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July 23, 2001

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Via Hand Delivery

Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, S.W., Counter TW-A325
Washington, D.C. 20554

Re: Written Ex Parte Presentation, ET Docket 00-47

Dear Ms. Salas:

Please find enclosed a written *ex parte* presentation sent today to Samuel L. Feder, Interim Legal Advisor to Commissioner Kevin J. Martin. Pursuant to Section 1.1206 of the Commission's rules, an original and one copy of the attached materials are being filed. If you have any questions or require any additional information, please do not hesitate to contact me at (202) 730-1345.

Respectfully submitted,

Michael G. Grable
Counsel to the SDR Forum

Enclosure

cc: Samuel L. Feder

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Via Hand Delivery

Mr. Samuel L. Feder
Interim Legal Advisor
Office of Commissioner Kevin J. Martin
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: Software Defined Radio

Dear Sam:

Thanks again for meeting with Mike Chartier, Ken Riordan, Dick Shrum and myself despite your hectic schedule on Thursday. Per your request, I have enclosed some materials describing software defined radio (SDR) technology and the SDR Forum. I have also enclosed the FCC's press releases announcing the SDR NOI and the SDR NPRM, including the separate statements of Chairman Kennard and Commissioner Ness.

Please let me know if I can be of further assistance.

Very truly yours,

Michael G. Grable
Counsel to the SDR Forum

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SDR forum

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Frequently Asked Questions

What exactly is SDR?

Software Defined Radio (SDR) is a collection of hardware and software technologies that enable reconfigurable system architectures for wireless networks and user terminals. SDR provides an efficient and comparatively inexpensive solution to the problem of building multi-mode, multi-band, multi-functional wireless devices that can be enhanced using software upgrades, thus addressing many of the most challenging issues confronting the wireless industry.

Why is SDR suddenly attracting so much attention?

SDR is considered by many to hold the key to providing consumers with affordable access to a wide variety of advanced services built around wireless Internet access.

Are SDR devices already being used in the wireless industry?

SDR is already being employed in some cellular and PCS base station products, as well as in military and aerospace equipment, and is expected soon to be utilized extensively in user terminals. However, designers of wireless devices have not yet taken full advantage of the flexibility and in-situ adaptability that can be achieved in the near future. To date, manufacturers have exploited SDR to reduce the number of different product platforms that they must develop and support, and to enable product architectures that can be systematically scaled to incorporate new and evolving capabilities.

When will more widespread adoption of SDR happen?

Beginning in 2001, the SDR Forum expects to see increased commercial, civil, and military use of SDR, driven by the development and initial deployment of third generation commercial wireless systems and the need for multi-service capabilities in civil and military markets. By 2005, SDR is expected to have been adopted by many manufacturers as their core platform.

What are the key regulatory issues associated with SDR?

Widespread adoption of SDR will require equipment authorization agencies to certify combinations of hardware and software for compliance with relevant rules. Such authorization can be carried out using basically the same approach as used in today's hardware testing, so long as the software can then be securely "sealed" to prevent tampering during the download process. Approved hardware would then check the "seal" to verify its authenticity before installing the software and allowing it to reconfigure any of the hardware elements in the user's device.

Are there other industry groups addressing SDR related issues?

The SDR Forum has established formal liaison activities with other industry groups, such as the 3GPP Mobile Station Application Execution Environment (MExE) working group (www.3gpp.org) and the Wireless Applications Protocol (WAP) Forum (www.wapforum.org) to address the above security issues. Electronic encryption techniques already being assessed by MExE and WAP for mobile e-commerce transactions and other secure mobile services are expected to be robust enough to provide the necessary security for SDR.

SDR forum

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As of December 4, 2000

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SDR FORUM INTRODUCES NEW OFFICERS FOR 2001

Worldwide Industry Leaders Direct the Future of Software Defined Radio Technology

ROME, N.Y, Dec. 7, 2000 – The Software Defined Radio (SDR) Forum, an international industry association dedicated to supporting the development of software defined radio in advanced wireless systems, today announced its officers for the 2001 term. The officers were introduced at the Forum's general meeting held last month in Mesa, Ariz. Stephen Blust continues to lead the SDR Forum as chairman, and Mike Williams serves as vice chairman.

"The SDR Forum's 2001 leadership team consists of industry veterans who are driven to rapidly bring software defined radio technology to market," said Blust. "The skills and experiences of the team combined will tremendously benefit the Forum as we continue to develop and deploy SDR technology in wireless systems worldwide."

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The 2001 officers are:

- Stephen Blust, chairman for the Forum and director of technology strategy and standards at Cingular Wireless.
- Mike Williams, vice chairman for the Forum and senior manager of Radio Standards at Voice Stream Wireless.
- John Ralston, Steering Committee chair for the Forum and vice president for intellectual property, standards and regulatory activities at Morphics Technology, Inc.
- Allan Margulies, secretary for the Forum and principal communications engineer at the MITRE Corp.
- Peter Cook, treasurer for the Forum and presidnt at Peter G. Cook Consultancy
- Nancy Pearson, Markets Committee chair for the SDR Forum and software products director at TRW Avionics Systems Division
- Larrie Sutliff, Regulatory Committee chair for the Forum and Member Technical Staff at Lucent Technologies
- Ken Riordan, Technical Committee chair for the Forum and director of SDR architecture at Motorola
- Paul Krebs, Large Company Representative for the Forum and manager of U.S. spectrum regulations at Nortel Networks
- Jack Rosa, Medium Company Representative for the Forum and CEO, president and vice chairman of Board of Directors at HYPRES, Inc.
- Andy Feldstein, Small Company Representative for the Forum and co-founder, president and CEO of Innovative Concepts, Inc.
- Richard Shrum, Government/Nonprofit Representative for the Forum and senior science advisor at IITRI

- Christian Serra, ITU Region 1 Representative for the Forum and chief engineer at Thompson CSF
- Mark Cummings, ITU Region 2 Representative for the Forum and CEO of enVia, Inc.
- Takuzo Fujii, ITU Region 3 Representative for the Forum and senior chief engineer of Kokusai Electric

About SDR Technology

SDR technology provides the building blocks to affordably integrate a wide variety of mobile Internet applications over multiple air interfaces, using multiple technologies to provide rapid access to advanced wireless networks.

At present, wireless telecommunications services are characterized by the use of competing and often incompatible standards, modes, and frequencies that span two generations of equipment and will soon span a third. SDR provides an efficient and comparatively inexpensive mechanism for the design and implementation of multi-mode, multi-band, multi-functional wireless devices that can be enhanced using software upgrades, thus addressing many of the most challenging issues confronting the wireless industry.

About the SDR Forum

The SDR Forum is an international industry association dedicated to supporting the development and deployment of software defined radio systems that enable flexible and adaptable architectures in advanced wireless systems. The membership of the SDR Forum spans commercial, defense, and civil government organizations, and includes wireless service providers, network operators, component and equipment manufacturers, hardware and software developers, regulatory agencies, and academia. Presently numbering over 110 organizations, the SDR Forum's membership includes the major commercial wireless players from Asia, Europe,

and North America. The SDR Forum's administrative office is headquartered in Rome, N.Y.; additional information is available on the SDR Forum web site at www.sdrforum.org.

# # #

SDR forum

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ADVANCES IN SOFTWARE DEFINED RADIO TECHNOLOGY CELEBRATED AT SDR FORUM CONFERENCE

Delegates Gear Up for February 2001 Meeting in Atlanta

ROME, N.Y, Dec. 7, 2000 – The Software Defined Radio (SDR) Forum, an international industry association dedicated to supporting the development of software defined radio in advanced wireless systems, today announced the successful conclusion of its three-day conference held last month in Mesa, Ariz.

With more than 100 participants from over 60 organizations around the world, the event showcased industry leaders and discussed global SDR advances. Delegates obtained a first-hand look at these SDR technology advances in enabling wireless Internet and advanced services. Celebrating the continued success of SDR, the Forum also announced its plans for its 22nd meeting scheduled for February 6-8, 2001 in Atlanta, Georgia.

"The attendance and energy levels at the Mesa meeting are indicative of the work taking place worldwide to quickly bring SDR technology to market," said Stephen M. Blust, chairman of the SDR Forum. "As the international group dedicated to the development and deployment of

- more -

SDR worldwide, the Forum and its member companies continue to make inroads with standards development organizations and regulatory bodies throughout the world."

Highlights of the conference include:

- Marc Cabi, managing director of Credit Suisse First Boston, delivered the keynote address sharing his views regarding the promise of SDR wireless communications technology investment opportunities.
- Plenary talks by John Ralston of Morphics Technology, Inc., and Robert Sanchez of inCode Telecom group, highlighted the FCC's upcoming release of their Notice of Proposed Rules Making (NPRM) on SDR, the addition of basic SDR capabilities to the 3GPP standards Release 2000, and the growing number of SDR testbed activities in Europe, Asia, and North America.
- The Technical Committee was restructured aligning the group's activities to provide a more commercial focus for SDR development.
- A Roadmap Task Group was established to further develop the Forum's focus and direction and to provide internal program management. Dr. Joseph Mitola, an expert in the industry, was appointed chair of the group.
- The SDR Forum's working sessions addressed the following major areas with the objective of further enabling the development and deployment of SDR technology:
  - Base stations and smart/adaptive antennas
  - Handheld devices, such as PDAs, cellular/PCS terminals, etc.
  - Mobile devices, including civil and military radios
  - Software download
  - Regulatory interaction

- Educational/awareness activities

- Several industry representatives provided reports on SDR technology.

Materials from the Mesa conference and information regarding the February 2001 event in Atlanta are available on the Forum's web site at www.sdrforum.org.

About SDR Technology

SDR technology provides the building blocks to affordably integrate a wide variety of mobile Internet applications over multiple air interfaces, using multiple technologies to provide rapid access to advanced wireless networks.

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# # #

Reprinted from WIRELESS SYSTEMS DESIGN February 1999

Study Views Software Radios As Future "Design Element"

MARKET DEMAND FORECAST MAY SET THE TONE FOR NEAR- AND LONG-TERM DEVELOPMENT OF SOFTWARE-DEFINED RADIOS.

BY RON SCHNEIDERMAN

EMERGING technologies in wireless communications are everywhere, and most appear to be destined for success, but software-defined radio-based devices may be pushing the envelope. That, at least, is the near-term assessment for the first of what is expected to be a series of market studies sponsored by the Software Defined Radio Forum (formerly the Modular Multifunction Information Transfer System, or MMITS Forum), an organization dedicated to the development, deployment, and use of open architectures for SDR waveform hardware, software, security, source coding, and network protocols.

In fact, software radios are unlikely to be very competitive, either in price or features, with existing cellular or other portable-communications devices when they begin hitting the market next year. That should begin to change, however, and fairly rapidly, according to the study, as SDR "engines" and chip sets become available from a number of sources in the industry, as more third-generation (3G) standards choices begin to evolve, and as the pressure for universality and technology transparency among end users grows over the next few years. By 2005, the market for SDR-based technology devices could range from 134 million up to 201 million units.

While the demand for global wireless communications continues to grow, the study finds that technological barriers produced by multiple air-interface standards threaten to slow this growth.

Integrated into the SDR Forum study are the results of an in-depth series of interviews of "industry experts" by a team from the Massachusetts Institute of Technology (MIT) Sloan School of Management, the highlight of which is a strong consensus that a single standard is unlikely to emerge from the current IMT-2000 standards process.

Most of those interviewed by the MIT team believe that software phones will be an extremely lucrative opportunity for traditional manufacturers of handheld personal computers (PCs) and personal digital assistants (PDAs) as these products expand in the wireless communications market. In fact, 70 percent of those interviewed expect SDR to be a key element in the multistandard environment that will likely emerge. According to one interviewee, "There now exists a clear sense among leading-edge carriers that SDR can and will happen."

According to the study, these perceptions may prove to be critical when accelerating the development of software phones, particularly if PC demand weakens and cellular service revenues soften.

SDR is not widely perceived so much as a wireless appliance or network standard, but rather as a potential design element to be incorporated into a future standard or standards.

"The growth of the software phone," the MIT report notes, "will depend on how quickly it can penetrate into both wireless phone and PDA/PC markets."

The industry experts interviewed by MIT expect software phone appliances to penetrate the wireless phone market more quickly than the PDA/PC market, with a 75-percent market penetration expected into the wireless phone market by the year 2006. Software phone-based PDA/PC devices are projected to reach 60-percent market penetration by 2006.

However, the MIT study team says that several prob-

Drivers of demand for SDR-enabled services

Constituents	Requirement
End user	Roaming transparency Prolonged device-life span Transparent services migration
Service provider	Easier expansion of services Fewer "incompatible" services Balancing base-station resources
Wireless appliance manufacturers	Prolonged device-life span Reduction of stock keeping units Over-the-air upgrades/ product fixes
Component manufacturers	Reduction of costs Market expansion

Source: SDR Forum

lems will need to be addressed if the SDR concept is to gain global acceptance.

One issue is the level of SDR implementation, which could range from a simple call by call switching between different air interfaces to complete wideband digital processing or the entire available spectrum. Pursuing SDR would also require many companies to undertake difficult structural alterations to avoid, for example, internal struggles between network infrastructure and SDR handset-development efforts. Also, extensive roaming agreements would have to be set up and, as the study points out, "service providers have proven to be very inflexible in the past."

Adopting SDR concepts would also require incorporating key aspects of the technology into 3G standard proposals. This is "unlikely to happen soon," says the MIT study. In fact, tri-mode Global System for Mobile Communications (GSM) phones will soon offer some of the global roaming features that SDR hopes to provide.

Another potential problem identified by MIT is that any hand-off when switching between different air interfaces will be difficult to implement. "Equipment suppliers and network operators traditionally do not work well together on such problems."

A more critical issue, according to MIT, is that a convincing need for SDR handsets has yet to be demonstrated—particularly since North American carriers are still building out their analog-to-digital and personal-communications-services (PCS) systems. SDR proponents still have not clearly defined what SDR-based handsets will offer to end users and how much they will cost. Also, there is no broad-based focus on SDR at this time.

THE SEVERE CONSTRAINTS ON SIZE, POWER CONSUMPTION, AND COST IMPOSED BY CONSUMER HANDHELD APPLIANCE MARKETS WILL REQUIRE CONTINUING ADVANCES IN BOTH HARDWARE AND SOFTWARE TECHNOLOGIES.

Still, most of the industry specialists interviewed by MIT conceded that the convergence of cellular telephony and PCs favors the eventual emergence of a software phone as the dominant design for a broad variety of "hybrid" handheld products. "However, the severe constraints on size, power consumption, and cost imposed by consumer handheld appliance markets will require continuing advances in both hardware and software technologies in order to realize the full potential of the software phone."

A dominant design in a product class is the design that wins the allegiance of the

TELEMETRY GAINS AS CARRIERS,

DIGITAL cellular and two-way paging have opened new opportunities for low-cost telemetry applications for wireless equipment vendors and carriers.

For some, telemetry is a niche opportunity. For others, it is their core business.

No one really has a good handle on the market at this point, but the potential for applications seems virtually endless—ranging from auto racing to vending machines, Federal Express boxes, truck and trailer tracking, alarm, utility monitoring, and medical devices.

The Federal Communications Commission (FCC) is looking for a new primary spectrum slot for wireless medical devices used in hospitals. Medical telemetry devices, such as heart monitors, have been secondary users of several frequency bands, mainly unused broadcast-television frequencies and land mobile radio services. The Land Mobile Communications Council (LMCC) filed a low-power plan with the FCC in mid-1997, proposing that medical telemetry be assigned its own primary frequencies. However, the FCC, which has not yet acted on the LMCC's proposals, says that it is considering three key issues—spectrum efficiency, technical design/engineering issues, and cost. The LMCC's plan covers the entire 450-to-470-MHz range, although medical telemetry devices operate in the 460-to-470-MHz range only. The medical community is being represented before the FCC by a task force created by the American Hospital Association.

Vehicle monitoring is another huge opportunity, particularly for wireless carriers and systems integrators. "There is a huge gap between what is available and what the market wants," says Dean Fresonke, president of Data On Air (Orlando, FL), a telemetry supplier and integrator. Technical standards is a big issue in vehicle tracking. Currently, says Fresonke, "You can't take someone's terminal and plug it into someone else's radio with GPS (Global Positioning System) and another vendor's credit-card reader and make it sing." The result, he says, is that most of his company's jobs require more hardware integration than necessary.

Several companies have developed portable telemetry products.

Data Critical Corp. (Redmond, WA), for example, recently introduced a wireless telemedicine server that transmits patient data, including electrocardiogram (ECG) waveforms, to StatView, a handheld device, through an in-building paging or wide-area wireless network. Data Critical has teamed with Siemens Medical Systems' Electromedical Systems Division (Danvers, MA), which has developed a software-based patient monitor, to market the wireless system. Another Data Critical device, MobileView, transmits patient-monitor data to the Nokia 9000i. Using the MobileView system with the server, an off-site physician can review multiple types of patient information, including vital signs, monitor waveforms, and 12-lead ECGs.

"The Nokia 9000i platform was chosen because it fully integrates a digital wireless telephone with the speed and performance of a palmtop PC," says Brad Harlow, general manager of Data Critical.

marketplace. MIT says that the IBM PC format is a good example of a design that quickly became dominant in the market. While it contained little in the way of breakthrough technology, it integrated many familiar elements into one product that provided value to computer users. One of the study's conclusions is that firms adopting the dominant design for multimode, multiband, and multicapability (in this case, SDR) will less likely exit from the industry or lose market share.

The main section of the SDR study, called "A Window of Opportunity in Wireless Communications," defines several critical success factors for SDR success in commercial or consumer markets **(see table)**.

One of these is the phone's capabilities. Clearly, software phones must offer something more than current dual-mode, dual-band phones. Possibilities include additional modes and frequency bands, and perhaps the capability to upgrade the phone to work over new air interfaces.

Price is also a key issue and the study suggests that software phones will have to be produced at a perceived cost parity with current dual-mode, dual-band phones to attract carriers.

The new phones will also have to be available in time to take advantage of the market opportunity, which the study says will "begin in earnest" in 2000 and last for five to seven years before becoming the mainstream design.

Service is also identified as a key issue. Software phones will require market differentiation gained by offering services that operate exclusively on them.

Another SDR market driver will be the acceptance of this technology by the market's two major influencers—wireless carriers and equipment manufacturers.

STANDARD OR NICHE?

Industry experts who were interviewed for the study estimated that the potential demand for SDR-enabled handsets would fall into one of two possible scenarios—standard or niche. The standard scenario assumes that handset manufacturers would adopt SDR as a dominant design that consolidates manufacturing lines around a single platform. SDR technology would be built into a majority of new handsets and sold to most new subscribers. Efficiencies would be gained from streamlining the manufacturing process. SDR-enabled processor cores would potentially be more powerful than current state-of-the-art processors that are being designed for mobile handsets. The added power could enable the handset to support a variety of new features that would provide differentiation values in the marketplace.

In the niche scenario, manufacturers would design SDR-enable handsets only for those mobile subscribers who roam between multiple standards, and carriers would sell these handsets only to these customers. As a result, demand would be limited to a small sub-segment of the overall handset market.

A second study, sponsored by the SDR Forum and conducted by the State University of New York Institute of Technology, focuses on SDR-enabled civil and government applications, and is scheduled for publication within the next month.

[Telemetry is another form of emerging wireless applications **(see sidebar)**.] *WSD*

VENDORS FIND NEW APPLICATIONS

Now that GPS is relatively inexpensive, a number of vendors have linked this technology with wireless data modems to track and monitor truck fleets. The system will turn on an alarm and transmit the vehicle's position if it is stolen. Since the system is two-way, it can even shut off the vehicle's engine and lock the doors.

Lucent Technologies (Whippany, NJ) is pursuing several telemetry projects, including the installation of wireless data networks in Latin America where stolen vehicles are a major problem. Lucent says that its networks can monitor vehicles on a real-time basis.

Two-way paging will also benefit from telemetry applications. BellSouth Corp. (Atlanta, GA) and NumereX Corp. (West Conshohocken, PA) have created Cellemetry LLC to provide monitoring services for a variety of applications using the control channel of existing analog cellular networks. Cellemetry LLC has extended its reach to industry-oriented rural statistical areas (RSAs) in Louisiana, Texas, and Virginia with three cellular carriers in these regions.

Also, PageMart Wireless, Inc. (Dallas, TX), which serves nearly three million paging subscribers, has formed a Telemetry Strategic Business Unit, which has teamed with Monitel Products Corp. (Cedar Knolls, NJ) to monitor the status and use of photocopiers in areas where wireless connectivity is necessary or preferred. Monitel is using Motorola's two-way wireless messaging protocol, ReFLEX, for the system. (Peregrine Semiconductor Corp. of San Diego, CA recently introduced its PE3291, a PLL designed for use in two-way pagers and wireless meter-reading products.)

Another application that is not far down the road is wireless parking meters. The radio-equipped meter would sense the presence of the vehicle. If the meter is not fed, it signals either a monitoring center or a nearby traffic-patrol person. With vehicle operators avoiding parking meters 80 percent of the time, the system is expected to pay for itself fairly quickly.

World Wireless Communications, Inc. (Salt Lake City, UT) has joined with Williams Telemetry Services to develop a number of automatic meter-reading products using its supervisory-control-and-data-acquisition (SCADA) and telemetry technology. The first application of the SCADA and telemetry wireless products will be to monitor gas- and water-meter data from remote locations. Other applications include the remote monitoring of inventories in vending machines, pipelines, and storage tanks.

Similarly, Bell Atlantic Mobile (Bedminster, NJ) says that it plans to use the short-burst data technology developed by Aeris Communications (San Jose, CA) in its cellular network for a wide range of telemetry applications, including automated vehicle location, automated meter reading, as well as remote monitoring of security alarms and other devices. Aeris' technology sends short data packets via cellular remote terminal units (RTUs) through Aeris' central hub facility over existing Signal System 7 networks. The Aeris hub identifies the service provider and routes the data packet for delivery, usually through the Internet or frame relay. *WSD*

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SDR FORUM APPLAUDS FCC ON PROPOSED RULES FOR SOFTWARE DEFINED RADIO

Action Will Speed Commercial Adoption of SDR

WASHINGTON, D.C., Dec. 7, 2000 – The Software Defined Radio (SDR) Forum today announced its support for the Federal Communications Commission's (FCC) decision to propose new rules to speed the adoption of SDR technology.

SDR technology will allow wireless phones and other mobile communications devices to be upgraded and reconfigured by downloading software over the air. The SDR Forum applauds the FCC's adoption of proposed rules reflecting a minimal regulatory approach to the certification of software defined radio transmitters. The Commission's suggestion that SDR manufacturers may proceed with the current certification process establishes a basis for appropriately protecting the radio frequency environment while facilitating introduction of this rapidly developing technology.

Today's proposal is particularly important because it clarifies that SDR is permitted under the current rules, and launches a proceeding that is designed to reduce the regulatory burdens of

- more -

recertifying and relabelling. The ability to modify SDR-enabled products in the field by software downloads will allow consumers to easily upgrade or alter the capabilities of their mobile communications devices after purchase. It will also make it easier for wireless communication companies to make fuller use of the spectrum by deploying radios that are capable of using different parts of the spectrum depending upon the software downloaded into them. As the first proceeding on the topic of SDR, the NPRM is expected to clarify that no major changes to existing rules will be required to allow industry to accelerate the deployment of SDR technology. The Commission will continue to monitor SDR's evolution and examine whether any further changes are needed as the technology develops.

"The NPRM is an essential step taken by the FCC to identify and implement rules that will allow expanded commercial adoption of SDR technologies," said John Ralston, chairman of the SDR Forum Steering Committee.

Scott Blake Harris of Washington, D.C.-based Harris, Wiltshire, and Grannis LLP, the Forum's Regulatory Counsel, added: " We anticipate that regulatory agencies around the world will follow the FCC's lead so as to permit SDR benefits to be offered to wireless consumers everywhere."

"Through our ongoing regulatory, standards, and technical initiatives, the SDR Forum expects to continue to support and accelerate commercial introduction of SDR technologies, including support of a favorable regulatory climate for international adoption", said Stephen M. Blust, chairman of the SDR Forum.

About SDR Technology

SDR technology provides the building blocks to affordably integrate a wide variety of mobile Internet applications over multiple air interfaces, using multiple technologies to provide rapid access to advanced wireless networks.

At present, wireless telecommunications services are characterized by the use of competing and often incompatible standards, modes, and frequencies that span two generations of equipment and will soon span a third. SDR provides an efficient and comparatively inexpensive mechanism for the design and implementation of multi-mode, multi-band, multi-functional wireless devices that can be enhanced using software upgrades, thus addressing many of the most challenging issues confronting the wireless industry.

For example, SDR can enhance network flexibility by allowing wireless network operators to change air interfaces and add new services primarily through software changes. Over-the-air downloads for mobile equipment and over-the-network downloads for base station infrastructures can greatly reduce the costs of service provisioning, upgrades, and bug fixes. SDR also allows manufacturers to consolidate their product platforms (both user terminals and base stations) and reduce the design and manufacturing resources needed to accommodate different air interfaces, wireless services, and user-accessible functions and applications. SDR can also provide the end user with universal access and greater flexibility in the choice of media content. Surging demand for mobile communications services, especially mobile Internet access, is the primary force driving the wireless industry toward widespread utilization of SDR.

About the SDR Forum

The SDR Forum is an international industry association dedicated to supporting the development and deployment of software defined radio systems that enable flexible and adaptable architectures in advanced wireless systems. The membership of the SDR Forum spans commercial, defense, and civil government organizations, and includes wireless service providers, network operators, component and equipment manufacturers, hardware and software developers, regulatory agencies, and academia. Presently numbering over 110 organizations, the SDR Forum's membership includes the major commercial wireless players from Asia, Europe, and North America. The SDRF is headquartered in Rome, N.Y.; additional information is available on the SDR Forum web site at www.sdrforum.org.

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NEWS

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Washington, D. C. 20554

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FOR IMMEDIATE RELEASE:
March 17, 2000

News Media contact:
David Fiske (202) 418-0513

FCC BEGINS INQUIRY REGARDING SOFTWARE DEFINED RADIO

The FCC today asked for public comment on a new generation of radio equipment under development that can be quickly reprogrammed to transmit and receive on any frequency within a wide range using virtually any transmission format. This programming capability could allow a single device to transmit in the various cellular, PCS and other wireless services used in the United States and worldwide.

In a Notice of Inquiry approved today, the Commission stated that introduction of this new technology, referred to as "software defined radio" (SDR), has the potential to change the way users can communicate across traditional services. These changes could promote more efficient use of spectrum, expand access to broadband communications for all persons and increase competition among telecommunications service providers. The Commission sought comment on how SDR could affect a number of Commission functions in the future, including spectrum allocation, spectrum assignment and equipment approval.

The Notice is designed to solicit information about the state of SDR technology, interoperability issues, spectrum efficiency issues, equipment authorization processes, and other issues to assist the Commission in deciding whether to propose rule changes as a result of the developing SDR technology.

In a software defined radio, functions that were formerly carried out solely in hardware, such as the generation of the transmitted signal and the tuning and detection of the received radio signal, are performed by software that controls high-speed signal processors. Because of the ability to be easily reprogrammed, a software defined radio could be programmed easily to operate over a broad range of frequencies, bandwidths and transmission standards.

The Commission asked for information on how SDR might improve "interoperability" among communications systems that currently operate in multiple frequency bands and use different standards. In particular, the Commission asked whether SDR could eventually improve the ability of public safety and emergency agencies to communicate across the multiple frequency bands they use today. The Commission also asked whether SDR would allow wireless operators to change to a more efficient transmission system without having to replace base station transmitters or receiving units in the field.

In the Notice, the Commission asked for comments about how SDR could result in improved spectrum efficiency and spectrum sharing. The Notice asked, for example, whether SDR would enable greater flexibility in access to open frequencies, and whether such equipment could be designed to include some "intelligence" that would let it monitor the spectrum to detect usage by other parties and then transmit on open frequencies. The Commission asked about the implications of SDR with regard to the current spectrum allocation model.

Because SDRs would allow technical characteristics such as operating frequencies and output power to be controlled through software, the Commission asked for comments on the implications for equipment authorization and interference control. The Commission invited comment as to whether advance FCC approval should be required for the radio hardware, the software, or a combination of the two, and how SDR equipment should be tested for compliance with FCC requirements and standards. The Commission also asked whether an authentication system could be designed using special authentication codes in the software.

The Commission noted that although SDR technology was first demonstrated in a Department of Defense project in 1995, the Commission's Technological Advisory Council (TAC), established in 1998, has been reviewing SDR technology, and is studying ways that the availability of such devices might affect the Commission's traditional approaches to spectrum management, as well as ways the agency could facilitate experimentation and commercial deployment of such devices.

It noted that while the TAC is continuing this work, it is important, through this Notice of Inquiry, to obtain input on the subject from all interested parties to ensure that all viewpoints are represented.

Action by the Commission by Notice of Inquiry (FCC 00-XXX)

- FCC -

Office of Engineering & Technology Contacts: Julius Knapp (202) 418-2472;
Hugh Van-Tuyl (202) 418-7506

March 17, 2000

STATEMENT OF FCC CHAIRMAN WILLIAM E. KENNARD
NOTICE OF INQUIRY ON SOFTWARE DEFINED RADIO

The tremendous success of wireless has come at a price. With all the new wireless products out there --the mobile phones, the devices for wireless Internet, palm pilots and two-way pagers --, we are running out of spectrum.

One way to head off a spectrum drought is to make sure that the spectrum that we have licensed is always in use. Ensuring that consumer demand is met requires that we push the envelope.

We can do this by creating fluid markets in spectrum so that spectrum users can instantly match short-term supply with short-term demand. We must craft rules that allow spectrum to flow as freely in the marketplace as any other commodity.

Last week the Commission took an important step in this direction by creating a new type of license in the 700 MHz band called the "guard band manager". Holders of these licenses will be able to subdivide their spectrum and make it available for others to use it as they see fit, so long as adjacent public safety users are protected.

I view this proceeding on Software Defined Radio as another critical step in the development of a more fluid spectrum market. Software defined radios are smart devices that can make good use of underused spectrum. They can operate as a cell phone one minute, a PCS phone the next, a taxi dispatch radio later on and a two-way pager after that. They can literally bridge the gaps created by differences in frequency and transmission standards. In this way, they can make all spectrum users – from average consumers to police, fire and EMS workers who need to talk to each other - - more productive and efficient.

- FCC -

March 17, 2000

Separate Statement of Commissioner Susan Ness

Re: Inquiry Regarding Software Defined Radios

I am bullish about the prospect of "software defined radio" (SDR), a new generation of technology that potentially will allow communications equipment to adapt to multiple standards and add service features without changes to the equipment's hardware. The Notice of Inquiry we release today is both a culmination of efforts and the beginning of a new initiative. While work still lies ahead, SDR holds the potential to enhance our participation in the global economy, to access new services, and to utilize the spectrum more efficiently.

The Notice is the outgrowth of efforts by the Department of Defense (DOD), members of the SDR Forum, and the FCC's Technical Advisory Council (TAC). DOD and members of the SDR Forum have pioneered the first generation of SDR, seeking to generate equipment that can be programmed to transmit and receive on any frequency within a wide range using a variety of transmission formats. The FCC has held several forums on new technologies and spectrum use, at which the potential benefits of SDR technology have been demonstrated. The TAC has reviewed SDR technology over the past year, studying the ways in which this technology may assist us in managing our precious resource – spectrum. This Notice is the result of such study. Hopefully, it will launch us in the direction of new products that better serve consumers; these products can be governed by streamlined rules that place the products in the marketplace more rapidly.

As a consumer, I am excited about SDR because it has the potential to add new meaning to the words "anywhere, anytime." As envisioned, SDR devices can be adapted to work anywhere on the planet through software changes or upgrades that can be installed or downloaded from remote locations. Such devices also could download new service applications as they are developed and made available.

As a spectrum manager, I am excited about SDR because it augments the tools we have to more efficiently manage spectrum. Today, we struggle to squeeze multiple services into spectrum, or to mandate specific standards to permit communications devices to work seamlessly. With SDR, the software could make such decisions, not the FCC. The availability of such software also might make it easier for different users to share crowded spectrum. Of course, protection of other spectrum licensees from interference resulting from SDR devices is paramount.

Given the promise of SDR, it is my hope that industry participants will help us address the complex issues raised in the Notice, so that we can move quickly to make any necessary changes in our rules. I am particularly interested in ways that we might revamp or streamline our equipment approval process to accommodate SDR. Any rules that would enable new and innovative products to reach the marketplace more quickly without compromising safety and interference protection for existing services would most certainly serve the public interest.

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FOR IMMEDIATE RELEASE:
December 7, 2000

News Media contact:
Rosemary Kimball at (202) 418-0511

FCC PROPOSES RULE CHANGES TO FACILIATE SOFTWARE DEFINED RADIO DEPLOYMENT

Washington, DC – The Commission today proposed rule changes to accommodate the authorization and deployment of a new generation of radio equipment known as software defined radios (SDRs). Software defined radios can be quickly reprogrammed to transmit and receive on multiple frequencies in different transmission formats. This reprogramming capability could change the way users traditionally communicate across wireless services and promote more efficient use of spectrum.

In a software defined radio, functions that were formerly carried out solely in hardware, such as the generation of the transmitted radio signal and the tuning of the received radio signal, are performed by software that is in high-speed digital signal processors. Because these functions are carried out in software, the radio is programmable, allowing it to transmit and receive over a wide range of frequencies and to emulate virtually any desired transmission format. The operating parameters of such a radio can be readily altered by a simple software change.

In March 2000, the Commission released a *Notice of Inquiry* seeking comments on a number of issues related to software defined radios. These issues included the current state of technology, how this technology could facilitate interoperability between radio services, how it could improve the efficiency of spectrum use, and what changes may be required in the FCC equipment approval process.

Under the current rules, if a manufacturer wants to make changes to the frequency, power or type of modulation for an approved transmitter, a new approval must be obtained, and the equipment must be re-labeled with a new identification number. This requirement has not posed problems in the past because radio transmitters have not had the capability of having their operating parameters easily changed in the field. However, software defined radios will have the capability of being reprogrammed in the field and the requirements to file completely new applications and re-label equipment when changes are made could be overly burdensome and hinder the deployment of software defined radios to consumers.

Under the proposals in the *Notice of Proposed Rulemaking*, updates to the software in a software defined radio would be handled as a new class of "permissive change," even if the updates resulted in changes to the frequency, modulation type or output power. Permissive changes are handled through a streamlined filing process. The FCC identification number of a transmitter would not have to be changed when software updates are made, so equipment in the field would not have to be re-labeled. These permissive changes could only be obtained by the original grantee of the equipment authorization. To allow for changes to equipment by other parties such as software developers, the Commission proposed permitting an optional "electronic label" for software defined radios, in which the FCC identification number could be displayed on an LCD or similar screen. This would provide a method to re-label equipment in the field if a new approval were obtained for a previously approved device. It could allow another party to obtain an equipment approval in its name and become the party responsible for compliance instead of the original grantee.

Action by the Commission, December 7, 2000 by Notice of Proposed Rulemaking (FCC
Office of Engineering and Technology contact: Hugh Van Tuyl at (202) 418-7506. ET Docket 00-47

December 7, 2000

Separate Statement of Commissioner Susan Ness

Re: In the Matter of Inquiry Regarding Software Defined Radios, Notice of Proposed Rulemaking, ET Docket 00-47

I as I stated at the time we adopted our Notice of Inquiry, I am bullish about the prospect of "software defined radio" ("SDR"). SDR is a new generation of technology that would allow communications equipment to adapt to multiple standards and add service features without changes to the equipment's hardware.

SDR holds the potential to enhance our participation in the global economy, to access new services, and to use the spectrum more efficiently. For example, SDR could facilitate the development of secondary markets for spectrum, because equipment could more easily operate under different parameters in different places. SDR could facilitate interoperability for users -- including public safety -- by making it easier to modify devices to communicate with each other. And SDR could facilitate global deployment of equipment, by making it easier for devices to operate in different bands and different modes, consistent with country allocations and rules.

To realize these benefits, however, we will have to alter our traditional equipment authorization process. Let me be clear: our need to protect the public from harmful interference from non-compliant equipment is not diminished. But as we have found elsewhere with our regulatory framework, our legacy regulations for equipment approval may impede rather than facilitate innovation. Thus, we must focus on developing more flexible ways to assure the Commission and the public that equipment complies with our technical rules, and that health and safety of the public is not compromised.

Today, we propose several modest steps to facilitate the use of SDR. I encourage parties to think creatively on ways to ensure that equipment complies with our rules without impeding the development of new and useful technologies like Software Defined Radio. Any rules that would enable new and innovative products to reach the marketplace more quickly without compromising safety and interference protection for existing services would most certainly serve the public interest.