

required to accomplish this task and the possible effects on the operation of the VoiceNow system. The time constant required to measure reasonably the inbound signal strength, process it, and send out a control signal to the portable could be as long as a few seconds. The literature indicates that the received power must be averaged over 20 to 40 wavelengths to get an accurate estimate of the received signal strength.³⁴ At 930 MHz for a 4 mph walking speed, this corresponds to about a 3.5 second time frame. The ACK traffic, however, is anticipated to be short, bursty packets (about 200 milliseconds). As such, the question arises as to whether the proposed methodology is really feasible or desirable for a service which claims the ability to load more than 25,000 voice pagers per channel in a given area.³⁵

³⁴ W.C.Y. Lee, "Estimate of the Local Average Power of a Mobile Radio Signal," IEEE Transactions on Vehicular Technology, Vol. VT-34, No. 1, Feb. 1985, at 22 - 27. The issue is the number of fades that should be included in calculating the average received signal strength. Simply averaging the received level over different paths (i.e. to different receivers) would not solve the problem of requiring a relatively long ACK if the accuracy is to be improved.

³⁵ As discussed, infra at 27-28, PageNet's proposed technique is quite similar to that apparently employed in the ARDIS system. In 1985 and 1987 Motorola obtained patents on a system of the sort described by PageNet for determining the best transmitter out of an array of such facilities to employ in communicating with a portable terminal.

IV. PAGENET'S VOICENOW SERVICE OFFERS NO INNOVATIONS WORTHY OF A PIONEER'S PREFERENCE

PageNet has identified a total of five alleged technical innovations that it believes qualify it for a pioneer's preference: (1) frequency re-use; (2) dynamic reallocation; (3) receiver locating; (4) predictive propagation; (5) compressed digital voice transmission.³⁶ The first three of these are no more innovative now than similar claims made by PageMart in its pioneer's preference application several months earlier. PageNet's fourth purported innovation, predictive propagation, is a scheme virtually identical to a technique patented by Motorola and implemented in the ARDIS system. Finally, "compressed digital voice transmission," PageNet's last claim to technical innovation, is the application of a well-known technique of questionable utility for the application PageNet has described. Thus, as discussed below, none of the identified "innovations" are worthy of a dispositive licensing preference.

A. Frequency Re-Use, Dynamic Reallocation, and Receiver Locating Are No More Innovative Now Than Three Months Ago

PageNet's architecture for the VoiceNow system is more than reminiscent of the architecture proposed for the Personal Information Messaging Service by PageMart, tendered

³⁶ Request at 23.

on March 19, 1992. Both have suggested the use of ten 25 kHz channels divided into a simulcast polling channel, a reply channel, and 8 data channels that will be used in a four-cell re-use pattern employing adaptive channel allocation. As Mtel previously noted with respect to PageMart's claim to have been the innovator of "cell based re-use," "adaptive architecture," and "radiolocationing," these features are of questionable technical validity, limited utility, or entirely derivative of existing services. PageNet's purported claim to have been the innovator behind these same features is even less persuasive upon repetition.

First, like PageMart before it, PageNet has done no more than suggest that it might be feasible to apply a cell-based re-use scheme to messaging. This technique, as previously discussed, has numerous potential fatal flaws, none of which have been identified by PageNet, much less solved. Consequently, PageNet's claim in this regard as an innovator is reduced, in essence, to being the third party in this docket to propose that cellular techniques could be applied to messaging, and the second party to propose specifically that four-cell re-use is possible.³⁷

³⁷ Prior to PageMart, Echo Group, L.P. proposed a cell-based scheme in this Docket. See Echo L.P. Request for Pioneer's Preference, ET Docket 92-100, PP-36 (filed July 30, 1991).

Second, PageNet's "dynamic channel allocation" is similar in concept to a channel borrowing scheme that Mtel addressed in its reply to PageMart. PageNet states in this regard, that dynamic channel allocation "has the potential to add considerable capacity to an AMS system."³⁸ As Mtel noted in its reply to PageMart, channel borrowing generally decreases, not increases, the total capacity of a four-cell frequency re-use system because the "borrowed" frequency must be removed from service in four adjacent cell groups to allow it to be used in a single cell.³⁹ PageNet's diagram is misleading in this regard, since it suggests by implication that the channel could be borrowed on a one-for-one basis.⁴⁰

Finally, PageNet's "receiver locating" plan is analogous to PageMart's "radiolocationing" proposal, with the added feature of utilizing "predictive propagation." Absent the use of predictive propagation, PageNet's signaling scheme is, reduced to essentials, the same concept proposed by PageMart of utilizing a simulcast channel in conjunction with a

³⁸ Request at 24.

³⁹ Mtel Formal Opposition and Reply Comments at 9-15, ET Docket No. 92-100, PP-40 (filed June 1, 1992); See also Figure 2.

⁴⁰ The diagram is also misleading because, except for cell D, it depicts a three cell re-use scheme rather than a four cell re-use scheme. For example, as shown by mapping PageNet's diagram to a hexagonal pattern, the re-use distance between cell F and the cell B using M-5 & M-6 (there are two cells identified as "B") is only 3 cell radii, rather than the 3.46 dictated by a four-cell re-use scheme.

distributed receiver network to identify subscriber location. PageNet's proposal thus suffers from the same criticisms: (1) it uses a full 50 kHz -- the entire spectrum requested for Mtel's NWN service -- to provide signaling alone; (2) it is subject to missed ACKs and needless retransmissions resulting from uneven coverage between the polling channel and the return link; (3) it is only useful if the subscriber remains in the same location until the data transfer is initiated; (4) it is a necessary component of any frequency re-use scheme and the most obvious means for locating a subscriber; and (5) it is derivative of techniques in use in Mobitex packet data networks.

B. PageNet's Predictive Propagation Is Not Innovative

PageNet states that its use of digitized terrain, vegetation, and obstacle information to select the optimal transmitter for a particular subscriber is innovative.⁴¹ First, a very similar technique was patented by Motorola, which Mtel understands has been implemented in the ARDIS packet data network. In its patent Motorola describes the process as follows:

The signal strength readings taken by receivers R1, R2, and R3 are used to compute an adjusted signal strength for each zone Z1 - Z7 by adjusting the measured signal strength for each receiver R1, R2, and R3 by

⁴¹ Request at 24.

corresponding predetermined factors associated with the particular zone and then combining the adjusted signal strengths. The predetermined factors used to compute the adjusted signal strength depend on a number of factors such as the terrain, the height and gain of the antennas, and the sensitivity of the receivers. These predetermined factors associated with each zone are most often empirically determined and depend upon the characteristics of the equipment and terrain in each data communications system.⁴²

In addition, in practice, as discussed, supra, the technical feasibility of PageNet's adaptation of this technique is highly questionable. Accordingly, PageNet's scheme does not warrant a dispositive licensing preference.

C. PageNet's Use of Compressed Digital Voice Transmission Is Not Innovative

PageNet has asserted that its use of 2.4 kbps LPC for encoding voice in a mobile environment is innovative. In light of the fact that some compression technique is mandated by the limited spectrum available for AMS systems, Mtel does not believe that simple selection of a particular technique warrants grant of a pioneer's preference. PageNet's particular selection of a technique that is currently in use for a number of applications, 2.4 kbps LPC, cannot be viewed

⁴² United States Patent No. 4,644,351, issued Feb. 17, 1987, filed May 8, 1984, column 6, lines 14 - 27. See also U.S. Patent No. 4,550,443 issued October 29, 1985, and Canadian Patent No. 1,205,140 issued May 27, 1986. The basic technique was also described by authors James Engle and Stuart Thro of Motorola in the February 1985 issue of Mobile Radio Technology in an article entitled "Frequency Reuse Boosts RF/data Terminal Throughput."

as anything other than a trade-off between voice quality and spectrum consumption. Indeed, as Mtel has previously noted, 2.4 kbps LPC may in fact be a bad trade-off. It requires significant computing power in the mobile, which drives up mobile costs. And, it does not have the performance characteristics alleged by PageNet.⁴³

V. PAGENET PROVIDES NO SUPPORT FOR A NATIONWIDE PREFERENCE

PageNet has requested a nationwide pioneer's preference for its VoiceNow services. In the Pioneer Preference Order, the Commission indicated that it would consider granting such nationwide preferences "[w]here a service is inherently nationwide."⁴⁴ As discussed below, PageNet has offered no evidence, either in terms of technical justifications or in terms of demand, for believing that VoiceNow is "inherently nationwide."

PageNet's VoiceNow service is patterned after traditional local or regional system, and is not "inherently nationwide" for any technical reason. PageNet even advocates allocating spectrum for local VoiceNow providers. And, although PageNet indicates that networking of local VoiceNow

⁴³ PageNet's focus groups were apparently not told that the quality of voice achieved with 2.4 kbps LPC would be of relatively high intelligibility but exhibit poor speaker recognition.

⁴⁴ Pioneer's Preference Order, 6 FCC Rcd at 3495.

systems would be required to provide nationwide service,⁴⁵ no justification is offered as to why this networking could not proceed, as it has in the cellular radio telecommunications service, through the efforts of local licensees responding to marketplace demands.⁴⁶

PageNet's only attempted justification for a nationwide preference is a demand study prepared by EMCI. The study, however, does not address consumer interest in nationwide services. Just as importantly, the study graphically depicts the declining subscriber demand for conventional voice paging systems. Over the past five years, this segment of the paging marketplace has decreased significantly at the very time that significant increases in all other aspects of messaging have occurred.

PageNet seeks to explain away the apparent contradiction of seeking virtually the entire 930 - 931 MHz band for the dwindling voice paging segment of the industry. According to PageNet, this pattern simply reflects lack of adequate spectrum to support fuller functionality in voice paging. However, an equally feasible conclusion is that consumers

⁴⁵ Although it is true that PageNet's VoiceNow service could be offered by a single national licensee, the same conclusion applies to virtually all radio services.

⁴⁶ In contrast, a service such as Mtel's NWN could only be offered on a nationwide basis due to the complexity of coordinating usage of the nationwide resources used by the system. See Mtel Reply Comments at 20-24, ET Docket 92-100, PP-37 (filed June 1, 1992).

require greater messaging capabilities than can be realistically accommodated through voice paging in a cost effective and spectrally efficient manner.

In Mtel's experience, voice paging has declined not due to spectrum shortages but rather due to the increased functionality of display pagers to carry information once transmitted by voice pagers. While PageNet cites the EMCI study as purportedly showing great interest in voice paging services,⁴⁷ the report is prefaced with the appropriate caveat that "the results of these focus groups are not statistically projectable."⁴⁸ Moreover, even a cursory review of the market study causes one to question its methodology and conclusions. The study was performed on an atypical focus group: (1) 12 percent of the group used cellular phones; (2) 81 percent were between the ages of 25 and 40; (3) 50 percent had incomes between \$25,000 and \$50,000; (4) 23 percent had incomes over \$75,000; and all were existing PageNet subscribers.⁴⁹ This highly selective surveying hardly constitutes a sample upon which any broad demand conclusions could be based.

Throughout this proceeding, Mtel and others have documented a legitimate and growing need for the high speed

⁴⁷ Request, Exhibit 1.

⁴⁸ Request, Exhibit 1 at 1.

⁴⁹ Request, Exhibit 1 at 14.

delivery of text messages. The need to provide untethered communications to portable and personal computer devices in the field is a need that the Commission must address.⁵⁰ To miss the opportunity in this proceeding to accommodate this tremendous demand by instead allocating frequencies for a dwindling voice paging market would be a great disservice to the American people.

VI. CONCLUSION

In view of the foregoing, PageNet clearly does not warrant a Pioneer Preference for its proposed VoiceNow service. Its technical feasibility showing is nothing more than system descriptions, lists of problems and citations to existing literature from its engineering consultants and prospective vendors. Its purported innovations mimic previous filings in this proceeding, rely on efforts of others or involve a patented system of another company. Its own work on VoiceNow does not involve any disclosed laboratory work, field tests or ongoing developmental

⁵⁰ See, e.g., "Motorola/Samsung Computer Follows Trend Toward Sub-Laptop Terminals," Industrial Communications, Issue #24 (Phillips Publishing June 12, 1992).

programs. Accordingly, PageNet's request should be summarily dismissed.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on this 19 day of June, 1992, I caused copies of the foregoing "Formal Opposition of Mobile Telecommunication Technologies Corporation" to be hand delivered to the following:

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