LACE, Incorporated
Developers and Manufacturers of Wired and Wireless LOCAL AREA COMMUNICATION EQUIPMENT

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Federal Communications Commission
Office of the Secretary

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June 4, 1992

Office of the Secretary
The Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Reference: ET Docket No. 92-9

Gentlepersons:

Attached hereto are 10 copies of my COMMENTS on the above referenced Notice of Proposed Rule Making which I request be added to the record.

In addition, a self-addressed envelope and one additional copy is enclosed so that a "receipt stamped" copy may be returned to me.

Thank you.

Cordially,

Chandos A. Rypinski

No. of Copies rec'd 10
List A B C D E

LACE, INC. — 921 TRANSPORT WAY — PETALUMA, CA 94954 USA — TEL: 707 765 9627 — FAX: 707 762 5328

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

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In the Matter of	)	
	)	
Redevelopment of Spectrum to	)	
Encourage Innovation in the	)	ET Docket No. 92-9
Use of New Telecommunications	)	
Technologies	)	

To: The Commission

COMMENTS OF CHANDOS A. RYPINSKI

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LACE, INCORPORATED
921 Transport Way
Petaluma, CA 94954
Tel: 707 765 9627--Fax: 707 762 5328

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To: The Commission

COMMENTS OF CHANDOS A. RYPINSKI

Chandos A. Rypinski offers comments on the Commission's "Notice of Proposed Rule Making" released February 7, 1992 as published in the above-captioned proceeding.

QUALIFICATIONS

My qualifications, experience and honors are summarized in Attachment A. In weighing the merit of my opinions, please consider that I have been a significant contributor of technological innovation for telecommunication; and I also have considerable experience with the business and financial side of innovation.

This level of detail experience in telecom is unusual for someone who has worked in computer data communication (local area networks) for the last eight years and who now expresses that viewpoint. Among other values, this experience has provided me with an understanding of the operations and viewpoint of many of the incumbent users of the 2 GHz microwave band.

SUMMARY

The creation of a short-reach data radio service for computer type data communication will broadly improve business and industrial efficiency. The same methods achieve will also increase spectrum utilization and decrease equipment cost for users. The following advocacy addresses those topics for which I have expertise and relevant experience.

The broad questions are taken up after a brief technical discussion suggesting that more economic and efficient methods of communication being developed for high-capacity wireless computer networks and personal telephony may also be appropriate for point-to-point systems.

The technical discussion includes an opinion on an important criterion for how much spectrum should be allocated for one radio channel in this context.

The conclusions reached are:

1) The incumbents will eventually have to change out their equipment, and should be compelled to do so over time to achieve the same gains in spectrum utilization to which other services (land mobile) have been subjected. The presumption should be rejected that total replacement cost alone is the effective cost when it should be relative to the cost that would be sustained without reallocation.

2) The incumbents in most cases will be net beneficiaries of this reallocation, and continued resistance is simply short-sighted and not economically justified. The incumbents should be obliged to consider the value of the new services that could be obtained.

3) As compared with personal voice telephony services, high-rate data services for personal computers and automation devices will have greater economic value and, because of inherently shorter range and predominant use inside of buildings, will have far less interfering effect on existing services.

4) As a general goal for many radio services, and in particular distributional microwave systems, it would be better to use the methods now being developed for the portable computers using the highest degree of frequency reuse, greater commonality of equipment design, distinctions between user groups maintained by logic content of messages, and transmitters off when not moving information.

5) For economic reasons, the a major part of the referenced spectrum should be reallocated to short-reach radio services not only for voice and narrowband data, but also for high capacity, wideband data.

BACKGROUND ON SPECTRUM USAGE

Code and Time Division Use of Communication Space

Both telephony and high-rate spread spectrum data services may want at least 25 megachips/sec in a 40 MHz bandwidth, but the way they use it is quite different:

	Telephony	Wideband Data
User bandwidth:	32 Kbits/sec	4,000 Kbits/sec
No. user trunks/channels:	125	1
User duty cycle:	1 (full time)	0.008 (equivalent)

Both are using the same amount of spectrum space, but the narrowband services slice it into 125 parallel-used parts by code division and the data users would give each user 100% of the transmission capacity for 1/125th of the time.

There is a major difference however: the data users are not confined to a particular time dimension or information bandwidth for each individual use, and therefore can provide bandwidth as well as channel time on demand. In addition, there is no reserved channel time, and it is used only when needed.

Historically, this tradeoff has not been made because the parallel channelized methods generally enable much greater radio range for a given power level.

Multipath Fading

As is accurately described in "Creating New Technology Bands...",[1] microwave radio fading from interaction between the direct ray and the surface reflected ray can cause cancellation and signal level loss of 32 dB (1600:1 power ratio) or more. It is normal for microwave stations use a transmitter power sufficient to offset this event which occurs 0.01% of the time.

While diversity methods may also be used to mitigate this signal loss phenomenon, the required additional equipment and antennas are often a more expensive alternative to more power.

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[1] "Creating New Technology Bands for Emerging Telecommunications Technology," FCC Office of Engineering and Technology, OET/TS 91-1 (last ¶ pg 16 to end)

This fading can also be mitigated by spread spectrum modulation with a chipping rate high enough to enable two paths of slightly different length to be separately detected and processed because of different time of arrival.

[1 chip at 25 Mchips/sec = 40 nanoseconds = path difference of 12 meters]

The exact same phenomena takes place in short reach radio system with reflections from the floor or ceiling, and this is a fundamental physical limit on economical transmission of high data rates. A lot of improvement can be obtained with directive and diversity antennas which, though expensive, may be more cost-effective than transmitter power in battery-powered equipment.

With spread spectrum, the time resolution of a high chipping rate is the most powerful tool to offset fading from multiple simultaneous propagation paths. A resolution of 6 meters (50 Mchips/sec) is a desirable value though as little as 12 meters resolution may still be beneficial.

The following subsidiary conclusions are drawn from this reasoning:

1) Short-reach radio systems will be better served by bandwidths of 70 or more MHz with chipping rates of 50 Mchips/sec loaded with sufficient traffic and users to exploit the capacity of that channel.

2) The minimum useful chipping rate is about 25 Mchips/sec for any of the short-reach radio services whether they are voice or wide-band data.

3) Point-to-point microwave links should eventually be converted to comparable chipping rate spread spectrum to greatly reduce required fade margins (and transmitter power) for a given reliability.

4) The conversion of microwave to spread spectrum modulation would also achieve increased spectrum capacity by greatly reducing the isolation required between contiguously located independent users. Many microwave systems sharing a common wide-band channel might have coverage overlap without necessarily interacting or reducing the capability of each other.

Sharing Not By Frequency Channelization But By Logic and Coding

Given that all users share one wider channel in time or even operate simultaneously and independently with the possibility of interference overlap, it is possible for all to be kept sorted out with embedded identifiers and code separation and for large scale systems by means of an access protocol. This allows any user to obtain advantage from the unused time in all systems which appears as reduced composite interference levels.

A common wideband highway with access as needed is better economics and functionality for microwave networks as well as for personal computers.

Each microwave-using entity would then have a peak access capacity many times what could be justified on a dedicated basis, and the worst case would be at least as much as a dedicated system. It is further asserted that this will come to be widely recognized by the technical community accelerated by the increasing proportion of communication which is transmitted as data bursts.

An adequate technical description of this alternative technology for point-to-point microwave is beyond the scope of these comments. The principles involved are as follows:

1) All (point-to-point) radio systems in a large group use a common channel with identical equipment transferring at high chip rates. Different users and their derived channels are separated by time or code when necessary.
2) Transmitted energy is proportional to the information carried from instant to instant, and only small amounts of time and power are used to monitor path integrity.
3) All information is transmitted in packet form so that setup time is not needed to negotiate and reserve slots and to enable resend of imperfectly received packets.
4) Spread spectrum is used primarily to provide multipath discrimination, and secondarily to provide separation between potentially interfering users.
5) Spectrum utilization is better achieved by radio methods that are more resistant to interference from other signals than by channelization with modulations that produce high ratios of bits/Hz.

Following these principles would lead to systems that do not underutilize occupied bandwidth or time and are not overpowered for dense frequency reuse. The incumbent 2 GHz users would benefit greatly from increased capacity and improved utilization of present or shifted frequency allocations.

CHANGEOUT LIFE EXPECTANCY OF INCUMBENT MICROWAVE SYSTEMS

One conclusion is that the lifetime of present point-to-point microwave can only be held past a small number of years by regulatory action preserving the status quo against actions based on economics and efficiency.

Motivation For Equipment Replacement

Many of the incumbent 2 GHz microwave links will be replaced and user needs better served by optical fiber for Companies owning right-of-way.

Many will move to the higher frequency bands to increase transmission capacity on main routes. This will be the case for routes which are really trunks or data links between operating centers, and the growth of data usage will be significant.

Some others will also move to higher frequencies, because it is economic after a need appears for intermediate drop points.

Some will be replaced when alternatives become available that will make clear that present links have excessive maintenance cost, floor area occupancy and real estate used for the function performed. In some cases, newer equipment will take far less power to maintain operation when commercial power is lost.

Many will be replaced because they are already too old and costly to maintain.

> Little weight should be given to the plea of many incumbents that cost of replacement is very (too) great. The context is a plan where the transition period might last 7-10 years, and in this period they will have to bear most of this cost even without the reallocation of the 2 GHZ band.

Others will be replaced because they are too easy to monitor and <u>too easy to jam</u> for a society with malevolent and non-law-abiding individuals and organizations.

> This vulnerability to hostile jamming is made more evident by the expressed concern of some operators (e.g. Los Angeles County Sheriff) that milliwatt transmitters on personal telephones or computers may impair their continuity of function.

Maybe, by the end of the millennium, all will be replaced or refitted because new methods with much greater spectrum utilization will be required by new regulations. Those new methods will value time utilization just as much as any of the other parameters.

Alternatives for Existing 2 GHz Microwave Systems

The report OET/TS 91-1[2] appears technically accurate and fair in its assessments of various microwave alternatives for incumbents.

Because most of the of utilities usually have extensive right-of-way access, they are prime candidates for replacement of microwave with copper or fiber optic media.

A change to fiber optic cable generally results in far less maintenance cost and lower error rates than with long-hop microwave radio (the usual case at 2 GHz). Specific examples of this are known.

Their ability to compress bandwidth and obtain better utilization is very large but presently no evaluation of the potential is known.

BENEFITS OF SHORT-REACH RADIO SERVICE

The uses for short-reach radio data transmission are numerous and growing, but the big growth will occur when it is limited by economics and usefulness rather than absence of regulatory provision. When the sum of telephones, personal computers and commercial and industrial automation is considered, there could well be more than one radio port per inhabitant. As functions become simpler and cheaper, their use multiplies.

It is important that the short-reach radio technology be general for most commercial and industrial enterprises. Without this high volume (or potential), it will be impossible to attract the investment necessary for development of standards, software and hardware. For wireless to have general value, it must be small, low-cost and run from batteries at the user device. Considering the known cost for LAN adapters on twisted pair, this is not an easy task.

This universality is of importance to every commercial enterprise, and that includes the protesting incumbents who also use computers, employees and automatic apparatus. Power utilities, petroleum product producers and processors, local government, right-of-way transportation and public safety entities among others will be large scale beneficiaries.

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[2] "Creating New Technology Bands for Emerging Telecommunications Technology," FCC Office of Engineering and Technology, OET/TS 91-1

The Mobility Benefit

The benefit of short-reach radio data communication is often misunderstood when described as "wiring replacement." In fact, short-reach radio systems will use plenty of "twisted pair" to connect Access-points to Cluster Concentrators. Its just that it will not be changed or supplemented nearly as often.

The benefit is as much in the change of protocols as in change of transmission medium. There are two different addressing philosophies for telecom and computer local area networks:

1) telecom switching: the user address is a geographically defined wiring outlet.
2) computer local area networks: the user address is globally unique to that user independently of where he, she or it accesses the network.

A substantial fraction of the US (and global) workforce perform their duties at other than a fixed location part or all of the time. The combination of wireless access with portable computers/telephones will enable people to be where the work needs to be performed rather than where they have communication access.

The scale of the cellular telephone business has induced the telecom industry to seriously take up address (number) mobility as a necessary function of the public switched network through Committees such as T1P1, but the results at best will serve telephone users who travel between cities or between parts of large cities. It will not help those who move from department to department within one Company.

Ease and speed of reconfiguration of Company operations is a further benefit of communication mobility provided by short-reach radio access.

The Provided Services Benefit

Narrowband data has served, and will continue to serve, a valuable function as surely as the keyboard entered word has permanent importance. Wideband data is as important as the picture that is worth a thousand words (and may take a million bits of memory and transmission capacity).

High transfer rate and capacity are critically important to flexibility of production and processing organizations. Automatic machines take large computer files to instruct them on what to do. The ability of one machine to make something different in consecutive slots on a production line is based on downloading of new instructions through a high speed data network. This is more difficult when the machine is mobile and must be repositioned from time to time or even while it is working.

Current developments make clear that transfer delays should be held below 5 milliseconds within departments and buildings, and that transfer rates of at least 10 Mbits/sec are necessary for the support of all kinds of improved industrial, office, medical, warehouse, transportation center, university campus and retail functions. All of these application areas are increasingly dependent on graphical data transfers and software downloading (only servable with wideband data) as well as increasing amounts of data base access and transaction entry (possibly servable with narrowband data communication).

A large portion of this kind of communication is the result of combining the efforts of many individuals to do one project or job. Local area computer networks are primarily used by departments and projects to improve the efficiency of work groups. In many cases the kinds of jobs undertaken could not be successful without this kind of communication. Granting the essential nature of off-premises communication, the ability of individuals within a group to work "collaboratively" is no less important. Work groups will be a vital class of application for short-reach radio services.

The level of transfer delay and rate is orders of magnitude better than that which can be provided by traditional public switched networks. This performance level is obtainable with packet switches and "last 100 feet" radio local distribution.

The wireless data networks that provide local area network (LAN) type services (the goal of IEEE 802.11) will also provide public network compatible connection type services fully integrated. This is not yet the case for wired services (at least until IEEE 802.9 is adopted and comes into common use). Because of this integration, the value of workstations will be increased adding useful capabilities not yet in wide use.

> All business sectors will benefit from the existence of a high-rate, short-reach radio service because of increased flexibility and service functions and decreased costs resulting from high volume, multi-vendor markets. This benefit particularly includes the incumbent point-to-point microwave users. The need for the improved function and cost is immediate whenever suitable equipment becomes available.

BENEFITS OF SHORT-REACH RADIO TO SOME SPECIFIC INCUMBENTS

By sharing in the computer methods of the rest of commerce and industry, local government, public safety, utilities and others will at least save money, and probably increase function and flexibility. A past trend of public safety organizations to buy ad hoc solutions to each administrations trade-off set should not be continued--at least in hardware and communication areas.

Short-reach radio can be a factor in promoting standardized communication methods.

Benefits to Public Safety Organizations

The public safety community has been poorly served by cultivation of jurisdictional autonomy which has given each department distinct tools and procedures. This differentiation is a matter or pride in quiet times, and a grave impediment under emergency conditions when the jurisdictions must help each other. (The Oakland Fire a year ago is one of several recent examples of emergency events with which help from surrounding jurisdictions was necessary.)

Under these conditions, help is much reduced in value, if it cannot be part of a common communication and management system. Hopefully, the public safety group is moving in this direction.

A large fraction of public safety is reports, records, data retrieval and administration as it is in all organizations. There is big value in improvements that can be made in these areas.

Configuration of these facilities to adapt quickly to changing conditions is a value that will be much easier if any equipment can be use immediately where ever it is moved. The sudden setup or reconfiguration of command centers including the ability to deal with fast transfer of pictures and facsimile documents is a much needed capability that would be vastly improved by commonality of computer interfaces and applications movable from one department to another in time of need. It should be possible to move in the equipment and download the locally used data base and applications.

This is a statement of what is normal and possible when computer workstations are connected by IEEE 802 Standard local area networks. The introduction of short-reach radio speeds setup and change.

Power, Gas and Water Utilities

Utilities rarely make sudden changes in their configuration without the stimulus of a major earthquake or some other large scale calamity, but even routine changes in offices for marketing and administrative reasons would be made easier and less costly with short-reach radio access. Many utilities could improve their efficiency by faster adaptation of administrative operations to changing tools and market conditions.

An application that may not be obvious is in the handling of yard-based vehicular equipment. All sorts or records and notifications could be better transferred in and out of these vehicles by short-reach radio when the leave and enter the yard.

The classic problems of meter reading on customer premises and load shedding are primarily narrowband data. It is possible that short-reach radio in this band could be used, but it is not obvious that it is a better solution.

The unpredictable factor that may enter is that the manufacturing volume for short-reach radio may reduce its cost to the point of economic advantage over purpose-designed radio data collectors. The excess in data capacity will enable frequency sharing with the other users since this use would consume minuscule channel time.

COMPARISON OF PERSONAL TELEPHONY AND DATA --IMPLEMENTATION AND USAGE CONSTRAINTS

Served Area Definitions

If the PCN interests direct their effort to duplicating cellular service, but with new franchise holders, that would be a large and costly redundancy. Their economics require that they serve no more land area than where they find customers. If PCN is attempted as a ubiquitous, wide-area service, where will be large scale subsidy of low-usage areas by the revenue producing areas. As a matter of public policy, this should be a differentiating point contrasted with present cellular. This is asserted even though the obvious consequence is that the PCN market is diminished if the capability is less than cellular.

There may be more claimants for the role of service provider within private premises than can be realistically supported. The arbiter of who serves a private premise should be the owner or user of that premise, not an FCC-granted franchise. With short-reach radio, private premises can and should be a separate category from

public areas. This is a further distinguishing concept relative to existing telephone services.

The notion that it is impossible limit the penetration of outside systems into buildings and the leakage of premises area systems outside is commonly exaggerated sustained by the erroneous belief that the short-reach systems will work like existing lower frequency systems. A plan with a free space radio range of less than a few hundred feet is going to be isolated both by walls and by space from very much excess coverage no matter which side of the wall it is on.

> It will be rare when cochannel use of a public system outside and a private system inside buildings will affect each other provided both operate with a common set of power density and occupied spectrum limitations. This is a factor that can be considered and dealt with in design.

The cost of doubling a frequency requirement for separation of inside/outside services is so high that the incidence of failed communication must be evaluated before reaching the conclusion that space separation is not enough.

Private and Public Service Providers

It is absolutely unacceptable to the computer and data-using community to have a required public service provider for internal departmental data communication. After it is understood that there are intense feelings on this point before technology is even considered, technical rationalizations may then be provided.

The same feeling does not now exist about telephone service or "Centrex" would not be much used. There is a far higher degree of departmentally contained data communication than there is for telephony for which outside links are predominant.

It is possible that some private users would accept a contractor to build and possibly maintain their internal data communication, but to have such a decision ordained by a city-wide franchise would simply foreclose the use of wireless within most premise areas.

It might seem that the security-based resistance could be moderated by easier implementation of encryption schemes. At that point other reasons would appear. The necessary transfer rate and response times will be greatly extended by routing through facilities at a distance from the point of use; and there would not be much acceptance of that penalty either.

There will have to be a private system provision for short-reach, high-rate data communication for the wireless premises area system to be used. A public service provider would not be accepted even before considering technical unfeasibility.

> If the concept of a public service provider does not include an area franchise, but is limited to where there is user demand, then there is no reason why the same type of private system equipment could not be operated by a service provider in public places (e.g. airports, convention centers, hotels).

Integrated Connection and Packet Services within One System

At the recent WINLAB Conference at Rutgers,[3] I presented a paper describing the access method and architecture for a single high rate channel providing an asynchronous packet medium into which both connectionless and connection type services with bounded delay could be provided. Reuse of a common frequency was provided by serial use of Access-points within a cluster.

The same plan has been presented within the IEEE P802.11 Standards Committee, however no representation is made concerning what that Committee may decide. Other proposals also offer voice-data integration in varying degrees.

It is now assumed that the technical solution for voice-data integration is possible and available.

It is believed that if a Company installs a ubiquitous wireless data access infra structure, the incremental cost will be small for adding a pocket telephone capability using up to 25% of the system capacity. Further, the cost of this addition will be smaller than adding a parallel and independent wireless pocket telephone system.

> There is a possibility of a co-located short-reach radio telephone and data LAN interfering with each other unless in the original design the possibility is anticipated and addressed. This situation might occur in a shopping mall where the merchants use LAN and the public uses pocket telephones.

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[3] "Architecture and Access Method Analysis for Integrated Voice-Data Short-Reach Radio Systems," C. A. Rypinski, April 28 1992, published in the conference proceeding of the Third WINLAB Workshop sponsored by Rutgers, the State University of NJ

Separate frequency allocations are the obvious solution, but are not necessarily the only or best solution. It would be better for both services to have twice the frequency space and do the separation logically. This requires cooperation and planning, but it is still the most efficient way.

The more likely case is that this is not the environment of most intense use for either, and there is then no problem with capacity division.

Roaming, Handoff and Diversity

With short-reach radio, the possibility of a pedestrian or a robotic mail distributor leaving one coverage and entering another is very high. Passing through a doorway is likely to do it. It is very important that such changes be without effect on outside networks.

Covering a premise type floor area with one antenna for each 10,000 ft^2, a number of such antennae might be required to cover each floor of a number of floors. Each antenna might contain enough radio function so that the data content could be transferred over telephone pairs between each one and a common hub equipment with concentrator/packet switch/outside network interface functions.

Movement of a user between the coverage of one antenna and another supported by the same hub equipment is called a "diversity event". Generally movement within one department or company and within one building will be a diversity event not visible to any interconnected network.

If a user goes from one building to another on a University Campus, that transfer may exceed the scope of a diversity function causing a new path to be setup in an external network, however that new path may still be within the scope of a common administration. This is the data network equivalent of "handoff."

Higher order handoffs may be imagined for a user who takes his portable computer to the airport and to another building of the same company in another city. At this point, he becomes a "roamer." Eventually, the roamer might be served in any wireless access building operated by other companies in the same city.

With standards, the universality necessary for technically unlimited roaming might and should exist for user of portable computers as well as for pocket telephones. The wide area backbone networks to support this type of roaming exist only for services that can accept substantial store and forward delay, but there is hope from ongoing developments.

An important contrast with some presently proposed PCN systems is that they depend on the public switch or a high level PCN switch to deal with continuity of service for stations passing between contiguous coverages. One result is that there is a great inducement for range maximization of each access antenna. This criteria is contrary to maximizing frequency reuse and spectrum utilization. A further consequence is that path to common control and back again is too long (propagation time) for the data services where a message length is commonly a millisecond or less.

Those systems that do not internally deal with local changes in radio coverage will incur switching system costs of a higher level possibly reducing the capacity and cost effectiveness of the system.

The personal data service will avoid this pitfall because its technical requirements do not allow anything else but local processing at a nearby concentrator.

Containment of Excess Coverage from Premises Use of Short-Reach Radio

The premises area system has the possibility of keeping externally detectable radiation quite low. One inducement is security, and another is isolation from incumbent users.

Walls can be low loss for perpendicularly incident waves and quite opaque for incidence at acute angles. It is possible to take advantage of this in the layout of Access-points within a building. Considering further that the free space range of the data radio system will be quite limited in the first place, external radiation is a small problem.

The reason that short-reach is acceptable for data comes from the primary service of departmental communication. The users are likely to be quite close to each other as is typical of large offices. This user density is far greater than public telephone assumptions. It is also necessary to limit the reach to paths that are probably optical because of the high data rates to be used. In addition, the short, unobstructed path is compatible with simpler, lower power, battery-operated radios. These are optimization criteria that would be less appropriate for telephone only.

Relative Economic Value of Voice and Data Communication

The pre-cellular history indicated that a radio channel was far more valuable for data than for voice. Ultimately, the operators of UHF RCC channels maintained only token voice services loading them with 1,000 or more pagers rather than 25 voice customers. If the voice function of cellular is not protected, eventually cellular

channel time will prove to be worth at least 10 times more per minute for narrowband data than for voice. The data usefulness would be greatly diminished without the public switched network access, but eventually direct links into packet networks will be found that better implement data services.

When on-premise high-rate data is considered, the transmission capability is much higher, but because of alternative wired solutions for short distances the value is not increased proportionally to the amount of data transferred. Nonetheless, data produced by work groups is very important to the companies. In many cases, it is part of the companies revenue producing capability.

The data communication on networks is part of the work that enables a Company to add value. It is far removed from recreational use of computers that generally does not require connection to outside networks.

INTERNATIONAL ACTIVITY

International activity in the area of high-rate wireless is known to me mainly through liaison reports to the IEEE 802.11 subcommittee except for TG 8/1 where I am also a participant. For completeness, a few relevant excerpts from summaries of these reports are given as follows:

TG 8/1 FPLMTS

Through the efforts of the US delegation, its Chairman, Frank Rose (FCC), and some other delegations CCIR WARC-92 defined a "Phase 2" for user requirements of more than 2 Mbits/sec.

"The following are new service objectives identified for inclusion in Phase 2:

1) support of the high data rate needs of portable computing users, and
2) support of enhanced multimedia communications requirements (e.g. providing voice, video and data simultaneously to a user."

ETSI STC RES-10

The Europeans have taken up the problem of high-capacity premises area data communication within ETSI. The terms of reference of ETSI STC RES-10 include:

"• *to draft an open standard for high performance radio local area networking, offering at least 10 Mbits/s at the terminal and supporting at least 100 Mbits/s/hectare/floor, including a radio specification and any necessary associated standards.*"

RES-10S will be a services and requirements group and RES-10R will be a radio group.

"RES-10R has been urgently tasked with the development of technical inputs for use in the spectrum allocation studies being undertaken within CEPT."

Wireless LAN Standardization Working Group, Research & Development Center for Radio Systems in Japan (RCR)

In November 1991 IEEE 802.11 heard a liaison report from a member of the above captioned Committee of RCR. The organization for standardizing wireless LAN system has started system studies based on USA frequency plans and 802.3 LAN standards. Nothing was said about any other alternatives.

Comment

There is substantial international interest in what happens in the US and in the IEEE P802.11 Committee. In Europe, it appears that they will work to their own problem definition possibly reaching a conclusion sooner than IEEE P802.11 and the FCC.

CONCLUDING COMMENTS

1) One innovative and unique new communication service has been proposed for this band, and it is short-reach radio, high-rate data transfer for primary use within premise areas, and this service has the following characteristics:
   a) no existing allocation of frequency space addresses this important need.
   b) the anticipated use and demand is a significant fraction of the population in numbers of units, and it is large enough in dollar value of supplied equipment to materially affect economic statistics for industrial output.
   c) the power levels and coverage areas are small enough to minimally effect other terrestrial and satellite communication systems that might be co-users of frequency space.
   d) the IEEE P802.11 Local Area Network Standards Subcommittee has been working on this problem for 18 months and could be a source of technical detail.

2) The same realization of the economic importance of this service is present now in European and Asian countries where they will proceed along these lines regardless of what the US does.

3) The cost and loss from reallocation of this frequency space given by some important incumbents, allowing some exceptions, is highly inflated. If the true cost is the difference between the replacement cost with reallocation and without it over the duration of a transition period, then:
   a) the cost without reallocation, if considered, grossly underestimates the attrition of present facilities from replacements to achieve lower operating cost, more capacity, increased reliability and reduced exposure to hostile acts.
   b) the economic value of the benefits of this new service to the same entities are almost always ignored.

4) However convenient the service provider entity may be as a revenue and financing source, privately provided systems must be recognized as the main implementation format for this type of radio system. The equipment is financed in the same way as any other productivity tool that a company buys.

5) The real public policy question is whether the licenses of the incumbents are proprietary property rights to perpetuity (like broadcast licenses), and whether the appreciated value should be to the account of the present holders, the government, new license applicants or some combination of these.

6) My view (as one private citizen, and not an expert) is that **all licenses** should have use fees attached which are in some proportion to the occupied time-space-megaHz product and weighted for relative value declining with increasing frequency. The revenue from leasing spectrum should go to the government. Unlicensed service should not be allowed in the new 2 GHz allocations.

Respectfully submitted,

Chandos A. Rypinski

LACE, INCORPORATED
921 Transport Way
Petaluma, CA 94954

ATTACHMENT A
CHANDOS A. RYPINSKI
BIOGRAPHICAL INFORMATION
as of January 1, 1992

EDUCATION: Bachelor of Science, Electrical Engineering, 1948
California Institute of Technology, Pasadena, California

SERVICE: **U.S. Marine Corps**, Staff/Sergeant., 1943-1946
Radar (SCR-584) Crew Chief, Radio Maintenance, Pacific Area

HONORS: **FELLOW**, Radio Club of America, New York, 1974
CENTENNIAL MEDAL, Institute of Electrical and Electronic Engineers (IEEE), 1984 (for contributions to vehicular radio technology)
AVANT GARDE AWARD, IEEE Vehicular Technology Group, 1990
LIFE FELLOW, IEEE, 1992 "For contributions to mobile radio technology."

PATENTS:
2,963,552 Telephone Subset Current Generator (Subscriber ID)
3,144,624 Coaxial Wave Filter (25 kw, 400 MHz, LPF for ITT)
3,173,996 Multiple Channel Radio Telephone System (IMTS/MJ)
3,764,926 Method for Demodulating Phase Reversal Wave (Rydax 300 bps)
3,909,727 Data Signaling Noise Suppression System (RCA)
4,803,485 LAN Communication System and Medium Adapter for Use Therewith (AMP)
(Others pending)

CURRENT ACTIVITY

LACE, Inc. (Local Area Communication Equipment) was formed by C. A. Rypinski, President and Chief Technical Officer, in July, 1988. The Company provides technical services and development for selected customers in subjects related to data transmission in adverse environments; and is working on the proprietary development of radio-medium integrated voice-data local area networks. Competence of the initial development staff includes digitally modulated radio systems, analog/digital modems, digital logic design and network access protocols.

Rypinski is a voting member of and a contributor to **IEEE Local Standards Committee 802.11** (Access Method for Wireless Physical Medium) and also **IEEE Local Area Network Standards Committee 802.9** (IVD LAN--Work Station Interface); and he has been active on **802.6** (Metropolitan Area Networks) and **802.4L** (Token Bus-Wireless medium). He also participates in the US delegation to **CCIR TG 8/1** concerned with Future (International Digital) Public Land Mobile Telecommunication Service (FPLMTS).

BACKGROUND

Until the formation of LACE, Rypinski was a self-employed consultant on LAN and radio telephone technology. Until July, 1985, he was President of **Radio/Switch**. At that time, the Company redirected its effort into Local Area Networks (**LAN**) which are software-intensive products; and he continued with the Company, renamed **Netronix**, as Vice-President until March, 1986. **Radio/Switch** was started by Rypinski in February, 1982; and completed developments of Demand Assigned Multiple Access Controllers (DAMA), FM Channel Modems (SCPC) for telephone channelization of satellite earth stations; of Test Equipment (radio, logic, protocol and data acquisition) for cellular mobile telephone fixed installations; and of an isochronous optical ring Local Area Network. Development of LAN products was started.

As a self-employed consultant from 1979-82, he worked for several clients including assistance to **Ericsson Radio Systems** in cellular mobile telephone marketing and FCC license application matters. This work grew causing the formation of Radio/Switch to supply product for these clients.

Until December 30, 1978, he was President of **RYDAX**, Inc. which he organized in 1970. **RYDAX** developed and sold many equipments for digital signaling and voice substitute messaging in land mobile radio services (police, taxi, transit for **RCA**) and the **ACS automatic mobile telephone system** before the Company was purchased by **E. F. Johnson Company** in 1978.

As Engineering Vice-President of **Secode Corporation**, he conceived and lead the development of the **MJ (IMTS)** mobile telephone logic for **Bell Laboratories** in 1960-63. In this period, he obtained the patent under which all subsequent systems of this type were licensed. IMTS Control Terminals developed here were manufactured by **General Electric Co.** for more than 15 years thereafter.

As **C. A. Rypinski Co.**, Pasadena, he conceived and designed the first volume produced mobile telephone antenna duplexing filter in 1958 for the **General Electric Co.** A 25 kw UHF filter for **ITT** and several duplexers for space probes were also developed and manufactured.

He obtained his early radio and digital communication engineering experience at the **Collins Radio Company** (Burbank) from 1949-57, where as an Engineering Group leader he developed various military airborne and naval UHF and HF radio equipments; and in 1948 at **Northrop Aviation** where he developed and built a microwave antenna pattern testing range.

During WWII, he designed and built an automatic plotting equipment for the SCR-584 radar that was used for fighter-direction and artillery counter-fire spotting in the Okinawa campaign (1945).

He obtained amateur radio operators license W6RDR in 1940, and in 1941 First Class Telephone and Second Class Telegraph commercial radio operators licenses.

LACE, INCORPORATED
921 Transport Way
Petaluma, CA 94954
Tel: 707 765 9627--Fax: 707 762 5328--Tel(H): 415 435 0642