**MINUTES OF THE NINTH MEETING**

**REGIONAL TELECOMMUNICATIONS PLANNING ADVISORY COMMITTEE (Reconstituted)**

DATE: July 27, 2005

TIME: 2:00 P.M.

PLACE: Commissioners' Conference Room
Regional Planning Commission Offices
W239 N1812 Rockwood Drive
Waukesha, Wisconsin

Members Present

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| Kurt W. Bauer<br>Chairman | Executive Director Emeritus, SEWRPC |
| Bob Chernow | Chairman, Regional Telecommunications Commission |
| Michael Falaschi | President, Wisconsin Internet |
| Barry Gatz | Network Supervisor, CenturyTel |
| Michael E. Klasen | Director, Regulatory Affairs, SBC Wisconsin |
| J. Michael Long | Attorney-at-Law, Murn and Martin, SC |
| George E. Melcher | Director, Office of Planning and Development, Kenosha County |
| Steven L. Ritt | Attorney at Law, Michael Best & Friedrich |
| James W. Romlein | Managing Director, MVLabs, LLC |
| Bennett Schliesman | Director, Kenosha County Emergency Management /Homeland Security |
| Dale R. Shaver | Director, Waukesha County Department of Parks and Land Use |
| Darryl Winston | Director of Data Services, City of Milwaukee Police Department |
| Gustav W. Wirth, Jr. | SEWRPC Commissioner |

Members Absent

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| William R. Drew<br>Vice Chairman | Vice-Chairman, SEWRPC; Executive Director, Milwaukee County Research Park |
| Kenneth Brown | RF Engineer, Nextel Communications, Inc. |
| Roger Caron | President, Racine Area Manufacturers and Commerce |
| David L. DeAngelis | Village Manager, Village of Elm Grove |
| Brahim Gaddour | Director of Network Operations, Time Warner Telecom of Wisconsin |
| Jeff Mantes | Commissioner of Public Works, City of Milwaukee |
| Jody McCann | Network Domain Manager, Wisconsin Department of Administration, BadgerNet |
| Paul E. Mueller | Administrator, Washington County Planning and Parks Department |
| Michael Ulicki | Vice President and Chief Technology Officer, Norlight Telecommunications |

Staff

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| Philip C. Evenson | Executive Director |
| Kenneth J. Schlager, PhD | Chief Telecommunications Engineer, SEWRPC |
| Lynn G. Heis | Staff Secretary, SEWRPC |

**CALL TO ORDER AND ROLL CALL**

Chairman Bauer called the meeting to order at 2:10P.M. Roll call was taken by circulating an attendance signature sheet, and a quorum was declared present.

**CONSIDERATION OF THE MINUTES OF THE MEETING OF JUNE 29, 2005**

Chairman Bauer noted that copies of the minutes of the eighth meeting of the Reconstituted Regional Telecommunications Planning Advisory Committee held on June 29, 2005, had been distributed to all members of the Committee for review prior to the meeting; and asked that the Committee consider approval of those minutes.

There being no questions, comments, or corrections, on a motion by Mr. Wirth, seconded by Mr. Chernow, and carried unanimously, the minutes of the meeting of June 29, 2005, were approved as published.

**FURTHER CONSIDERATION OF PRELIMINARY DRAFT OF SEWRPC REGIONAL TELECOMMUNICATIONS PLANNING PROGRAM, TECHNICAL STUDY DESIGN MEMORANDUM NO. 7, WIRELESS PERFORMANCE MONITORING INVENTORY**.

Chairman Bauer noted that a copy of the revised preliminary draft -- the third draft -- of SEWRPC Regional Telecommunications Planning Program, Technical Study Design Memorandum No. 7, Wireless Performance Monitoring Inventory, dated July 12, 2005 had been distributed to all members of the Committee for review prior to the meeting.

Chairman Bauer recalled that the Committee had received the first preliminary draft of this planning report at its meeting held on May 10, 2005; and a revised second preliminary draft at its meeting held on June 29, 2005. At both meetings, he recalled, the Committee had postponed action on the report until a revised draft incorporating the original and further changes which the Committee directed to be made could be reviewed. He then asked Dr. Schlager to undertake a page by page review of the revised third draft with the Committee, emphasizing the deletions, additions, and other changes which the Committee had directed to be made in the now third draft.

Dr. Schlager called attention to the revised text on page 13 of the memorandum and indicated that the staff had been able to revise the proposed performance monitoring procedure in accordance with the recommendations made by Mr. Klasen and endorsed by the Committee at its last meeting. He then called attention to the revised text of Appendix IV and the attached diagram of the now proposed circuit-switched monitoring system.

Mr. Romlein indicated the now proposed monitoring system constituted an elegant solution to the problems raised by the Committee at its last meeting. Mr. Chernow agreed, and indicated that the staff was to be complimented for the innovative approach now being taken. Chairman Bauer observed, in his opinion, that Mr. Klasen was to be complimented for his constructive criticism of the circuit-switched monitoring system as originally proposed by the staff.

Mr. Romlein suggested, and the Committee concurred, that the word "may" be inserted into the beginning of the seventh line of the first paragraph of Appendix IV. Mr. Klasen suggested, and the Committee concurred, that the word "directs" in the eighth line of the first paragraph of Appendix IV be changed to "transmits".

In answer to a question by Mr. Ritt, Dr. Schlager indicated that the management server is involved in individual calls only by directing the transmitting endpoint to "begin transmitting" when the call connection has been made. In answer to a further question by Mr. Ritt, Dr. Schlager indicated that the receiving endpoint transmitted the data created in the calls back to the management server through the Internet. In answer to a final question by Mr. Ritt, Dr. Schlager indicated that conceptually, "dashed" line connections could be envisioned between the management server and the transmitting and receiving endpoints.

In answer to a question by Mr. Chernow, Dr. Schlager indicated that the calls were expected to average a total of five minutes per call; the first minute being allotted to set up and connect the call, an average of three minutes being allotted to the call maker, and one minute being allotted to disconnect the call.

In answer to a question by Mr. Klasen, Dr. Schlager indicated that the data query and transmission to the management server would indeed be over a land-line Internet connection. Mr. Klasen suggested, and the Committee concurred, the diagram be accordingly modified, making it clearly evident that the voice calls are to be made from cell phone to cell phone on the same providers network, while the data findings are to be transmitted from the receiving endpoint to the management server over land-line Internet connection.

Mr. Wirth asked whether any of the providers concerned utilized "ruthless priority" in the transmission of emergency calls -- such as 911 calls -- relating to the need for public safety, fire, and emergency medical services. A discussion ensued in which Captain Winston indicated that some providers -- including at least Verizon – utilized means for prioritizing emergency calls which, in effect, made the next available transmission available for connection to first responders. At the conclusion of the discussion, Mr. Wirth suggested that the staff investigate this matter in order to be sure that the use of such public safety related call priorities procedures is properly reflected in the monitoring data.

> [Secretary's Note: Staff investigation indicated that priority based interruptions are a normal part of day-to-day wireless telecommunication operations, and would equally affect all wireless carriers which utilize priority based emergency calling. Therefore, the monitoring will properly reflect the service being provided. Moreover, statistically such calls may be expected to comprise a very small portion of total calls made.]

There being no further questions or comments, on a motion by Mr. Melcher, seconded by Captain Winston, and carried unanimously, SEWRPC Technical Study Design Memorandum No. 7 "Wireless Performance Monitoring Inventory", dated July 12, 2005, was approved with Messrs. Klasen, Long, and Ritt voting "No."

Mr. Klasen explained his vote by indicating that while he now had no concerns over the technical soundness of the proposed monitoring procedure, the monitoring effort was regarded per se by his firm as crossing over into a regulatory role, a role by the Commission to which his firm was opposed. He indicated further, that while he was appreciative of the staff work done on the memorandum in response to the Committee directions, corporate policy now precluded his support of the memorandum.

Chairman Bauer indicated that a copy of the memorandum as finally approved would be attached to the Minutes (copy attached, including revised diagram for the circuit-switched monitoring network).

**CONSIDERATION OF GLOSSARY DATED JULY 27, 2005**

Chairman Bauer noted that in accordance with the direction of the Committee, a copy of the proposed Glossary had been distributed to all members of the Committee prior to the meeting. He stressed that the copy provided represented a "work-in-progress" and additional terms would be added as the planning work progressed either at the specific direction of the Committee or as a staff initiative. He indicated further that the Committee would be provided with a copy of the final Glossary for review prior to publication of SEWRPC Planning Report No. 51.

Mr. Falaschi noted that the definitions of the acronyms MHz and PCS had been duplicated in the Glossary and that this duplication should be eliminated. Mr. Falaschi indicated further, that under the definition of the acronym ILEC, the word "expansion" in the first line of the definition should be changed to "exchange".

Mr. Evenson suggested, and the Committee concurred, that the terms "broadband" and "advanced broadband" be added to the Glossary.

Mr. Falaschi questioned the definition provided in the Glossary for WiFi. He indicated that the definition of WiFi included only IEEE standard 802.11b and not 802.11a. Dr. Schlager disagreed that this was correct, but indicated that the Glossary definition would, however, be reviewed and clarified.

[Secretary's Note: A copy of the revised Glossary is attached to these minutes.]

**STAFF REPORT ON WISCONSIN "OPEN RECORDS" LAW**

Chairman Bauer noted that the Committee had at its last meeting reiterated its request for a briefing on the ability of the Commission to maintain the confidentiality of any sensitive data that the private carriers might provide to the Commission for use in the planning effort. He then asked Mr. Evenson to brief the Committee on this issue.

Mr. Evenson indicated that he had discussed the issues concerned with the Commission's legal counsel and he could make the following statements to the Committee.

Any data collated by the Commission from other public sources must be considered to be in the public domain and, under the State open records law, must be made available upon request. Any attempt to mask the data to conceal individual corporate names would ultimately fail, since the code relating the generic identification with the specific firms concerned would represent a new public record created by the Commission.

Any data provided to the Commission by a private carrier for use in the study which is declared by the providing carrier to constitute a "trade secret" as defined in Section 134.90(1)(c) of the Wisconsin Statutes, would have to be kept confidential by the Commission. Indeed, he said, the Commission would be obligated not to release such data to anyone.

In answer to a question by Mr. Falaschi, Mr. Evenson indicated that the term "trade secret" was defined in Section 134.90(1)c of the Wisconsin Statutes, the so-called "Uniform Trade Secret Law".

Mr. Ritt observed that a larger concern on the part of the providers was that, if the providers voluntarily submitted information to the Commission and tried to label that information as a trade secret, the Commission may be challenged, perhaps in court, as to whether or not the information concerned was indeed a trade secret as defined in the State Statues. The uncertainty of confidentiality entailed is apt to make the private sector firms reluctant to share information with the Commission.

Mr. Evenson observed that the Commission had already experienced a challenge in this respect. The challenge, he said, involved a private party requesting a copy of an address list provided on a confidential basis by a service firm to the Commission for use in the conduct of public attitudinal surveys relating to freeway system development. The Commission refused to make the list available and the request was, at that point, dropped. Mr. Ritt observed that the result could, in the case sited by Mr. Evenson, have been quite different had it involved a request from the media as opposed to a request from a private individual.

Mr. Wirth observed that -- as a practical matter -- bringing a court action against the Commission for release of technical data held confidentially as having been provided to the Commission as a trade secret was a non-issue since, by the time a court decision was reached, the data concerned would -- given the rapidly changing technology involved -- be obsolete.

Mr. Chernow suggested that the Commission may want to consider providing an incentive to the private providers for cooperation in the Commission planning effort by getting the counties and local communities to agree to automatically approve permit applications for facility construction if the proposed construction is in accordance with Commission adopted plans. Chairman Bauer indicated that this suggestion would be properly considered in drafting plan implementation recommendations. Mr. Evenson indicated that Mr. Chernow's suggestion was in the spirit of a cooperative planning program. Under Mr. Chernow's suggestion, he said, the Commission would, upon request, issue a finding of conformance with the plan for facilities included in a cooperatively prepared plan.

There being no further questions or comments, it was the consensus of the Committee that the report be accepted and placed on file via the minutes of the meeting.

**CONSIDERATION OF STAFF MEMORANDUM DESCRIBING PROPOSED REGIONAL TELECOMMUNICATIONS PLANS**

Chairman Bauer noted that the Committee had, at its last meeting, requested that the staff prepare a memorandum describing the scope and content of the plans proposed to be prepared under the study for consideration by the Committee. He noted that a copy of the requested memorandum had been provided to all members of the Committee for review prior to the meeting. He then asked Mr. Evenson to undertake a review of the memorandum with the Committee.

Mr. Ritt reiterated the concern which he had previously expressed a number of times in Committee meetings, that the Commission was, through the proposed plan preparation, inserting itself into the design of private provider systems. This, he said, could present a major obstacle to the providers ability to develop systems providing a level of service meeting market demand as that demand was evaluated by the private providers. In this respect, he said, the Commission's work could be regarded as detrimental -- and not helpful -- to the private sector service providers. He indicated further that the private sector providers had no responsibility to reach agreement with the Commission as to what level of service should be provided to potential customers.

Mr. Chernow disagreed with Mr. Ritt, indicating that, in his opinion, the Commission prepared wireless antenna plan could only be helpful to private providers in seeking approval of permit applications for antenna location and construction. He indicated that with a cooperatively prepared plan, there would be

agreement between private providers and the Commission with respect to the need for antenna location and construction, and this would bring another voice to the table at the county and local levels of review. Dr. Schlager agreed, indicating that, if in a cooperative planning effort you have agreement between the Commission and the private provider on such technical issues as antenna site locations and power levels and on the type of radio propagation models used in the necessary analysis, there could only be agreement on the antenna configurations between the Commission and the providers. If the providers refuse to cooperate in the planning effort, then quite different viewpoints may be provided to the counties and local communities, he said.

Mr. Klasen observed that the service providers as private enterprises operate under capital constraints and do not propose antenna construction that is not absolutely needed. When service providers approach regulatory agencies with a request for permit application approval, the provider has already identified a need. Although it might, in some cases, be helpful to have a third party validate that need, such validation did not, in his opinion, require a publicly prepared plan; but, more simply, independent expert advice to the local communities provided on an ad hoc, site-by-site basis. Chairman Bauer indicated that Mr. Klasen's suggested approach was indeed a fallback position for the Commission. A careful reading of the memorandum concerned, he said, indicated that the Commission will prepare a 4G wireless antenna plan, and that the Committee -- through review and constructive criticism -- is intended to help make that plan a technically sound one. The memo further indicates that the Commission will prepare a 2G-3G plan -- as a stage in the implementation of the 4G -- plan only in cooperation with the individual service providers. If those providers refuse to cooperate in the preparation of that plan, the Commission will be left no alternative but to participate in the development process on the basis indicated by Mr. Klasen.

Mr. Romlein suggested that it would be possible for the Commission to develop plan maps showing the functional requirements of a good wireless telecommunications system for the Region by identifying -- for each carrier -- existing service levels by geographic area; comparing those levels to desired levels of service by geographic area; and indicating the attendant needs for service improvements in geographic subareas of the Region, leaving each carrier to develop proposals to meet the identified needs.

In answer to a question by Mr. Long, Mr. Romlein indicated that such an analysis would treat all carriers the same because the plan maps would identify only service requirements.

Chairman Bauer indicated that Mr. Romlein's suggested approach actually represented a stage in the proposed plan preparation process, and the process could be terminated at that stage, at least with respect to the 2G-3G plan. The final phase of the planning process, as presently proposed, would be for the Commission to identify proposed antenna locations to provide service to the areas identified as having substandard service -- substandard being identified in terms of the adopted plan objectives and supporting standards.

Mr. Melcher indicated that while the end product of the planning process suggested by Mr. Romlein, represented a compromise position, he would very much like to have, for his use, a Commission recommended configuration of antenna sites required to serve Kenosha County. Such a plan configuration could be properly regarded and used as a point of departure in County considerations of permit applications for new antenna sites.

Mr. Romlein disagreed, indicated further that it would be perfectly proper for the Commission to utilize the Commission's antenna inventories, radio propagation models, and objectives and standards to develop the analytical maps which identified areas of deficient service. The location of specific antennas as proposed by the private providers in response to the Commission's delineation areas requiring improved service could then be handled on a case-by-case basis in which the Commission staff would provide an independent review of the private service providers proposals for improved service.

After some further discussion, Chairman Bauer summarized Mr. Romlein's proposal by indicating that, under that proposal, the Commission would produce a series of plan maps that would show the areas of the Region in which wireless telecommunications service was currently substandard based upon Commission adopted objectives and standards. The areas requiring improved service by carrier would be delineated on the basis of the Commission inventory data and radio propagation modeling. He indicated further that the planning process would not, under Mr. Romlein's proposal, proceed to the identification of specific antenna sites. Mr. Romlein agreed with the summary statement. Mr. Romlein observed further that as suggested, the end product would also be more acceptable with respect to the third composite regional telecommunications network plan than going to the next stage and identifying specific locations of -- for example -- fiber optic cables.

Chairman Bauer suggested that the Commission staff take Mr. Romlein's suggested approach under advisement and report back to the Committee on this issue at its next meeting. Chairman Bauer indicated further that the alternative approach to Mr. Romlein's suggestion would be for the Commission to drop the preparation of a 2G-3G plan for those providers which refuse to cooperate with the Commission in the planning process. The Commission would, under that alternative, publish the results of its current inventories and analytical service coverage maps based on its own inventory data and radio propagation modeling.

In answer to a question by Mr. Chernow, Chairman Bauer indicated that the Commission's 4G wireless antenna configuration plan is to be completed by the end of this calendar year.

Mr. Falaschi called attention to the statement on page 3 of the planning memo which indicated that the Commission's 4G network plan would allow for the accommodation of only one unlicensed service provider in each unlicensed frequency band. He expressed concern that this approach would establish a monopoly with respect to unlicensed service providers across the seven county region -- in his opinion, an unacceptable situation. Mr. Falaschi indicated that the issue is further complicated by the fact that in Racine County, the public safety telecommunications network is proposed to be operated in the 2.4 megahertz frequency range, an unlicensed range -- in violation of the law. In conclusion, Mr. Falaschi indicated that, in his opinion, the approach proposed for the 4G planning is not feasible given the problem with unlicensed service.

In response to Mr. Falaschi's comments, Mr. Klasen suggested that the Commission's 4G plan address only the licensed frequencies.

Mr. Romlelin suggested that the Commission simply identify the functional requirements with respect to 4G service, specifying the needed band width without specifying whether the service would be in the licensed or unlicensed range.

Mr. Klasen indicated that the Commission should not, through its planning process, create "winners or losers" in the market place; that if this means that the Commission cannot address the unlicensed service issue, then the Commission should plan only for the licensed service networks.

In answer to a question by Chairman Bauer, Mr. Romlein reiterated his suggestion that the Commission plan simply to identify for all of the technologies concerned -- whether wired, 2G-3G wireless, or 4G wireless -- areas of the region with substandard service as defined by the Commission. At the point in the planning process when this has been done, the Committee and Commission could determine whether to take the next step in the planning process to develop recommended solutions, or whether that step was better left to the private service providers.

Chairman Bauer then summarized the proposals in the staff memorandum setting forth the reports proposed to be prepared under the telecommunications program together with Mr. Romlein's suggestion for modification of the end state plans to be produced. He indicated that, in his opinion, there was nothing new in the memorandum in that it simply summarized what was clearly set forth in the Commission approved Prospectus that provides the basis for conduct of the planning program. He indicated that it appeared that the result of the Committee's deliberations on the planning memorandum could be summarized as:

1. The Commission will proceed with the preparation of a 4G wireless service plan for the Region with or without the cooperation of individual private service providers; and that plan will be based upon the Commission's inventory findings, radio propagation modeling and analyses of the modeling results.

2. The Commission will initially prepare a 2G-3G service plan as staged development toward the 4G plan only for those providers that agree to cooperate with the Commission in the planning process by providing necessary data that cannot be obtained from the public records. These data include, importantly, actual antenna power used.

There being no objections, Chairman Bauer indicated that the staff prepared planning memo be accepted by the Committee and placed on file via the minutes.

Chairman Bauer then indicated that the Committee could, at its next meeting, expect to again receive a preliminary draft of Chapter V "Wireless Telecommunications Inventory Findings." The draft would be limited to the inventory findings with respect to Kenosha County, setting forth antenna site locations and related data and coverage maps based upon the Commission inventory findings and radio propagation modeling. It is proposed that the maps be based upon a higher level of service than originally developed and presented to the Committee, namely that the -80 decibels per miliwatt standard be met 90 percent of the time, rather than 50 percent. This raised standard is proposed based on staff discussions with law enforcement agencies operating within the Region.

Chairman Bauer then indicated that the remaining issue with respect as to how to proceed at the staff level concerned how to contact the individual service providers to determine whether or not those providers would cooperate in the preparation of a 2G-3G phase plan. He indicated that experience in other areas of the Commission work clearly indicated to the staff that utilizing a formal letter of inquiry addressed to corporate headquarters of the individual service providers was impractical given the time constraints on completion of the wireless service plan. He noted that Mr. Brown had, in his comments made at the last meeting of the Committee, in effect substantiated this staff conclusion. Accordingly, it was proposed to proceed through informal contacts in which Commission staff would call either the attorneys or staff of each individual provider to ascertain the willingness, or unwillingness, of the provider to cooperate fully in the planning effort.

**CORRESPONDENCE**

Chairman Bauer reported that Mr. Schumacher had, with regret, resigned his position on the Advisory Committee. He noted that Mr. Schumacher had left the position of Program Manager, Tricounty Business Partnerships to pursue other opportunities, and this change in employment engendered the resignation. Chairman Bauer asked Mr. Evenson to send a letter of appreciation on behalf of the Commission to Mr. Schumacher for his past service on the Committee (copy attached to these minutes).

Chairman Bauer reported that the staff had received a communication from Mr. Brown indicating that changes in his work schedule now made it impossible for him to attend Committee meetings on

Wednesday, and -- therefore -- requested that the Committee meetings again be scheduled on Tuesdays as was originally the case. Chairman Bauer reported that the staff had also received a communication from Mr. Caron indicating that he too could not attend Committee meetings held on Wednesday afternoons.

After a brief discussion, is was the consensus of the Committee to accommodate Messrs. Brown and Caron's requests and again schedule Committee meetings to be held on Tuesday afternoons. At Mr. Melcher's request, however, the meetings would not be scheduled to be held on the second Tuesday of the month.

**DATE AND TIME OF NEXT MEETING**

Chairman Bauer then asked to Committee to consider the date and time for the next Committee meeting. After a brief discussion it was agreed that the next meeting of the Committee would be held on Tuesday, September 20, 2005 at the Commission offices, beginning at 2:00PM.

**ADJOURNMENT**

There being no further business to come before the Committee, on a motion by Mr. Melcher, seconded by Mr. Chernow, and carried unanimously, the meeting was adjourned at 4:15P.M.

Respectfully Submitted,

Lynn G. Heis
Staff Secretary

KWB/lgh
09/27/05
#110597 V1 - T/C Minutes - 9th Meeting

**SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION**

**REGIONAL TELECOMMUNICATIONS PLANNING PROGRAM**

# TECHNICAL STUDY DESIGN MEMORANDUM No. 7
# WIRELESS PERFORMANCE MONITORING INVENTORY

**July 12, 2005**

## INTRODUCTION

The Regional Telecommunications Planning Program as set forth in the Commission approved Prospectus[1] for that program includes the conduct of a quality of service inventory. That inventory is envisioned to be conducted through end user performance monitoring utilizing computer and telecommunications hardware and software adopted for this purpose. This memorandum describes the proposed network monitoring system, defines the proposed monitoring parameters, and presents the necessary experimental design that provides the basis for the system. A wireless component of the system will be used to monitor the performance of the cellular/PCS wireless service within the seven county planning region. Wireline components will be used to monitor the performance of the regional wireline telecommunications system. This memorandum describes the proposed wireless system performance monitoring system.

The purpose of the proposed performance monitoring inventory is to provide information on the existing level of wireless service within the planning area. That existing level of service can then be compared to the level of service required to maintain the economic viability of this Region in competition with other regions of the world. The proposed Commission wireless antenna siting and relating infrastructure plan will then describe any needed facilities and service improvements, and identify actions required to be taken by private service providers and by the county and local municipal governments concerned to facilitate the attainment of the desired level of service.

The NetIQ AppManager network monitoring system is proposed to be used as the software vehicle to collect this performance data for packet-switched networks. The NetIQ Vivinet

[1] SEWRPC: "Prospectus for a Regional Telecommunications Planning Region" Southeastern Wisconsin Regional Planning Commission, December, 2003.

Assessor will function as the evaluation software for circuit-switched networks. Although the NetIQ AppManager and Vivinet Assessor were originally developed for wireline network monitoring, they can be adapted to wireless application with the addition of transceiver interface cards, laptop computer agents and suitable supporting software as described in Appendices I and II.

**WIRELESS CUSTOMER EXPERIENCE MONITORING SYSTEM**

The equipment components of the network monitoring system include:

1. Network Management System (NMS) Server Computer– located at SEWRPC
2. Supervisory NMS Desktop Computer– located at SEWRPC
3. Six Laptop Computer Agents– located at various rotating temporary locations throughout the Region.
4. Six Transceiver Interface Access Cards
   - one for each wireless cellular/PCS service provider
   - each integrated with one of the six laptop computers
5. Twelve cell phones and supporting cable interconnect
   - two for each cellular/PCS service provider
   -each integrated with one of the six laptop computers with no two phones from the same provider connected to the same laptop

The above listed equipment will be operated using the NetIQ AppManager and the NetIQ Vivinet Assessor software. The AppManager will collect data on the packet-switched network parameters defined below while the Vivinet Assessor measures the readiness of each provider's packet-switched network for Voice over Internet Protocol (VoIP). While none of the Regional wireless providers currently offers VoIP, Vivinet measurements of VoIP readiness do provide a well conceived overall measure of network quality. The Vivinet Assessor will also determine the availability and the voice quality of circuit-switched networks.

Originally, it was intended to monitor only the packet-switched network since that is the type of network for which the monitoring software was designed. Packet-switched networks are also the wave of the future and will eventually replace circuit-switched networks. Current day cellular/PCS networks, however, serve primarily voice communications in the circuit-switched domain. Since a major purpose of the wireless performance inventory is to present the

performance of the existing wireless network system, it was decided to include circuit switched voice communications in the wireless performance inventory. This inclusion can be accomplished at little cost since the same laptop computer agent can be used to monitor both networks. Aside from the cell phone and its associated cabling, the only other addition required will be interface device driver software to interface the laptop computer to a particular cell phone.

**NETWORK MONITORING PARAMETERS**

The primary objective of the wireless network monitoring effort is to measure the four primary network performance parameters: availability; throughput; response time; and accuracy

Specific monitoring measurements, however, depend on the characteristics of wireless network operations and practices. For example, availability measurements such as blocked calls or dropped calls may have no meaning in a wireless packet-switched network. In a wireless circuit-switched network, there are only a limited number of channels. When all of these channels are in use, subsequent calls will be blocked. In packet-switched wireless networks, available bandwidth is typically rationed so that blocked or dropped calls do not occur. Such a practice, however, is inconsistent with the maintenance of a standard for quality of service (QoS). In any event, such spectral rationing, if it takes place, will be indicated in the throughput and response time measurements of the network monitoring system. Availability, however, is a major concern on circuit-switched voice networks. Blocked and dropped calls are key parameters in the evaluation of voice network quality. Given that service providers practices such as the above spectral rationing may influence the indications of some network measurements, the following network parameters have been specified for monitoring:

**AVAILABILITY**

During any monitoring session, lack of network availability will be time duration recorded as a lack of service. Lack of service time on packet-switched networks will be recorded as a "zero" on a one-zero availability chart over the monitoring period as shown in Appendix III. Chart data will then be accumulated to determine overall availability expressed as a percentage of user operating time. For circuit-switched networks, blocked and dropped calls will be recorded and time accumulated to determine the network availability percentage.

**THROUGHPUT**

For packet-switched networks, data throughput is recorded in bits per second. In current cellular/PCS networks, data rates will be in the kilobits per second range. For a given network, there are two relevant throughput data rates – burst and sustained. Small files will transmit at burst rates while larger files will slow to reduced sustained rates. The Federal Communications Commission (FCC) defines the minimum "little-broadband" data rate as 200 kilobits per second. Current 3G wireless networks are achieving around 300 kilobits per second. Since circuit-switched monitoring will emphasize voice traffic, throughput is not a meaningful parameter.

**RESPONSE TIME**

Response time data for packet-switched networks are recorded by network application such as Domain Name Service (DNS) IP address lookup, POP3/SMTP (e-mail) protocol, Hyper Text Transfer Protocol (HTTP) – text or graphic and HTTPS -- the secure version, of HTTP. The response time is recorded in seconds over a monitoring time period again as shown in Appendix III. While there is no specific standard for data traffic response time, these times should be consistent with throughput rate standards.

**ACCURACY**

Accuracy measurements vary with the type of media. For voice communications (VoIP), voice quality is recorded in terms of the R value which in turn depends on three network characteristics: latency time, jitter and lost packets. On-line measurements of these three factors are converted into R values using a standard formula. R values are then converted into MOS values through a linear conversion. R values range from 0 to 100 while MOS values range from 1 to 5. An R value of 80 is equivalent to an MOS value of 4.0.

Data and video communications are monitored in terms of saved and unsaved lost data expressed in percentage. The unsaved percentage will be converted into an uncorrected bit error rate of bits per million bits transmitted. Typical values for saved and unsaved lost data are:

1. Saved
   - maximum packet loss of 10 percent data and 5 percent voice

2. Unsaved
   - uncorrected bit error rate of 15 bits per million bits transmitted (0.0015 percent)

Circuit-switched voice traffic will be evaluated based on this same MOS value as packet-switched VoIP although the impact of the VoIP compression algorithm will be removed.

**NETWORK MONITORING CATEGORIES**

Wireless network monitoring data will be analyzed and summarized in a number of categories.

1. Regionwide

   -Average (mean) values for all of the regional network performance parameters along with their 95 percent confidence interval limits will be provided.

2. Regional Areas

   Average values for these same parameters will also be summarized for urban, suburban and rural areas of the Region. The Commission land use inventories categorize U.S. Public Land Survey system quarter sections as either urban, suburban or rural based on population density, measured in terms of average lot size per dwelling unit as follows:

   a. Urban
      - less than 1.5 acres
   b. Suburban
      - between 1.5 to 5.0 acres
   c. Rural
      -greater than 5.0 acres

3. Wireless Technology

   Network performance can also be analyzed by type of technology

   a. GSM (2G)
      - Global system for mobile communications
      - the global 2G standard
   b. GPRS (2.5G)
      - General packet radio service
      - a 2.5G addition
   c. Edge (2.5G)
      - Enhanced data for GSM evolution

d. iDEN (2.5G)
e. 3G (Third generation)

All of the above technologies support wireless data transmission. GSM is the slowest. Transmission rates increase in the order listed with 3G technology being the fastest.

4. Service Provider

Mean values for these same parameters will also be estimated for the following Regional service providers:

a. AT&T/Cingular
b. Nextel Communications
c. Sprint
d. Verizon Wireless
e. U.S. Cellular
f. T-Mobile

Service provider data will be reviewed with each provider prior to internal documentation. These data will not be published without the permission of the service provider concerned.

5. County

Cellular/PCS network performance data will also be summarized by each county in the Region.

6. Cellular versus PCS

Cellular Wireless networks operate in the 800-900 MHz spectral region while PCS networks operate at higher frequencies around 1900 MHz. Performance summaries will be prepared for each of these two spectral technologies.

**EXPERIMENTAL DESIGN**

All of the network performance parameters measurements involve estimates of a sample mean. The accuracy of these estimates depend on the variance of the sampling distribution and the number of samples collected. The standard deviation of the estimated mean is expressed as:

$\sigma_{\bar{x}} = \sigma/n$ ½

Where:

$\sigma_{\bar{x}}$ -standard deviation of the mean
σ-standard deviation of the distribution
n-number of samples

Knowing the standard deviations of the mean, it is possible to calculate the 95 percent confidence interval which will be $x \pm 2\sigma_x$. Knowing the confidence interval will enable the wireless performance inventory to state with 95 percent confidence that the performance parameter is within the stated value interval.

**Sample Volume**

From the above, it is clear that two factors determine performance parameters estimation accuracy; the number of samples and the sample variance. Since there is no way to control the variance of the sample, sample volume is the only control variable. The objective of the wireless performance monitoring inventory is to generate a significant of samples to provide accurate estimates of the performance parameters for each of the categories described previously.

To generate such sample volume, the wireless network monitoring system will be deployed and operate as follows:

1. Sampling Time Period
   The sampling time period at each location will be one week.

2. Sample Frequency - Circuit-switched network

Ten (10) three minute voice calls will be scheduled daily. These calls will occur during both peak and off-peak time periods during the 24 hour day.

3. Sample Frequency-Packet switched networks

   Packet-switched monitoring will occur every five minutes continuously throughout the day.

With the above time periods and sample frequencies, the following category based sample volumes are expected in the initial three month data collection period:

**Region/Circuit-Switched**

Conditions:

Laptop Agents – 6
Sample Period – 1 week
Inventory Period – 13 weeks
Samples/Day – 60
Samples/Week – 420
Samples/Inventory – 5,460

**Region/Packet-Switched**

Conditions:

Same as above except:
Samples/Day – 1,728
Samples/Week – 12,096
Inventory Period – 13 Weeks
Samples/Inventory – 157,248

**Urban/Packet-Switched**

Conditions:

Samples/Day – 1,728
Samples/Week – 12,096
Inventory Period – 5 Weeks
Samples/Inventory – 60,480

**Urban/Circuit-Switched**

Conditions:

Samples/Week – 420

Inventory Period – 5 Weeks
Samples/Inventory – 2,100

**Suburban/Packet-Switched**

Conditions:

Samples/Week – 12,096
Inventory Period – 5 Weeks
Samples/Inventory – 60,480

**Suburban/Circuit-Switched**

Conditions:

Samples/Week – 420
Inventory Period – 5 Weeks
Samples/Inventory – 2,100

**Rural/Packet-Switched**

Samples/Week – 12,096
Inventory Period – 3 Weeks
Samples/Inventory – 36,288

**Rural/Circuit-Switched**

Samples/Week – 420
Inventory Period – 3 Weeks
Samples/Inventory – 1,260

Note: The rural inventory sample volumes are smaller than the urban/suburban because only three weeks of sampling is conducted in rural areas versus five weeks in both urban and suburban areas.

**Technology**

Technology performance inventory summaries apply to both packet-switched and circuit-switched network, but the categories are somewhat different.

Circuit-switched

1. TDM
2. GSM - 280
3. iDEN - 70
4. UMTS (3G) - 70

Packet-Switched

1. GPRS – 104,832
2. Edge – 26,208
3. 3G – 26,208

**Service Provider**

Each service provider would be represented by one-sixth of the samples for the regional urban, suburban and rural categories.

**County**

The following sample sizes are estimated for each of the seven counties:

Kenosha – 15,725
Milwaukee – 15,725
Ozaukee – 15,725
Racine – 15,725
Walworth – 31,450
Washington – 31,450
Waukesha – 31,450

**Cellular versus PCS**

The three Regional cellular (800-900 MHz) providers are Nextel, Cingular and U.S. Cellular. The other four providers are PCS: Sprint, AT&T, T-Mobil and Verizon Wireless. At the Regional level, the sample size totals will be:

Cellular – 67,392
PCS – 89,856

**SAMPLE LOCATION SELECTIONS**

Monitoring data will be collected over 78 agent-period locations (6 agents over 13 weeks). To insure adequate geographic coverage of the seven county planning area, the area will be divided into ten data collection zones – one each for Kenosha, Milwaukee, Ozaukee, and Racine counties, and two each for Walworth, Washington, and Waukesha counties. The latter counties will be assigned two zones because they are approximately twice the area of the smaller counties. Each zone will then be assigned 8 agent-period locations with assignment order randomized. The last two zones in the assignment order will receive only seven agent-periods. Within each zone, agent-period entities will be randomly assigned to a prepared list of available sites within the zone. It is anticipated that the agent sites will be located at local government offices randomly selected from the 147 sites available.

The number of samples collected for each of the above categories will be limited by the agent-period entities available in a 13 week period. After the initial three-month inventory period, represented categories will be improved by subsequent weighted, randomized selections that will serve to achieve proper balance in all of the categories based on established principles of statistical sequential analysis.

**ESTIMATE ACCURACIES AND CONFIDENCE INTERNALS – SAMPLE ESTIMATES**

Without actually collecting sufficient data to determine sample variances, it is not possible to estimate the accuracies of the parameter means and confidence intervals. It is possible, however, to assume a range of variances in percentage terms and then apply that range to probable parameter values to estimate mean and confidence interval deviations.

**REGIONAL-LEVEL ACCURACY ESTIMATES**

**Availability: Packet-Switched**

Assumed value - 99.9 percent

Assumed standard deviation – 5.0 percent

Sample size – 157,248

Standard error, mean= 0,01 percent

**Availability: Circuit-Switched**

Assumed value - 99.9 percent

Assumed standard deviation – 5.0 percent

Sample size – 5,460

Standard error, mean – 0.07 percent

**Throughput – Packet-switched**

Assumed value – 20 – 200 Mbps

Assumed means

2.5G – 75 Kbps

3.0G – 300 Kbps

Assumed standard deviation

2.5G – 25 Kbps

3.0G– 100 Kbps

Sample size/2.5G - 104,832

Standard error, mean/2.5G – 0.077 Kbps

Sample size/3G – 26,208

Standard error, mean/3G = 0.62 Kbps

**Throughput: Circuit-Switched**

Not applicable

**Accuracy: Packet-Switched**

Assumed value – MOS 4.0

Assumed mean – 3.0

Assumed standard deviation 1.0

Sample size – 157,248

Standard error, mean = 0.0025

**Accuracy: Circuit – Switched**

Assumed value – MOS = 4.0

Assumed mean – 3.0

Assumed standard deviation – 1.0

Sample size – 5,460

Standard error, mean = 0.0135

The foregoing analysis indicates that the proposed sample sizes will be sufficient to obtain accurate parameter estimates, even in the smaller category sizes. In this respect it should be noted that accuracy estimates were not calculated for packet-switched networks response times because of the wide variation of these values for each application. These estimates will be calculated when sufficient monitoring data are available. Response time is not a meaningful parameter for circuit-switched networks.

**POTENTIAL LIMITATIONS OF THE PROPOSED PERFORMANCE MONITORING PROCEDURE**

It is important to understand that the proposed wireless performance monitoring may have certain potential limitations. One of these limitation concerns the use of multiple networks involving the Internet or other wireline-wireless service providers that may obscure the monitoring results. The Commission Advisory Committee expressed concern about the structure of the circuit-switched network monitoring procedure as proposed in both the first and second draft of this memorandum. The concern related to the use in the proposed procedure with respect to circuit-switched traffic of multiple networks involving the Internet or other wireless-wireline networks that may obscure the monitoring results. This concern has been addressed by removing the Internet and all other non-wireless service provider circuit elements from the circuit-switched traffic monitoring circuit as explained in a revised draft of Appendix IV, dated July 12, 2005. The circuit-switched monitoring procedure is now proposed to consist of a wireless-to-wireless configuration as suggested by the Advisory Committee. The circuit as now proposed contains only infrastructure elements selected by each wireless service provider.

A second potential limitation relates to the proposed fixed nature of the remote testing location. In this respect it should be noted that most service providers field test their networks using moving vehicles. Fixed versus mobile wireless network testing is herein proposed for the first three-month data collection period in order to simplify initial monitoring operations to meet plan completion schedules. Nomadic (walking user) and mobile test sequences will be added in later quarterly periods. Fixed testing was also selected to serve as a performance base for later nomadic and mobile monitoring measurements. All wireless communications systems are first developed and tested in the fixed mode where higher performance is typically experienced. Development and testing then moves on to nomadic and mobile versions of the technology. Regional wireless service providers will usually record their highest performance in fixed

location use. Later nomadic and mobile testing will then allow for the determination of the effects of mobility on system performance.

A third potential limitation relates to avoiding special test site location situations that would enhance or degrade service. To overcome this limitation it will be necessary to avoid test site locations where a particular carrier would have network performance enhancements in place for a designated facility, or where the buildings concerned may inordinately interfere with wireless transmissions. Locations where service is provided through roaming arrangements with other carriers should also be avoided.

Monitoring operations during periods of maintenance down time should not, as such, comprise a limitation. Such downtime is part of the provider's network service availability and should, therefore, be treated impartially as part of the availability parameters for all carriers.

Finally, great care will be taken in the use and publication of performance parameter values with small sample sizes. The initial three-month inventory may only permit reliable parameter estimates at the regional level, with other categories having sample sizes too small for accurate parameter estimates. Needed caution will be exercised and parameter values will be stated with both their mean value accuracy estimate, and their 95 percent confidence interval, both of which are dependent on sample size.

**Advisory Committee Review Process**

All wireless network monitoring system data will be reviewed with the Advisory Committee prior to publication. All monitoring data specific to a particular service provider will be reviewed with that provider and publicly released only with the written permission of each wireless service provider.

**Documentation**

The wireless performance inventory resulting from the three initial months of data collection will be documented in both the antenna siting and related infrastructure planning report and later in an inventory technical report. Both reports will include tabular summaries of network parameters for the various categories discussed in this report. Tabular summaries will also be shown using regional and county-level maps displaying wireless network performance by geographic area. A

detailed description of the wireless network monitoring system will also be included in these reports.

Following the initial wireless performance inventory, performance monitoring will continue on a year-around basis with technical reports issued quarterly summarizing network performance during the quarter and comparisons made with previous time periods.

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08/03/05
#106128 V5 - T/C-Tech Study Design Memo No. 7-Performance Monitoring Inventory

**Appendix IV**

# WIRELESS NETWORK MONITORING SYSTEM (WNMS)

# CIRCUIT-SWITCHED VERSION

## APPENDIX IV

## WIRELESS NETWORK MONITORING SYSTEM (WNMS)
## CIRCUIT-SWITCHED VERSION

This Appendix will explain the voice traffic flow in the circuit-switched version of the system proposed to be used to measure the availability and voice quality of the wireless cellular-PCS networks in the planning area as shown in Figure 1. Voice messages are originated at the transmitting end point using a laptop computer, cellular-PCS telephones and associated software as described in Appendix I. The voice message is transmitted to the base transceiver station (antenna site) of the particular wireless service provider. The voice message then moves through the transmission network of the provider to the mobile switching center (MSC) of the provider where it may interconnect with a wireline service provider that is an integral part of the wireless service provider's network system. The wireline service provider then transmits the call to the call destination through the wireless service provider's transmission subsystem to the appropriate antenna site which then transmits it to the remote cell phone transceiver. The management server located at the Commission offices initially sets up the call and then later receives the values of the performance parameters after each message transaction.

The mean opinion score (MOS) for voice quality will be calculated from monitoring measurements using the E-model method defined in International Telecommunications Standard ITO G.107.

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08/03/05
#108132 V3 - Appendix IV Wireless Network Monitoring System Circuit-Switched Version

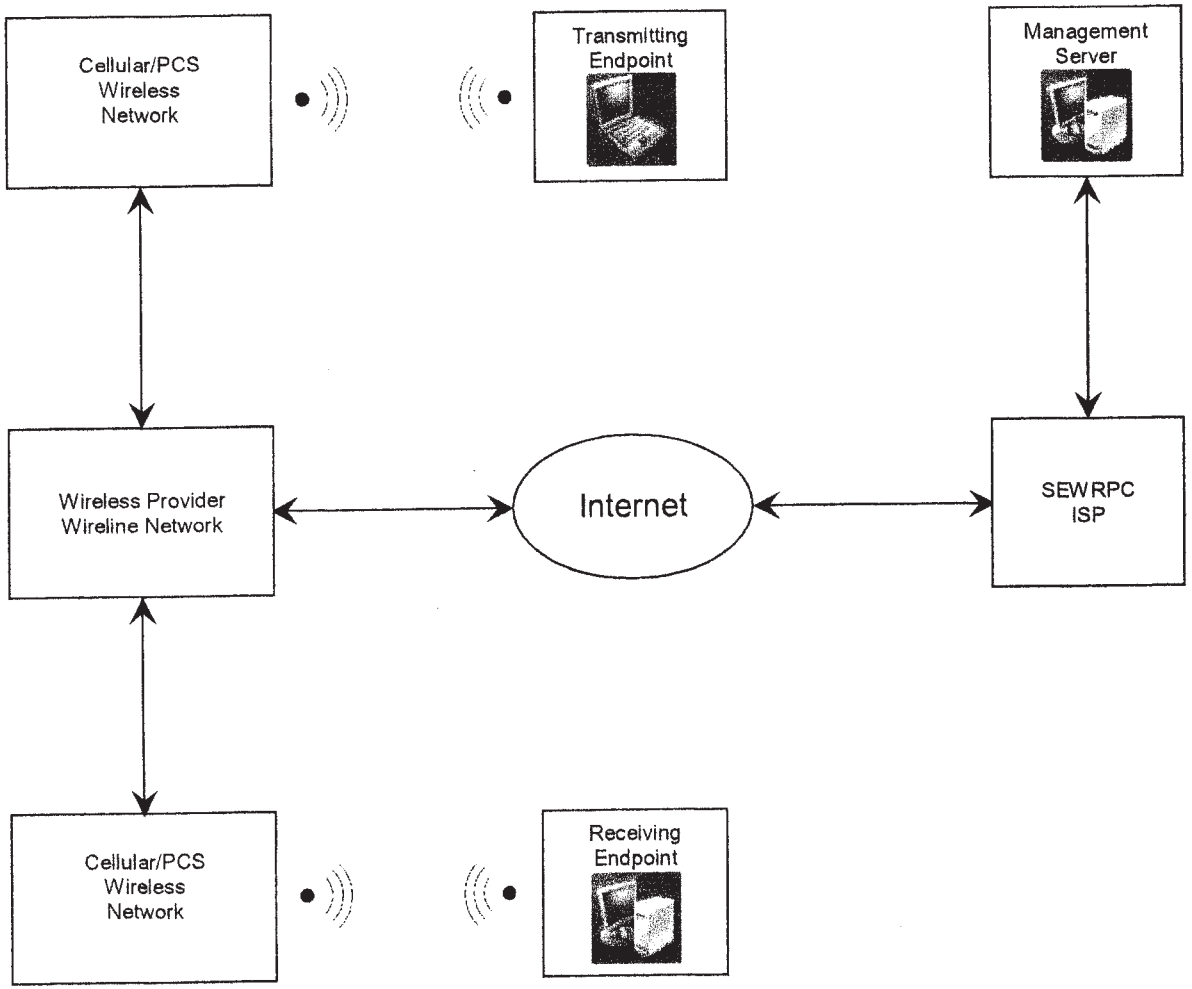


**Figure 1: Circuit-Switched Monitoring System**

## Appendix A

# REVISED GLOSSARY

## Appendix A

## GLOSSARY

| Term | Definition |
|---|---|
| **1G** | First generation wireless technology: Analog technology, introduced circa 1983. |
| **2G** | Second generation wireless technology: Digital technology, introduced circa 1992. |
| **2.5G** | Second and a half generation wireless – 2G digital technology plus added feature of GPRS (General Packet Radio Service). |
| **3G** | Third generation wireless technology: Broadband, high speed, digital technology, currently being introduced. |
| **4G** | Fourth generation wireless technology: Advanced broadband, high speed, digital technology, anticipated to be introduced circa 2007. |
| **Access Network** | The fiber connection and associated electronic equipment that link a core network to Points of Presence (POPs) and on to Points of Interconnect (POIs) switch locations. |
| **Advanced Broadband** | The FCC defines advanced broadband as service providing data transmission at a rate of at least 200 kilobits per second in both directions. |
| **AMPS** | Advanced Mobile Phone Service. Another word for the North American analog cellular phone system. |
| **Antenna Site** | A geographic location used for an antenna structure. |
| **Antenna Structure** | The tower, mast or other support on which antenna are mounted together with the radiation system and attendant appurtenances. |
| **Antenna** | A device for transmitting, receiving or transmitting and receiving radio frequency signals. |
| **AT&T** | American Telephone & Telegraph Company: Prior to 1984, AT&T was the major telephone service provider and equipment manufacturer in the U.S. Broken up by court decree in 1984, the Company became a long distance service provider and eventually spun off its manufacturing arm in a series of divestitures. Today, it is a major long distance and wireless service provider and a CLEC in many areas of the country. |
| **ATM** | Asynchronous Transfer Mode: ATM service was developed to allow one communication medium (high speed packet data) to provide for voice, data and video service. During the 1990s, ATM became a standard for high-speed digital backbone networks. ATM networks are widely used by large telecommunications service providers to interconnect their network parts (e.g., DSLAMs and Routers). ATM aggregators operate networks that consolidate data traffic from multiple feeders (such as DSL lines and ISP links) to transport different types of media (voice, data and video). |

**Base Station** A fixed station used for communicating with mobile stations most commonly handsets. Fixed stations usually consist of an antenna site, antenna structure, antennae and supporting electronic and electric power facilities.

**Bluetooth** A standard for short range wireless personal area networks (IEEE 802.15.1). Operates in the 2.45 GHz unlicensed frequency band.

**Broadband** In general, any telecommunications connection to a user providing transmission at a rate of at least of 256 kilobits per second or more is considered broadband Internet. The official International Telecommunications Union Standardization Section (ITU-T recommendation I.113 has defined broadband as a transmission capacity that is faster than ISDN, at 1.5 to 2 megabits per second. It should be noted, however, that there is no international uniformity with respect to the definition of the term "Broadband," for example, the United States FCC definition of broadband is 200 kilobits per second in one direction, while the country of South Korea defines as broadband a telecommunication connection providing a transmission rate of over 50 megabits per second."

**CDMA** Code Division Multiple Access.

**CLEC** Competitive Local Exchange Carriers: The term was coined by the Telecommunications Act of 1996 and refers to an organization that competes with the incumbent, i.e., a former monopoly local phone company.

**CO** Central Office: The CO is the location which houses a switch to serve local telephone subscribers.

**Core Network** A combination of high-capacity switches and transmission facilities which form the backbone of a carrier network. End users gain access to the core of the network from the Edge Network.

**DNS** Domain Name Service.

**DSL** Digital Subscriber Line: A generic name for a family of digital lines (also called xDSL) being provided by CLECs and local telephone companies for high speed data services.

**DWDM** Dense Wave-Length Division Multiplexing: A version of fiberoptic communication that combines many optical channels on a single fiber to increase the data transmission capacity of the fiber. Dense wave division multiplexing provides a significant increase to wave division multiplexing (WDM) that combines up to four different optical channels (different wavelengths) on a single fiber. As of 2001, DWDM systems provided for 8 to 80 different wavelengths with the capability of transferring over 1 trillion bits of data per second (Tbps).

**EHF** Extremely High Frequency: The band of microwave frequencies between the limits of 30 GHz and 300 GHz (wavelengths between 1 cm and 1 mm).

**EV-DO** Evolutionary Data Optimized.

**FCC** Federal Communications Commission: The federal organization set up by the Communication Act of 1934 to regulate all interstate (but not intrastate) communications in the U.S.

**FHSS** Frequency Hopping Spread Spectrum. A technique used in spread spectrum radio transmission systems, such as Wireless LANs and some PCS cellular systems. FHSS involves the conversion of a data stream into a stream of packets, each of which is prepended by an ID contained in the packet header.

**FSO** Free Space Optical: FSO refers to wireless telecommunications transmission in the infrared frequency bands in the 800-1600 nanometer range.

**FTTC** Fiber to the Curb: A hybrid transmission system which involves fiber optic links to the curb and either twisted pair or coaxial cable to the premises.

**FTTH** Fiber to the Home: A transmission system in which optical fiber is carried all the way to the customer's premises.

**FTTN** Fiber to the Neighborhood: A hybrid transmission system involving optical fiber from the carrier network to a neighborhood node. The connection from the neighborhood node to individual homes may be wireless or involve legacy twisted pair or coaxial cable.

**GHz** Gigahertz: A unit of frequency denoting one billion Hertz (Hz) or one billion cycles per second.

**GIS** Geographic Information System: Computer applications involving the storage and manipulation of maps and related data in electronic format.

**GSM** Global System for Mobile Communications. The standard digital cellular phone service found in Europe, Japan, Australia and elsewhere – a total of 85 countries.

**Hertz** Cycles per second named after German physicist, Heinrich Hertz.

**HFC** Hybrid Coax-Fiber Optic Cable: An advanced CATV (cable television) transmission system that uses fiber optic cable for the head end and feeder distribution system and coaxial cable for the customer's end connection. HFC are the 2nd generation of CATV systems. They offer high-speed backbone data interconnection lines (the fiber portion) to interconnect end user video and data equipment. Many cable system operators anticipating deregulation and in preparation for competition began to upgrade their systems to HFC systems in the early 1990s. As of late 2000, over 35 percent of the total cable lines in the United States had been converted to HFC technology.

**HSDPA** High Speed Downlink Packet Access

**HTTP** Hyper Text Transfer Protocol – text or graphic.

**HTTPS** The secure version of HTTP.

**IEEE** Institute of Electrical and Electronic Engineers: Founded in 1884 as the AIEE (American Institute of Electrical Engineers), it later merged (circa 1960s) with the Institute of Radio Engineers (IRE) to become the world's largest technical professional society renamed the IEEE. It sponsors technical symposia, conferences and local meetings and publishes technical papers. In telecommunications, it is best known for the publication of standards such as the 802 series for local area networks.

**ILEC** Incumbent Local Exchange Carrier: A telephone carrier (service provider) that was operating a local telephone system prior to the divestiture of the AT&T Bell system. Also specifically defined in the Telecommunications Act of 1996 as a carrier providing local exchange service to a specific area as of the date of the enactment of the Act.

**IP** Internet Protocol: The IP is a protocol describing software used on the Internet that routes outgoing messages, recognizes incoming messages, and keeps track of addresses for different nodes.

**ISO/FCAPS** International Standards Organization/Fault Configuration Accounting Performance Security: ISO is a voluntary organization chartered by the United Nations in 1947 that develops and publishes international standards in many technical areas. FCAPS is a standard for the management of telecommunications networks. The standard embraces performance management which is the function of the proposed network monitoring system in Southeastern Wisconsin.

**ISP** Internet Service Provider: A company that provides an end user with data communications service that allows them to connect to the Internet. An ISP purchases a high-speed link to the Internet and divides up the data transmission to allow many more users to connect to the Internet.

**ITS** Intelligent Transportation System: A technology that employs computers, sensors and communications networks to improve the operation of transportation systems.

**ITU** International Telecommunications Union: An organization based in Geneva, Switzerland, the most important telecom standards setting body in the world.

**LAN** Local Area Network: A LAN is a communications network connecting computers, work stations, printers, file servers and other devices inside a building or campus.

**LATA** Local Access Transport Area: An area served by a local telephone company in which it may offer both local and toll services.

**MHz** Megahertz: A unit of frequency denoting one million Hertz (Hz) or one million cycles per second.

**MIB** Management Information Base: A database of network management information used by CMIP (common management information protocol) and SNMP (simple network management protocol).

**MIMO** Multiple Input - Multiple Output: Involves the employment of phased array antennas for increased range of data transfer rates.

**MMDS** Microwave Multipoint Distribution System: A method of distributing television signals through microwave from a single transmission point to multiple receiving points.

**MOS** Mean Opinion Score.

**MPLS** Multiple Protocol Label Switching: MPLS is a widely supported method of speeding up IP-based communications over ATM or Ethernet networks.

**MSC** Mobile Switching Center.

| | |
|---|---|
| **Network Architecture** | The philosophy and organizational concept for enabling communications between multiple locations and multiple organizational units. Network architecture is a structural statement of the terminal devices, switching elements and the protocols and procedures to be used for the establishment effective telecommunications. |
| **NMS** | Network Management Station: NMS is a central station in a network monitoring system that talks to remote network management agents to obtain information used in network performance or other monitoring functions. |
| **OC** | Optical Carrier: OC is a term used to designate transmission rates in fiber transmission systems using the SONET protocol. |
| **OSI** | Open System Interconnection: A reference model developed by the ISO that defines the seven layers used in communication network protocols. |
| **PCS** | Personal Communication System: A low-powered, high frequency alternative to traditional wireless cellular communications systems. |
| **POP** | Point of Presence: A physical location that allows an interexchange carrier (IXC) to connect to a local exchange company (LEC) within a LATA. The point of presence (POP) equipment is usually located in a building that houses switching and/or transmission equipment for the LEC. |
| **POTS** | Plain Old Telephone Service: The basic service supplying standard telephone single line telephones and access to the public switched network. |
| **PSC-WI** | Public Service Commission of Wisconsin: The agency that regulates public utilities in Wisconsin. |
| **PSTN** | Public-Switched Telephone Network: The local, long distance, and international phone system. |
| **QoS** | Quality of Service: A measure of the quality of telephone service provided to a subscriber. It embraces a wide range of specific definitions depending on the type of service provided. |
| **RF** | Radio Frequency: Electromagnetic waves operating between 10 kHz and 30 GHz in either cables or free space. |
| **RTM** | Regional Traffic Matrix: A data matrix that defines the origins and destinations of voice, data, or multimedia communications in a geographic region. |
| **SCADA** | Supervisory Control and Data Acquisition Systems used by electric power, gas, water, wastewater and other utilities to monitor and manage the operation of geographically dispersed facilities. |
| **SHF** | Super High Frequency: The frequencies ranging from 3 GHz to 30 GHz (wave-lengths between 10 cm and 1 cm). |
| **SNMP** | Simple Network Management Protocol: A standard communication protocol that is used to setup, test, and manage network equipment. By conforming to this protocol, equipment assemblies that are produced by different manufacturers can be managed by a single program. SNMP protocol can operate via Internet protocol. |
| **SNR** | Signal to Noise Ratio. |

| | |
|---|---|
| **SONET/SDH** | Synchronous Optical Network/Synchronous Digital Hierarchy: The current leading optical transmission protocols used in North America (SONET) and internationally (SDH). |
| **T/DS** | Transmission-Digital Signal: The T and DS define levels of digital transmission speed capabilities of digital lines and trunks. The T-1 line has a signaling speed of 1,544,000 bits per second. |
| **TCP/IP** | Transmission Control Protocol/Internet Protocol: TCP/IP is standard set (suite) of protocols that define the transmission of Internet messages. The Transmission Control Protocol (TCP) portion ensures message delivery between two points and the Internet Protocol (IP) defines the routing of physical packets of data. |
| **TDMA** | Time Division Multiple Access. One of several technologies used to separate multiple conversation transmissions over a finite frequency allocation of through-the-air bandwidth. |
| **TIA** | Telecommunications Industry Association: An association of telecommunications equipment manufacturers. |
| **UHF** | Ultra High Frequency: The frequency range from 300 MHz to 3000 MHz (3GHz). |
| **UNE** | Unbundled Network Element: Network elements owned by ILECs that must be available to CLECs in accordance with the Telecommunications Act of 1996. |
| **VA** | Vulnerability Assessment: Methods used to determine the security of a network. |
| **VHF** | Very High Frequency: The band of frequencies between the limits of 30MHz and 300 MHz (wavelengths between 10 cm and 1 cm). |
| **VoIP** | Voice Over Internet Protocol: A process of sending voice telephone signals over the Internet. If the telephone signal is in analog form (voice or fax), the signal is first converted to a digital form. Packet routing information is then added to the digital voice signal so it can be routed through the Internet. |
| **WAVE** | Wireless Access In Vehicular Environments. |
| **WiFi** | Wireless Fidelity: A popular term for wireless local area networks operating under IEEE Standard 802.11b or 802.11g in the 2.4 GHz range. |
| **WiFi5** | A faster, higher frequency version of WiFi defined under IEEE Standard 802.11a operating in the 5 GHz frequency band. |
| **WiMAX** | (Worldwide Interoperability Microwave Access) Wireless Technology serving Metropolitan Area Networks under IEEE Standard 802.16. |
| **WLANS** | Wireless Local Area Network. A LAN without wires. |
| **WNMS** | Wireless Network Monitoring System. |
| **ZigBee** | A standard for short range wireless sensor networks (IEEE 802.15.4). Operates in the 2.40 GHz band. Emphasizes small size, low power and low cost. |

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02/02/06
#104193 V1 - T/C - Glossary - Appendix A

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**MEMORANDUM**

TO: Telecommunications Advisory Committee

FROM: SEWRPC Staff

DATE: July 14, 2005

SUBJECT: **SCHEDULED REPORTS – SEWRPC REGIONAL TELECOMMUNICATIONS PLANNING PROGRAM**

This memorandum provides summary descriptions of the following three elements of the proposed SEWRPC regional telecommunications plan.

1. Wireless Antenna Site and Related Infrastructure Plan – to be documented in a SEWRPC Planning Report

2. Potential Public Enterprise Telecommunications Networks – to be documented in a SEWRPC Memorandum Report

3. Composite Regional Telecommunications Network Plan – to be documented in a SEWRPC Planning Report

These plan elements and related work efforts are more fully described in the Prospectus for A Regional Telecommunications Planning Program, dated December 2003, as approved by the Commission Advisory Committee and by the Commission itself.

**WIRELESS NETWORK PLAN**

The wireless antenna site and related infrastructure plan is proposed to consist of two elements:

1. Second/third generation (2G-3G) regional wireless plan; and
2. Fourth generation (4G) regional wireless plan

**Second/Third Generation (2G, 3G) Wireless Plan**

The 2G-3G regional wireless network plan would have as its primary objective the provision of quality voice and data wireless communications services throughout the Region based upon currently deployed technologies. Quality of service is to be defined in terms of availability and accuracy (voice quality) for circuit-switched networks and availability, throughput, response time and accuracy for packet-switched networks.

The sound preparation of the 2G-3G plan will be dependent upon an accurate wireless antenna site and related infrastructure inventory. There are basically three sources of data for such an inventory:

1. Federal Communications Commission (FCC);
2. County and local units of government; and
3. Wireless service providers

Potential errors and omissions in both of the first two databases make it advisable to utilize service provider location and technical data as a cross check. The end result would be a reconciled set of antenna site coordinates and supporting technical data that provide accurate inputs to the radio propagation models that are to be used to map the coverage area of a defined set of antenna sites. Operation of such models requires other parameter inputs that can vary with the design characteristics of a particular network. These other inputs – such as power – can be best obtained in a collegial fashion in a cooperative effort of the wireless service providers and SEWRPC. Lacking such cooperation, it would be difficult to and much more costly to prepare a 2G-3G wireless network plan for the Region. Without such a plan and lacking service provider confirmation of antenna site data, antenna site permit application recommendations will have to be based on the existing antenna site infrastructure and network performance monitoring inventory data available to the Commission.

Antenna site data are used as inputs to radio propagation models to define the expected geographic coverage of each site and the composite coverage of a set of sites in any given area. Antenna site data inaccuracies will produce erroneous geographic coverage mapping. Reconciled antenna site data will allow for common ground between each service provider and the Planning Commission. New antenna site applications, on a carrier-by-carrier basis, can then be judged on a mutually agreed upon technical basis which should facilitate the antenna site approval process. The wireless network performance monitoring inventory data recorded by the network monitoring system is intended to serve to confirm the coverage-capacity parameters of the infrastructure inventory. Poor coverage or no coverage will be recorded by the monitoring system as a lack of availability. Weak coverage will also be indicated by low MOS values on voice quality measurements. The combined results of infrastructure and performance inventories will serve as the basis for improvements to existing technology cellular-PCS networks in the Region. The analyses will take into account demand derived from Commission land use plans for the design year of 2010.

Beyond the specifics of the various wireless communications technologies involved, quality service will depend primarily on the geographic coverage and the capacity of each service provider's network. Planning recommendations to extend coverage and expand capacity will take the form of either recommendations for new antenna sites or modifications of the technical parameters of existing sites.

The plan recommendations would be followed by a proactive program of plan implementation. Such a program would involve direct support of service provider site applications with local units of government. Such an expedited plan implementation would be in the best interests of the wireless service providers and the citizens of the Region.

**Fourth Generation (4G) Wireless Plan**

The proposed fourth generation (4G) wireless network plan differs significantly in both in its objectives and its implementation from the proposed (2G-3G) plan. While the 2G-3G plan is intended to help raise the level of quality and coverage of current cellular-PCS networks, the 4G

plan is to present a new advanced technology network based on combined WiMAX (IEEE 802.16) and WiFi (IEEE 802.11)standards. The objectives would include:

1. Faster Transmission Rates
   - starting at 10 megabits/second and moving up to 100 megabits/second

2. Fixed and Mobile Multimedia Communications Capability
   - initially fixed (2006) (IEEE 802.16d)
   - later mobile (2007) (IEEE 802.16e)

3. Interoperability
   - with legacy 2G-3G cellular-PCS networks

The 4G plan would be presented in the form of county network layouts but designed as one integrated Regional broadband wireless network. The plan would specify a set of antenna sites compatible with operation in a number of licensed and unlicensed WiMAX/WiFi frequency bands and transmitted power output levels. This 4G network plan would be intended to allow for multiple licensed wireless service providers operating in different WiMAX/WiFi frequency bands to co-locate on the same antenna sites. It would also allow for one unlicensed service provider in each unlicensed frequency band. Multiple Internet access points would be identified throughout the network.

The commercial 4G wireless network plan would be separate and distinct from the 4G public safety network plan and other public networks operating in licensed bands such as 4.9 GHz. Public safety wireless networks have more demanding requirements than commercial wireless networks and must be designed to higher standards.

Antenna site locations in the 4G wireless plan would be initially determined by radio propagation modeling, but the location and configuration of these sites would then be checked by radio field measurements based on a randomized experimental design. The plan will have a design year 2035.

**Potential Public Telecommunications Networks**

Public enterprise telecommunications network planning relates to telecommunications networks serving public sector functions such as public safety (police, fire and emergency medical services), transportation, and public health. Such planning of public infrastructure closely parallels other long-established Commission planning responsibilities in areas such as transportation; drainage and flood control, and water and wastewater networks. Such plans are typically used as the starting point for the engineering design of elements of the public networks concerned.

The SEWRPC telecommunications planning staff has already been called upon to assist counties and other local units of government in the planning of advanced public safety wireless networks. Many counties in the Region are currently looking to update their traditional VHF/UHF voice networks, but they are also interested in the possibilities of advanced high speed data and video networks based on the new WiMAX broadband wireless technology. SEWRPC has already completed a preliminary design of a WiMAX data network for Ozaukee County that is budgeted for implementation in 2006. Commission staff have also assisted the City of Milwaukee, Milwaukee County, Racine County, and Waukesha County in a recent COPS proposal to the U.S. Department of Homeland Security. SEWRPC proposes to prepare a Region-wide 4G public

safety wireless network plan based on WiMAX technology in 2005 with the same objectives of high speed data transfer and legacy network interoperability as the commercial 4G wireless network plan.

Another major area of public enterprise network planning activity relates to initiatives in Intelligent Transportation Systems (ITS). Proposals have been prepared in two major areas: centralized freeway traffic control and area-wide traffic routing. The first application would develop a centralized adaptive control system to minimize travel times for freeway vehicles by developing optimal ramp metering control strategies. The second application would allow current "telematic" navigation systems in motor vehicles to determine the shortest time route to any destination based on a broadcast of network work travel times through existing Cellular-PCS data networks.

A third major area of public sector communications planning relates to applications in public health. Examples include emergency medical services (EMS) and telemedical home health care. Neither of these two applications would require new telecom infrastructure, but instead would emerge as an application of new network infrastructures such as the WiMAX-based public safety network in Ozaukee County. The government partner for an EMS application would be a town or a municipality in a county such as Ozaukee that has a broadband WiMAX-based wireless network. The telemedical home health care partner would be a county at which level most government-based home health care is controlled. More extensive information on public health applications will be presented in the public enterprise network report.

**Composite Regional Telecommunications Network Plan**

As stated in the Prospectus, the focus of the composite wireless-wireline regional network plan will be on providing needs-based broadband services for all of the residents, business firms and other organizations of Southeastern Wisconsin. Some of these needs would be satisfied by the 4G wireless plan in both its commercial and public enterprise forms. Other needs would be satisfied by existing or planned fiber optic networks. Satisfying residual needs for communications bandwidth not satisfied by either of the above technologies would be the primary objective of the composite regional network. Such planning will begin after the regional wireless and public enterprise network planning efforts have been completed. This delay will also allow time for the plans of private wireless and wireline service providers to become known. The end result will be a regional telecommunications plan to guide both private enterprise and governments in the development and on-going enhancement of a premier telecommunications system for Southeastern Wisconsin.

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SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION
W239 N1812 ROCKWOOD DRIVE • PO BOX 1607 • WAUKESHA, WI 53187-1607•
TELEPHONE (262) 547-6721
FAX (262) 547-1103

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August 2, 2005

Mr. Paul R. Schumacher
TriCounty Business Partnerships
2320 Renaissance Boulevard
Sturtevant, WI 53177

Dear Mr. Schumacher:

Thank you for informing the Commission of your change in position and that you no longer will be able to serve on the Regional Telecommunications Planning Advisory Committee. Your service over the past two years has helped the Commission meet the difficult challenge of preparing a regional telecommunications plan. Your knowledge of the telecommunications industry, your commitment to helping build a strong economy in Southeastern Wisconsin, and your encouragement to move ahead were very much appreciated here.

We wish you the best in whatever endeavors you will now pursue.

Sincerely,

Philip C. Evenson
Executive Director

PCE/lgh
#110914 V1 - Schumacher Ltr.