gateway and permit users to send mail to Safari™ computers equipped with a low cost adapter.[6]

B. Mtel Has Developed A Needed, Affordable and Efficient Nationwide Wireless Network Service

Mtel's extensive experience with a broad base of communications systems provides it with unique insights into identifying public need for new radio services. In this petition, Mtel addresses a deficiency in commercial radio services designed to meet the growing data transmission needs of portable computer users. Although a number of

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[5] *See Telocator Bulletin*, Vol. 91 No. 32, p. 2 (August 11, 1991).

[6] Although somewhat analogous to the proposed NWN service in terms of ease of use and area of operation, NWN will be a fully two-way service, unlike the Easylink™ gateway service.

radio based local area network concepts have been proposed and eventually may provide wireless office data transfer capability for portable computers, the benefits of this technology have not been extended much beyond the physical building. Some two-way data services have been designed for specialized out-of-building applications. These services, however, lack universally accessible and adaptable public interfaces; the nationwide, ubiquitous coverage familiar to today's one-way messaging customers; and adequate building penetration characteristics.

Mtel anticipates extensive demand for a service designed to fill this void -- a nationwide wireless network ("NWN") service. NWN will provide an efficient and convenient means for the public to interchange data with users travelling throughout the nation as well as a mechanism to address the significant market for messaging where an acknowledgement to a message is required or desirable. Mtel's initial market research indicates that demand for a highly portable general messaging service from the installed base of portable computers alone potentially could reach up to 3.5 million terminal units by 1996, with combined demand from "answer-back" and "acknowledge-only" pager units even higher.

Mtel has designed an affordable NWN service to address these needs, transferring its extensive technical resources and knowledge of wide area simulcasting into the two-way context. Mtel's proposed NWN service departs significantly from the existing commercial radio service concepts. NWN is not just an adjunct or complementary service, but rather a full service that contemplates:

- A nationwide system with wide area coverage of metropolitan areas.
- A graceful, evolutionary deployment scheme allowing NWN to circumvent saturation by subdividing the existing network in a low cost, incremental fashion.
- An architecture facilitating efficient two-way transmission of short as well as extended length messages.
- Portable user terminals resembling "notebook" or "palmtop" computers in size and weight equipped with displays, keyboards, and extensive memory.
- Acknowledgment and error checking of messages sent or received by user terminals, including preformatted responses from pager-sized terminals.
- Nationwide automatic determination of the general location of subscribers.
- Enhanced, high-speed one-way messaging services.

Mtel's use of simulcasting is ideally matched to the coverage and spectrum requirements of the NWN service. While simulcasting is not appropriate for some real time applications such as voice, where users must be allocated dedicated subchannels composed of frequency or time slices, NWN's storage and queuing operation does not demand real time access. Conversely, spectrum efficiency measures utilized in real time systems, like FDMA cell-based re-use schemes or narrowbanding, are not ideal for systems where acceptable delay is measured in seconds rather than microseconds. Simulcasting, however, provides superior building penetration characteristics and permits simpler, less expensive expansion of coverage since there is no need to alter the existing time or frequency usage patterns of adjacent transmitters. Simulcasting

also fully utilizes all available capacity at any point, both in the frequency and time domains.

Previously, a service combining all of the characteristics of NWN would have been prohibitively expensive for both subscribers and carriers due to the spectrum demands and transmission technology required for implementation. In particular, the destructive summing of "mis-synchronized" signals that occurs in simulcast systems effectively limits the baud rate to approximately 3,000 baud.[7] Utilizing state-of-the-art modulation schemes, the 3,000 baud limit translates into an effective maximum bit rate of only 6,250 bits per second ("bps"), the rate proposed for the European Radio Messaging System ("ERMES"). At this throughput, either messages must be very short or subscribers must pay excessively high service costs.

Mtel, however, recently developed a proposed service offering that goes beyond the current state-of-the-art by incorporating several innovative technologies in a synergistic fashion to accommodate significant amounts of NWN traffic.[8] Mtel's offering not only will provide effective transmission rates up to 24,000 bps, but also will allow capacity re-use. Mtel's integration of highly advanced technologies thus will

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[7] The baud rate differs from the bit rate in that the baud rate describes the rate at which symbols can be transmitted, and the bit rate describes the throughput achieved by decoding the symbols into a binary stream. Mtel has described the limitation on the baud rate in detail in the attached Appendix B.

[8] Mtel concurrently is filing a request for a pioneer's preference for the NWN service. Mtel believes its advances in the current state-of-the-art for messaging services satisfy the Commission's criteria for award of a pioneer's preference as stated in *Establishment of Procedures to Provide a Preference to Applicants Proposing an Allocation for New Services*, 6 FCC Rcd 3488 (1991).

enable the proposed NWN service to be priced such that significant volumes of commercial traffic will be generated.

The key to Mtel's proposed NWN service offering is the marriage of high speed, spectrally efficient enhanced multitone modulation techniques with an "intelligent" infrastructure. By placing the burden of arranging compact and efficient communications on a central scheduler, Mtel will be able to meet expected demand with far less spectrum than would be possible using existing systems. Mtel, however, does not believe the Commission should restrict NWN operators to the specific system configuration developed by Mtel, although alternative implementations should provide a comparable level of efficiency, service quality, and throughput.

II. PROVISION OF NWN WOULD MEET A SIGNIFICANT DEMAND FOR TWO-WAY PORTABLE DATA COMMUNICATIONS

A. There is an Increasing and Unaddressed Demand for Economic, Two-Way Portable Data Communications

Increasing use of portable digital devices is driving demand for two-way wireless data communications. This demand from compact devices for high-speed, wide area, digital communications nationwide has not been met by current mobile services. In particular, demand for wireless data interchange with remote digital devices and electronic mail ("E-Mail") systems is unsatisfied by current commercial radio based providers, since current systems lack: (1) public interfaces that are both utilitarian and "user-friendly," (2) adequate building penetration, and (3) ubiquitous

wide area operation -- characteristics critical to serving today's portable user environment.

As designed, Mtel's NWN service will offer significant advantages over existing services in other respects as well. For example, unlike current systems that require that users to log on or to take affirmative actions indicating their position prior to receiving or transmitting messages, Mtel's proposed NWN architecture will automatically and transparently locate user terminals across the nation. Thus, a user need do nothing but push the "send" button to initiate a data transfer. Mtel also believes NWN will provide superior data transfer capabilities than current cellular systems, offering lower cost service, better building penetration, and, ultimately, wider service area coverage.

The explosive growth in use of laptop and notebook computers has created an acute need for two-way radio data transfer links. *Business Week* estimates that there will be 1.8 million laptops in use by 1992 and 2.3 million by 1993, apparently not even including the proliferation of proprietary handheld computer-based devices used by companies with widely dispersed employees such as delivery, maintenance and sales companies.[9]

Mtel's market research is consistent with these figures, and indicates that there will be a cumulative installed base of 3.5 million of these compact computing devices

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[9] *See Business Week*, March 18, 1991 at 119. The demand for such proprietary systems will be met in part by existing and other developing two-way data services even though Mtel's proposed NWN system may serve some of these needs. More notably, however, NWN is targeted to meet the demand for a universal system for a wide variety of users who require a large measure of public access.

equipped with RF capability by the end of 1996. Radio links are urgently needed to allow the highly mobile users of these portable computers to exchange data with personal computers, larger mainframe machines, and other notebook computers while away from the home or office.

Demand for radio links also is driven by the rapidly increasing sophistication of these portable computing devices. Notebook computers with greater computing power than some minicomputers of 10 years ago are available today for under $2000. The increased power of these devices has created demand for a plethora of new applications, from services as simple as electronic yellow pages, stock market quotations, database updating for sales personnel from national inventories, remote downloading of prepared sales agreements or contracts, and online airline reservations, to services as complex as transmission of specialized repair procedures for technicians in the field.

E-Mail represents a well understood, if simple, example of demand for NWN services. E-Mail already is a communications staple on local and wide area networks. The next logical step -- and one for which there already is growing demand -- is E-Mail to portables in the field. Because real-time interaction is not required, E-Mail messaging to NWN user terminals will be a highly efficient means of communicating with business executives or others on travel.

The power of combining reliable two-way wireless digital transmission with portable computers is immense. It is a power that also is untapped because adequate

spectrum has not been made available for two-way systems and technologies have not been implemented to enable user friendly, cost effective utilization on a universal basis. Allocating spectrum for NWN would alleviate much of this pent up demand, since custom interfaces and applications easily can be designed for NWN to accommodate a wide variety of data transfer needs.

B. NWN Will Allow Virtually Unlimited User Access for Message Origination

NWN contemplates a fully open user community utilizing a variety of adaptable interfaces. At one end of the spectrum, institutional users will coordinate with NWN system operators to obtain individually tailored computer-to-computer interfaces that may include encryption, specialized mapping of symbols to data, and specific codewords. These institutional users will be able to establish X.400 connections between their E-Mail systems and the NWN system. Importantly, this illustrates the application independent nature of NWN. Each user of the NWN system is free to establish its own unique association between symbols transmitted and message content. In other words, while one user may wish to transmit alphanumerics, another may wish to transmit proprietary database information.

The benefits of NWN, however, will not be limited to large institutions. For example, small businesses and individual users with modems will be able to access NWN via public telephone numbers. Users with E-Mail boxes on other commercial systems will be able to initiate X.400 transfers to the NWN system using the existing,

and thus transparent, E-mail interface. Confirmation of message delivery, driven by the NWN acknowledgements, will be stored and forwarded through the various NWN links. Users also will be able to access NWN operators via voice telephone for transcription and transmission of shorter messages. Notably, NWN user terminals will be able to initiate data transfers to the system that are routed to a specific subset of other radio or landline NWN users. Thus, the proposed NWN service will offer a multilayer, application independent interface adaptable to most user needs.

C. NWN Utility Would be Enhanced By Permitting Use of NWN as an "Answer-Back" Service

As with virtually all new telecommunications technologies, time is necessary to lower per unit terminal costs, to establish a basic infrastructure, and to penetrate the widest possible market for data services. One of the benefits of the NWN system will be its ability to offer the public an initial level of service on a less costly basis, satisfying some public demand while a larger two-way market develops.

Mtel's market research indicates extensive consumer demand for initial use of pager-sized NWN terminals with two-way, "answer-back" capability.[10] In fact, Mtel's initial research discloses a potential for several million "answer-back"

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[10] "Answer back" terminals, as opposed to "ack-only" terminals or fully two-way NWN terminals, allow transmission of an acknowledgement that a message was received coupled with one of several preformatted responses. For example, the messages could be mapped by a company to responses such as "yes," "no," "I will call," "busy," "emergency," etc.

customers, within realistic service and unit pricing ranges.[11] Further, because wide area forward channel transmitters can be deployed rapidly, one-way services could be provided even as the receiver network is established in new areas. Many of these one-way and "answer-back" customers are expected to upgrade their NWN equipment as prices for the larger units fall and consumers become aware of potential applications. At the same time, as demand increases, the system architecture provides for the infrastructure to grow to meet all demand.

III. MTEL'S MODEL NWN SYSTEM ARCHITECTURE ILLUSTRATES THAT EFFICIENT, EXPANDABLE AND RELIABLE TWO-WAY COMMUNICATIONS SERVICE CAN BE PROVIDED TODAY

A. Mtel's Model NWN System

In addition to describing below the allocation and rules that are necessary to establish a NWN service, Mtel has provided a specific and detailed model of how Mtel currently would implement NWN service.[12] The example illustrates the capabilities that can be readily developed, the highly efficient nature of the service, and NWN's commercial feasibility. A description of Mtel's model is summarized below.

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[11] Since "answer-back" terminals will consume far less capacity on the reverse channel, NWN will accommodate a substantial number of "answer-back" pagers without degrading capacity available for full NWN users.

[12] Mtel concurrently is filing an application for an experimental license to finalize its NWN system concept. Depending upon the results obtained through Mtel's experiments, the actual implementation of NWN could vary from the model summarized herein and described in detail in Appendix A.

As designed, Mtel's proposed NWN service offering will operate as a simplex system using a single 50 kHz channel. The forward (base to user terminal) and reverse (user terminal to base) transmissions will share the channel using a dynamic time division scheme to accommodate fluctuations in forward and reverse channel use. Both the forward and reverse channels in Mtel's system combine a number of advanced, but known, technologies to achieve a synergy in operation. For forward channel transmissions, Mtel's innovative design includes:

- *Nationwide Simulcasting*. Simulcast operation will enhance coverage continuity and building penetration, as well as allowing low cost network growth.

- *Enhanced Multitone Modulation*. Enhanced multitone modulation techniques, particularly appropriate for simulcast systems, will allow transmission speeds of up to 24,000 bits per second ("bps") on a 50 kHz channel.

- *Adaptive Zoning*. NWN's architecture will provide automatic "follow me" delivery of messages to users changing zones, enhancing operational efficiency.

- *Variable Length Batching*. Forward communications will be organized in repeating cycles. Each cycle is divided into dynamically adjusted address group time intervals, permitting efficient adaptation to variable load conditions.

Using enhanced multitone modulation, adaptive zoning, and variable length batching, NWN will be able to provide a high-speed, high-throughput simulcast network.

Mtel's proposed forward channel architecture employs simulcasting in a very spectrally efficient manner. As the Commission has recognized, there is no single

spectrum efficient technology.[13] The most appropriate technique depends upon the problem to be solved.[14] For NWN messaging, Mtel believes that high speed simulcasting offers the best solution.

Up to the capacity limits of the channel, simulcasting uses less spectrum than other methods that require additional channels to cover the same geographic area. Simulcasting also is a proven technique employed for over fifteen years in the paging industry. Mtel proposes to bring the advantages of simulcasting to two-way messaging. Portable NWN terminals will be small and likely will have relatively inefficient antennas. NWN user terminals also will need to operate from within buildings as well as inside vehicles. Simulcasting, with its ability to use controlled multipath, will place a more usable signal more often at a terminal's antenna. Use of a single frequency also will facilitate the deployment of additional base stations within a system and simplify the design of portable terminals. A more economic design without the need for scanning and the loss of time in locking onto a channel will mean longer battery life and more efficient operation. In short, for the substantial demand that NWN will address, simulcasting will afford a very efficient technique.

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[13] *See Amendment of Part 90 of the Commission's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Radio Services*, 3 FCC Rcd 5287, 5289 (1988), *recon. denied*, 4 FCC Rcd 6407, 6408 (1989).

[14] In some cases, narrowband may be appropriate, for other applications CDMA spread spectrum may offer the most efficient solution, and in certain circumstances cellular like frequency reuse may be desirable. These approaches, however, are not well suited to meeting the needs of likely NWN users.

For reverse channel transmissions, Mtel's innovative design includes:

- *Multiple Receiver Load Balancing.* NWN's base station receiver network will be more extensive than the transmission network. The aggregated reverse channel capacity from all NWN receivers thus will be greater than forward channel capacity, permitting lower reverse channel bit rates, a simpler reverse channel modulation scheme, and less costly user terminals. The narrower bandwidth of the low powered signal of the terminals also will allow the signals to be "protected" within the 50 kHz channel. This will make for more robust reverse channel operation. To some extent, the reverse channel capacity also can be increased by deploying additional receivers.

- *Efficient Resource Allocation Protocol.* NWN will employ a Contention Priority Oriented Demand Assignment ("CPODA") protocol to increase throughput by scheduling the great majority of reverse transmissions. Because requests to transmit are brief, only a fraction of each reverse channel subcycle will be devoted to unsolicited transmissions. CPODA thus minimizes the number of unsolicited transmissions, which limit spectrum efficiency because of "collisions" necessitating retransmissions.

- *Dynamic Scheduling.* Based on the known relative location of user terminals that have requested data transfers, network computers will dynamically schedule simultaneous responses to different receivers, achieving reliable, high throughput communication.

In conjunction, these technologies allow Mtel to deploy a base receiver network that efficiently accommodates a large number of users initiating short as well as extended terminal to base transfers.

Through an innovative combination of a number of advanced communications technologies, NWN has the ability to satisfy a substantial demand for digital two-way communications in a modest allocation. Largely, the efficiencies achieved by Mtel are the result of three interrelated factors: precise synchronization, nationwide operation,

and extensive network intelligence. Without precise synchronization, throughput would deteriorate as users compete to transmit, terminal battery life would decline as users monitor and decode all transmissions, and reliability would be harmed by lost acknowledgments. Without nationwide operation, certainty of locating terminals would be lost, with commensurate effects on Mtel's ability to zone for added capacity, and system synchronization would become haphazard. These two factors, when employed in a system that utilizes a high degree of computing power, produce a synergy in operation and permit a commercially feasible, singularly high throughput, two-way NWN offering.

B. Mtel's NWN System Capacity

For reference purposes, Mtel has developed an estimate of the total number of subscribers that could be accommodated on the forward channel of a mature NWN system. Mtel modeled systems operating at both 18,000 and 24,000 bps, the predicted throughputs of the two enhanced modulation techniques Mtel is considering. The model used variable message lengths up to 10,000 characters, with an average weighted message length of almost 3,000 characters. The model also postulated a well developed system with a number of multistate zones, but not a system at ultimate frequency re-use capacity. Using these assumptions and a 13 percent busy hour call rate, the model predicted that a 18,000 bps NWN system will accommodate over 600,000 users and that a 24,000 bps NWN system will accommodate over 800,000 users.

IV. THE COMMISSION SHOULD ALLOCATE 150 kHz FROM THE 930-931 MHz BAND FOR AN NWN SERVICE

Mtel recommends an NWN allocation of 150 kHz in the 930-931 MHz band for three 50 kHz simplex channels, permitting a competitive market with three providers.[15] Mtel believes the 930-931 MHz band is most appropriate for an NWN allocation, based upon its experiences with operating a nationwide simulcast system at 931.9375 MHz and the spectrum constraints for existing mobile radio services. The 930-931 MHz band, in particular, provides favorable signal propagation characteristics suitable for an NWN system. The allocation also would be compatible with the original intent of reserving 930-931 MHz for advanced technology paging since both one-way services and NWN contemplate high power, wide area, high capacity forward channel transmissions.[16]

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[15] At minimum, any allocation should allow for two providers. This would reduce the spectrum requirements for a full NWN implementation to 100 kHz, but retain the benefits of competitive markets available in numerous other services. *See, e.g., Cellular Communications Systems*, 86 F.C.C.2d 469, 474 (1981); *Multipoint Distribution Service*, 45 F.C.C.2d 616, 622 (1974) (mandating competitive markets with two independent providers).

[16] Telocator has filed a petition for rulemaking with the Commission requesting allocation of 930-931 MHz for "Advanced Messaging Services." *See Telocator Petition for Rulemaking to Amend Part 22 of the Commission's Rules Concerning the Use of 930-931 MHz For An Advanced Messaging Service*, FCC RM - 7617 (filed Jan. 22, 1991). Mtel, in fact, supported Telocator's petition in a filing dated March 11, 1991. Mtel believes its proposal is consistent with the general principles of AMS. In any event, Telocator's AMS petition requested release of a reserve allocation without proposing specific service rules. When service rules are adopted, there is no reason to believe that two-way messaging uses would not be contemplated. Mtel's petition, in contrast, is specific and proposes a particular use of a band within the proposed AMS spectrum, and adjustments to any contemplated rules that would allow use of 930-931 MHz for NWN.