

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

APR 22 1994

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of)
)
Amendment of the Commission's)
Rules to Establish New Personal)
Communications Services)

GEN Docket No. 90-314

SUPPLEMENTAL STATEMENT
OF
SANDY ABRAMSON

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April 22, 1994

No. of Copies rec'd 245
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EXECUTIVE SUMMARY

The testimony at the PCS Task Force hearings identified the many important benefits that will be provided by unlicensed PCS systems and devices. Unlicensed products are particularly well-suited to act as wireless extensions of the National Information Infrastructure with numerous applications for improving the delivery of health care and education to the public. These valuable applications will involve all types of unlicensed PCS offerings, both voice and data as well as coordinatable and non-coordinatable, not simply "nomadic data-PCS."

Unlicensed PCS also is expected to encompass a wide variety of new products that will complement rather than duplicate licensed PCS. Unlicensed PCS can be used for in-building and on-campus applications characterized by high user density and for high data rate transmission requirements. Other uniquely valuable attributes of unlicensed PCS products are: (1) customers' ability to purchase and use them without cumbersome licensing procedures; (2) their ease of deployment on a compatible basis nationwide; (3) the ability of numerous companies to create and market their own visions of unlicensed PCS technology and service applications in a robustly competitive industry; and (4) the absence of airtime charges for usage.

The record also strongly supports retention of the full 40 MHz allocation for unlicensed PCS. This is the minimum amount of spectrum necessary to meet the enormous demand for both isochronous and asynchronous equipment. Any lesser allocation would severely limit frequency reuse and deployment opportunities.

The evidence likewise supports maintaining the existing unlicensed PCS allocation at 1890 MHz - 1930 MHz. Other potential spectrum above 2.1 GHz contains many more microwave links than the existing allocation and would, thus, cost four or more times the amount in clearing fees than the current spectrum will require, which is beyond the ability of the industry to afford. In addition, the placement of the unlicensed PCS allocation adjacent to licensed PCS bands now facilitates the combination of the two types of offerings, for which there is substantial demand.

The witnesses at the hearings also noted the wide variety of potential unlicensed PCS applications which will involve all forms of coordinatable and non-coordinatable, isochronous and asynchronous products. Contrary to the suggestions of Apple Computer's witness, coordinatable and isochronous devices will have important education and health care applications. Moreover, many data-PCS applications involving PDAs will in fact be coordinatable because they will involve interaction with a centralized database, base station, or wireline infrastructure. Use of such an infrastructure will be particularly important to provide security and privacy protection for information in these sensitive areas.

Finally, UTAM commends the FCC for establishing a constructive hearing process that has served to crystallize the outstanding issues affecting unlicensed PCS. The Commission can now move forward with confidence in the soundness of its initial decision. As numerous witnesses noted, delays in authorizing both licensed and unlicensed PCS could substantially undermine the markets for those offerings.

Accordingly, the Commission should promptly finalize its rules to facilitate the deployment of valuable unlicensed PCS systems and devices.

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**SUPPLEMENTAL STATEMENT
OF
SANDY ABRAMSON**

Sandy Abramson, President of UTAM, Inc., hereby submits her supplemental statement addressing issues raised in connection with the PCS Task Force Hearings of April 11 and 12, 1994.¹ Both the oral and written submissions at those hearings detail the tremendous public benefits to be expected from unlicensed PCS. They additionally confirm the strong record support for retaining the full existing 40 MHz allocation at 1890-1930 MHz, including the current assignment of 1890-1900 MHz and 1920-1930 MHz for isochronous (mostly voice) equipment and 1900-1920 MHz for asynchronous (mostly data) equipment. Accordingly, UTAM urges the Commission to act promptly to reaffirm its existing allocation spectrum for unlicensed PCS in all respects and to move expeditiously to finalize the rules and policies governing the deployment of these important elements of the National Information Infrastructure.

¹ See FCC News Release, Mimeo No. 42480 (April 4, 1994).

I. UNLICENSED PCS WILL PROVIDE MANY IMPORTANT PUBLIC BENEFITS

A. The Record Confirms the Enormous Demand and Significant Benefits of Unlicensed PCS

As UTAM explained in its Written Statement, "[u]nlicensed PCS products will provide tremendous public benefits. Deployment of these systems and devices will provide a cost-effective and flexible extension of the National Information Infrastructure that will ensure economical and portable telecommunications capabilities. The enormous public demand for such products is already well-documented in the record of this proceeding."²

Deployment of unlicensed PCS systems and devices will (1) strengthen the American economy by creating new jobs and improving business efficiency; (2) ensure continued U.S. technological leadership in the global marketplace; and (3) enhance international competitiveness. Such benefits will be available to all Americans, from

² Written Statement of UTAM, GEN Docket No. 90-314, at 8 (filed Apr. 7, 1994). See Comments of Hitachi Telecom, GEN Docket No. 90-314 (filed Nov. 9, 1992) (citing a Dataquest Study of May 1992 estimating wireless PBX revenues as high as \$300 million by 1998); PCS Demand Forecast, Telocator, May 1, 1992 (predicting unlicensed office telephones will serve as many as 16 million users within five years after spectrum authorization); Comments of the Wireless Information Networks Forum, ET Docket 92-9 (filed June 5, 1992) (discussing need for at least 40 MHz for unlicensed spectrum). See Ex Parte Filing, GEN Docket No. 90-314, from SpectraLink Corp., Ericsson Corp., Motorola, Inc., Northern Telecom, AT&T, and Rose Communications (Feb. 12, 1993) (at least 40 MHz required to serve isochronous voice and data needs). See Ex Parte Filing, GEN Docket No. 90-314, from WINForum (Sept. 7, 1993) (40 to 80 MHz needed to satisfy isochronous and asynchronous demand).

the inner cities to the most rural areas, when the unlicensed PCS industry goal of relocating existing microwave links from the allocated spectrum is achieved.

These public benefits will be generated through the important business and consumer applications made possible by unlicensed PCS products. Potential business applications include bringing affordable portability to factories and offices. Consumers will benefit from personal digital assistants and advanced cordless phones that receive and transmit both data and voice information. And, as discussed in more detail below, likely applications in the important fields of education and health care include allowing wireless interconnection of classroom computers, patient monitoring systems, and laboratory databases.

B. Unlicensed PCS Is Uniquely Suited to Educational and Health Care Applications

In response to the Commission's request, UTAM has consulted with unlicensed PCS industry participants to determine some of the potential coordinatable and non-coordinatable unlicensed PCS applications which could benefit education and health care services in the United States. Unlicensed PCS systems and devices can be rapidly deployed and have clear educational and health care advantages. Moreover, additional innovative technologies still being developed will provide further beneficial capabilities. While some of these benefits could be provided by nomadic devices utilizing peer-to-peer communications, many will be secured through the use of coordinatable technologies dependent upon a base station or other fixed infrastructure.

While licensed PCS services can provide many benefits, unlicensed PCS products have attributes uniquely matching many important needs for all forms of audio, video and data communications. Perhaps most significantly, unlicensed products are likely to be more accessible and less expensive to use because the cost will largely be confined to the initial equipment purchase. Schools and health care facilities will be able to use unlicensed PCS technologies as soon as they are on the market (subject to interference concerns) and will not be burdened by licensing mechanisms or periodic service charges.

1. **Educational Benefits of Unlicensed PCS**

Unlicensed PCS systems and devices can bring relatively inexpensive communications improvements to American schools. As Apple Computer has described, peer-to-peer devices will have important applications in this area. However, this is just one specific segment of a broad array of non-coordinatable and coordinatable, data and voice applications. Indeed, for reasons of academic integrity, access to information sources, security, and confidentiality, it is anticipated that much of this equipment will require connection to a network infrastructure providing educators and administrators the ability to route, manage, and control the flow of information and communications in the campus environment.

Examples of potential applications and their anticipated benefits include:

- Transmission and coordination of daily attendance records to facilitate identification and notification of absentees.

- **Course registration allowing selection of classes from a catalog database and reservation of spaces without requiring students to wait in long lines.**
- **Widespread distribution of scheduling or other information such as lunch menus and changes in class times.**
- **"On-line" access to library collections, databases, and information sources.**
- **Test administration with immediate grading feedback.**

Additional applications will assist students in the actual process of learning.

Students will be able to collaborate on assignments using portable PCS units and learn from their fellow students. Using the same types of devices, teachers will be able to give personalized instruction by monitoring students' work during class. For example, as students complete mathematics problems using an unlicensed PCS device, teachers will be able to examine each student's work and correct errors without leaving the desk. As the Information Superhighway continues to grow, students will enjoy access to significant amounts of information from anywhere in their schools through databases such as those available on the Internet. This will be particularly beneficial for schools which have limited resources, giving those students who might otherwise have fewer opportunities the same advantages as students who attend better equipped schools.

A further important concern for students, their parents, and educators is personal safety. Unlicensed PCS products will bring significant security benefits to America's schools. It is possible to envision combination voice/data devices operating in the isochronous band that will provide students and faculty members with a means of notifying school officials if they encounter an emergency situation as well as

communicating relevant data such as medical records to the scene. As a result, school medical services will, for example, be able to respond more quickly to student accidents on the playground or athletic fields. Other applications such as school facilities monitoring to assist maintenance activities and similar functions can also be expected.

2. Health Care Benefits of Unlicensed PCS

Because unlicensed PCS devices and systems can provide better mobile telecommunications without the burden of service charges, they will improve the health care Americans receive. Remote, real time, and in some cases long distance access to medical resources is a fundamental precept of health care reform. Examples of possible unlicensed PCS applications will be enabling health care personnel to monitor a patient's condition and location from anywhere in a hospital or nursing home. In addition, doctors and nurses will have access to lab reports and medical databases directly from a patient's bedside. Since unlicensed PCS devices will be able to carry images, doctors will be able to receive complex reports from labs or send them to other doctors to facilitate consultations with specialists. This improved communication will especially benefit hospitals in rural areas where specialized care is often unavailable.

The administration of health facilities also will be simpler and more efficient with the use of unlicensed PCS devices. Admissions and billing functions can be conducted from anywhere in the facility -- much like curbside check-in at airports --

which will save administrators time and avoid having to move patients from one part of the hospital to another while they are being admitted. Since unlicensed PCS devices will be able to record, store and forward both data and voice annotations, doctors and administrators will be able to preserve more complex messages. Facility maintenance and security measures will also be improved through the use of unlicensed devices because those in charge of these functions cannot only be notified that their services are needed, but also be given details of the situation requiring their intervention. These capabilities will be provided through both peer-to-peer and peer-to-host techniques.

In addition to these direct benefits to administrators and patients, improved communications within facilities will increase efficiency while decreasing emergency response times. Unlicensed PCS will allow for real person-to-person communications, targeted short messaging, and improved telephone usage, all of which permit health care providers to have access to additional information more quickly than is now possible.

II. LICENSED PCS AND UNLICENSED PCS WILL PROVIDE COMPLEMENTARY, NOT DUPLICATIVE, FUNCTIONALITY

UTAM also explained in its Written Statement that "[u]nlicensed PCS is a family of voice and data systems or devices that consumers may own or lease to meet their telecommunications needs."³ It is expected to encompass a wide variety of new

³ Written Statement of UTAM, GEN Docket No. 90-314, at 5.

products, including wireless local area networks, wireless PBXs, advanced cordless phones, personal digital assistants, devices for linking laptop and desktop computers, and two-way telemetry, as well as yet unknown innovative and exciting wireless applications. Because of marked differences between licensed and unlicensed service offerings, these applications will be different from, albeit complementary to, those of the licensed services.

For example, unlicensed PCS will service in-building business applications which are characterized by high user density and require a full 40 MHz of spectrum availability to meet user requirements. The low power operation of likely unlicensed PCS products permits frequency reuse both within buildings and between buildings which is necessary to satisfy such a high level of demand. Higher power requirements prevent licensed PCS from enjoying the level of frequency reuse possible in the unlicensed band.

The relatively larger blocks of available spectrum for unlicensed PCS uses also allow deployment of unlicensed PCS equipment in high data rate applications, the order of five to ten megabits per second. Such data rates can only be achieved by using equivalent amounts of spectrum, 5 to 10 MHz at a time. These types of applications simply could not co-exist with other users in a licensed system. Nor could licensees conceivably manage the high numbers and myriad varieties of user devices, systems, and applications that will develop in the unlicensed PCS market place.

Unlicensed PCS products additionally exhibit a number of other unique attributes that enhance the value they offer users:

- The customer can purchase or lease unlicensed PCS systems or devices from a retail or wholesale outlet without cumbersome licensing procedures. This permits easy and prompt deployment of new wireless telecommunications capabilities.
- Unlicensed PCS products can be deployed anywhere, without regard to licensing restrictions or service providers' coverage plans. This will enable multistate enterprises located throughout the nation to acquire fully compatible equipment for every site.
- Because there are no limits on the number of manufacturers selling products in the band, unlicensed PCS is a robustly competitive industry which will encourage both affordable pricing and product innovation. Numerous companies may pursue their own visions of technology and service applications without conforming to a licensee's specifications.
- Customers need not incur airtime charges for using an unlicensed system or device, so it will be cost effective for numerous applications that could not be justified as licensed offerings given their greater spectrum management costs.

A number of participants at the hearings also emphasized the complementary nature of licensed and unlicensed offerings, and many opposed changes to the unlicensed spectrum allocation that would undermine this synergy. Elliott Hamilton of EMCI stated that "the allocation of frequency for unlicensed applications, adjacent to the licensed PCS bands, will create the opportunity for multi-mode handsets, permitting both private and wireless PBX and public license[d] operations."⁴ Indeed, EMCI believes that not only are licensed and unlicensed services complementary, but the

⁴ Statement by Elliott Hamilton, Transcript of PCS Task Force Hearings, at 48 (Apr. 11, 1994)

combination of unlicensed and licensed PCS "will be the critical difference between the cellular industry, the SMR industry, and even the paging industry."⁵ Dave Twyver likewise agreed that unlicensed services are "largely complementary" to unlicensed.⁶

Finally, as discussed in more detail below, AirTouch, EMCI and Dr. Jackson all noted the additional public benefits that would accrue from the ability to "marry" licensed and unlicensed applications.⁷ Notably, current cellular service users have expressed a strong interest in the addition of in-building PBX-type functionality that can be provided through compatible unlicensed equipment.⁸ This is a prime example of the different but complementary needs met by licensed and unlicensed PCS.

III. UNLICENSED PCS REQUIRES THE FULL 40 MHZ SPECTRUM ALLOCATION

UTAM demonstrated that in its earlier filing the record strongly supports the Commission's decision to allocate 40 MHz of spectrum for unlicensed PCS systems and devices.⁹ A number of studies already in the record show that at least 40 MHz is

⁵ Id. at 66.

⁶ Transcript of PCS Task Force Hearings, at 63 (Apr. 11, 1994).

⁷ See discussion infra at 15-16.

⁸ Written Statement of EMCI, GEN Docket No. 90-314, at 11 (filed Apr. 7, 1994).

⁹ Written Statement of UTAM, GEN Docket No. 90-314, at 10-11.

necessary to satisfy the demand for both isochronous and asynchronous equipment.¹⁰ Indeed, 40 MHz is required to meet the needs of business users in each office building.¹¹ Any lesser allocation would severely limit such reuse opportunities and constrict the opportunities for deployment of coordinatable systems and devices which, in turn, would impede the band-clearing process with potentially fatal consequences for the deployment of nomadic systems and devices.¹²

All other participants in the hearings who addressed the issue similarly endorsed the 40 MHz allocation. For example, Northern Telecom predicts some 9 million unlicensed PCS subscribers by 1998 and "commends the Commission for allocating 40 MHz of spectrum to unlicensed PCS."¹³ Apple Computer likewise supports retention of the full 40 MHz allocation given its concerns regarding deployment of data products.¹⁴ Indeed, insofar as no party has argued for a reduction in the unlicensed PCS spectrum allocation or sought reconsideration of the Commission's decision in this

¹⁰ Id. at 10.

¹¹ See Ex Parte Filing, GEN Docket No. 90-314, from SpectraLink Corp., Ericsson Corp., Motorola, Inc., Northern Telecom, AT&T, and Rose Communications (Feb. 12, 1993) (at least 40 MHz required to serve isochronous voice and data needs). See Ex Parte Filing, GEN Docket No. 90-314, from WINForum (Sept. 7, 1993) (40 to 80 MHz needed to satisfy isochronous and asynchronous demand).

¹² Written Statement of UTAM, GEN Docket No. 90-314, at 11.

¹³ Written Statement of Northern Telecom, GEN Docket No. 90-314, at 8 (filed Apr. 7, 1994); accord Statement by Dave Twyver, Transcript of PCS Task Force Hearings, at 62-63 (Apr. 11, 1994).

¹⁴ Written Statement of Apple Computer, GEN Docket No. 90-314, passim (filed Apr. 8, 1994).

regard, it is beyond dispute that the 40 MHz allocation for unlicensed PCS should be affirmed.

IV. THE RECORD OVERWHELMINGLY SUPPORTS MAINTAINING THE EXISTING UNLICENSED PCS ALLOCATION AT 1890-1930 MHz

All hearing witnesses strongly supported keeping the unlicensed PCS allocation at 1890-1930 MHz for reasons of both cost and ease of interoperability with licensed PCS offerings. Unlike licensed PCS services, unlicensed PCS cannot coexist with microwave licensees and every microwave link in the unlicensed band throughout the entire nation must be relocated from its current spectrum home. Without complete band clearing, non-coordinatable consumer products such as residential cordless phones and some types of PDAs cannot be sold.

A. Unlicensed PCS Relocation Costs for Any Other Emerging Technologies Spectrum Would be Prohibitively Expensive

UTAM and other witnesses agree that the existing unlicensed PCS frequencies are critical to the success of unlicensed PCS because clearing any other 2 GHz bands would be prohibitively expensive.¹⁵ Spectrum identified above 2.1 GHz contains many more incumbent microwave links and would increase UTAM's band clearing costs from \$300 million to \$500 million for the 1890-1930 MHz band to a prohibitively

¹⁵ Written Statement of UTAM, GEN Docket No. 90-314, at 11-14.

expensive range of from \$1 billion to almost \$2 billion for 2100 MHz frequencies.¹⁶

UTAM explained that such an enormous cost increase would be beyond the ability of the unlicensed PCS industry to afford and, consequently, would severely undermine the economic viability of the market for unlicensed systems and devices.

Dr. Charles Jackson of Strategic Policy Research confirmed UTAM's analysis. He determined that, because "there are far more microwave incumbents per megahertz in the higher band than in the lower band," it would require five to ten times the effort to clear the higher band than the originally designated spectrum.¹⁷ This, he concluded, "would destroy unlicensed PCS."¹⁸

UTAM has also reviewed another recent proposal from the mobile satellite service ("MSS") industry to relocate the unlicensed PCS spectrum at 1890-1930 MHz. As UTAM understands this plan, the 1970-2010/2160-2200 MHz bands would be allocated domestically for MSS use consistent with international allocations; the 1850-1970 MHz band would be allocated for broadband licensed PCS service; and the 2110-2150 MHz band would be left for unlicensed PCS devices. The MSS interests have suggested that the increased number of links at 2.1 GHz would be

¹⁶ Id. at 13.

¹⁷ Written Statement of Dr. Charles L. Jackson, GEN Docket No. 90-314, at 5 (filed Apr. 7, 1994).

¹⁸ Statement of Dr. Charles L. Jackson, Transcript of PCS Task Force Hearings, at 31 (Apr. 12, 1994). In contrast, commenters noted that licensed PCS would be viable at 2.1 GHz. E.g., Statement of Dr. Limond Grindstaff, Transcript of PCS Task Force Hearings, at 10 (Apr. 12, 1994).

counterbalanced by the fact that the narrowband carriers found there would facilitate sharing between unlicensed PCS and the incumbent microwave systems.

The proponents of this plan appear to have overlooked the fact that not only can unlicensed PCS not share spectrum with microwave licensees, UTAM is under an affirmative obligation to clear the entire band.¹⁹ The deployment of coordinatable devices is only a transitional mechanism to raise funds for band clearing. All parties agree that non-coordinatable products, such as nomadic data-PCS and residential cordless phones, require clear spectrum in which to operate. As a result, additional sharing opportunities cannot compensate for a massive increase in relocation costs.

UTAM also notes that the spectrum adjacent to 2110-2150 MHz is occupied by broadcast auxiliary and MDS services. These high powered adjacent channel operations -- which are under no obligation to move from that spectrum -- would require the establishment of guardbands that could substantially reduce the spectrum available to unlicensed PCS and make it economically unusable. Accordingly, UTAM must reiterate its record position that moving the unlicensed PCS allocation from its current location is not feasible.

¹⁹ Amendment of the Commission's Rules to Establish Personal Communications Services, 8 FCC Rcd 7700, 7738 (1993).

B. The Current Unlicensed PCS Allocation Promotes Licensed and Unlicensed PCS Interoperability

UTAM pointed out that "achievement of interoperability between licensed and unlicensed PCS should be easier and less expensive if unlicensed products remain in the 1890-1930 MHz band contiguous to the licensed allocations."²⁰ Motorola and Qualcomm affirmed this observation, calculating that the cost of interoperability would almost double if the unlicensed PCS spectrum were relocated to 2.1 GHz.²¹ Once again, numerous other commenters agreed.

AirTouch Communications, for example, echoed UTAM's assessment, noting that the "1800 MHz unlicensed band will provide easier interoperability," while the "2130 MHz frequency band may make the unlicensed services less interoperable" with licensed services.²² Dr. Grindstaff of AirTouch observed in particular that the close proximity of the licensed and unlicensed spectrum would provide "tremendous possibilities and opportunities" for innovation in those offerings.²³

²⁰ Written Statement of UTAM, GEN Docket No. 90-314, at 13-14.

²¹ Statements of John Battin and Dr. Irwin Jacobs, Transcript of PCS Task Force Hearings, at 124-25 (Apr. 12, 1994).

²² Written Statement of AirTouch Communications, GEN Docket No. 90-314, at 7 (filed Apr. 7, 1994).

²³ Statement of Dr. Limond Grindstaff, Transcript of PCS Task Force Hearings, at 122-23 (Apr. 12, 1994).

Dr. Jackson likewise stated that:

[M]oving the unlicensed PCS up to the higher band would eliminate many of the complementarities that would flow from the unlicensed PCS being adjacent to the licensed PCS. It is possible to imagine a wireless handset that works as a cordless extension in the home or office and as a terminal for licensed PCS service when the user is out of the home or office. Building such equipment will be significantly easier if the unlicensed PCS spectrum is close to the licensed PCS spectrum.²⁴

EMCI further explained that placing the spectrum allocation for unlicensed PCS adjacent to the licensed bands offers the "unique advantage" of permitting a "marriage of licensed and unlicensed applications."²⁵ EMCI argued that this "opportunity for multi-mode handsets permitting both private WPBX and public licensed operation" should not be lost because "[t]here is significant potential demand for these services."²⁶ For all these reasons, the existing allocation for unlicensed PCS at 1890-1930 MHz must be retained.

²⁴ Written Statement of Dr. Charles L. Jackson, GEN Docket No. 90-314, at 5.

²⁵ Written Statement of EMCI, GEN Docket No. 90-314, at 11.

²⁶ Id.

**V. THE CURRENT UNLICENSED PCS ALLOCATION
PERMITS OPPORTUNITIES FOR ALL TYPES
OF ASYNCHRONOUS AND ISOCHRONOUS PRODUCTS**

**A. All Types of Unlicensed PCS Warrant
Access to Suitable Spectrum**

A number of participants in the hearings noted the wide variety of potential unlicensed PCS applications, such as "wireless LANs, Internet connectivity for personal equipment at airports and hotels, cordless PBXs, cordless pay telephones at convenience stores and service stations, and perhaps even wireless drops for plain old telephone service."²⁷ Others lauded the substantial promise of the unlicensed market for innovation from the many potential entrants.²⁸ The myriad known applications, and the likelihood that there are many others not yet contemplated, promise substantial public benefits in terms of both personal and business mobility as well as easy access to useful functionality.

Nonetheless, Dr. Nagel has suggested on behalf of Apple Computer that certain PCS products, specifically nomadic data PCS in the form of personal digital assistants ("PDAs") operating in a peer-to-peer environment, are somehow more innovative and

²⁷ Written Statement of Dr. Charles L. Jackson, GEN Docket No. 90-314, at 5-6. Accord, Written Statement of UTAM, GEN Docket No. 90-314, at 5-6; Written Statement of Apple Computer, GEN Docket No. 90-314, at 2.

²⁸ E.g., Statement by Daniel Kelley, Transcript of PCS Task Force Hearings, at 217-18 (Apr. 11, 1994); Statement by Limond Grindstaff, Transcript of PCS Task Force Hearings, at 122-23 (Apr. 12, 1994).

more important than other forms of unlicensed PCS. UTAM believes that these claims omit the benefits of other unlicensed PCS products. Moreover, the assertion that PDA-based applications will invariably be classified as "nomadic" fails to recognize that such products can and will be marketed in conjunction with coordinatable systems.

For purposes of the unlicensed PCS allocation, unlicensed PCS systems and devices will fall into one of four categories:

- Coordinatable isochronous products;
- Coordinatable asynchronous products;
- Non-coordinatable isochronous products; and
- Non-coordinatable asynchronous products.

As discussed below, each of these categories of products, not simply one of them, will permit valuable applications, including important uses in the fields of education and health care.

B. Nomadic Data Products Represent Only One Segment of Unlicensed PCS That Can Provide Important Education and Health Care Benefits

Apple has asserted that only nomadic data products can meet education and health care needs. Of course, many of the applications described in Section I above involve voice transmissions, which would most likely be provided by isochronous devices. Moreover, while nomadic products may well have peer-to-peer applications which will benefit these social sectors, UTAM submits that these and many other

benefits can and will be secured through the use of the coordinatable PCS technologies that are dependent upon a base station or other fixed infrastructure. Indeed, the needs of educators, administrators, and health care providers to manage the flow of communications and protect the privacy and integrity of the information contained therein will tend to favor the establishment of centralized coordination points, such as file servers accessed via base stations.

It is not hard to imagine in view of the various education and health care examples discussed above why some type of infrastructure component would be desirable in these settings. For example, valuable educational applications such as collection of attendance records, electronic course registration, and point-to-multipoint distribution of scheduling or other notifications will each require interaction with a centralized database or clearing house which is likely to be part of a fixed infrastructure. This will be equally true of other unlicensed PCS applications such as classroom learning environments and access to library collections or to distant databases. In particular, simple economics dictates that information compilations, and the expensive computer equipment which houses them, cannot be duplicated on a cost effective basis in many cases.

Even monitoring activities for school or hospital heating and cooling plants raise security and other issues that may well counsel reliance upon a fixed infrastructure to provide a greater degree of insulation from potential disruptions. Such concerns will be heightened in a medical context where the integrity of transmitted data may mean