Remarks of
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Introduction

Thank you, Scott, for that generous introduction. I am happy to join you to help kick off your summit. It looks like you have a full day of excellent discussions on some of successes, goals, and challenges associated with these amazing technologies.

I have really enjoyed working on software defined radios issues. My interest was piqued by helping the FCC's Office of Engineering and Technology open its workshop on this topic in the spring of 2003. I have been very impressed by the advancing capabilities of software defined and cognitive radio technologies. They have the potential to significantly shape our approach to spectrum use in the future.

I want to congratulate the Software Defined Radio Forum for taking a leadership role in exploring the questions that will help the FCC and other organizations around the world define policy to further develop and deploy these technologies.

Software Defined Radio

As you are well aware, software defined radio (SDR) is a reality today. While the FCC approved the first SDR-enabled base station just last November, software defined radio devices continue to be developed in both commercial and defense sectors throughout the world. The sheer number of the SDR Forum's one hundred-plus members indicates just how much interest there is in seeing these technologies grow.

These emerging technologies offer the potential for continued innovation that can both spur commercial productivity and enhance important homeland security objectives like public safety communications. By replacing the hardware that generates the transmitted signal and the tuning and detection of the received radio signal with software that controls high-speed signal processors, SDR technologies can promote three key objectives. First, they can provide improved flexibility and interoperability. Second, they dramatically cut operational costs. And third, they enable operators to increase revenues by carrying services previously supported on separate technologies. At the FCC, we want to put in place policies that encourage the growth of these technologies.

One of the more promising benefits of software defined radio lies in its potential to facilitate communications between emergency responders. Here in the U.S., it is not unusual for police in one city to have difficulty communicating with the local fire department, the police in the next

county, or with federal agencies covering similar jurisdictions. At the FCC, we have devoted a lot of energy to fixing the interoperability problem that affects our first responders. We have set aside channels for interoperability in a number of public safety spectrum bands and set up a coordination committee to help us adopt interoperability standards for new 700 MHz public safety systems.

Ultimately, though, successful communications among emergency responders will depend on technology. It can improve the ability of future systems to allow communications across multiple bands and different communications protocols. Software defined radio offers real promise. Its interoperability could allow emergency services with incompatible radio systems to create a compatible infrastructure on-the-fly simply by downloading software. I would like to commend the SDR Forum for initiating its Special Interest Group for Public Safety. It will help ensure that software defined technologies continue to be developed for use in the public safety sector.

In addition to public safety benefits, the flexibility of software defined radio may improve commercial telecommunications services by permitting wireless systems to be more versatile. The ability of SDR to adjust to shifting communications protocols gives operators the option to run several standards on a single network. These developments could present great opportunities for both high-use and underserved areas. For example, SDR technology may especially help rural carriers who want to be able to support multiple mobile wireless technologies so they can secure roaming agreements with more than one major operator. Software-defined radios can let them do that without investing in new hardware each time they add a new technology. As a result, rural consumers will reap the benefits of new and enhanced services, as well as better coverage. Also, software-defined radios will potentially allow devices and systems to take advantage of the relative abundance of unused spectrum in rural areas to provide more advanced services.

Software defined radio may also lower overall operational costs and increase the life span of networks. Installing and maintaining a wireless network can eat up a lot of assets. But the enhanced upgradeability offered by software defined radios can improve the network's durability and offset maintenance costs. Additionally, the commercial appeal of software defined radio lies in its potential to provide adaptability. We do not yet know what all the killer applications will be for broadband, but software upgrades may enable networks to "make room" as newer and better technologies roll out. This kind of "future-proofing" is particularly attractive in the dynamic arena of telecommunications.

Cognitive Radios

I am particularly enthusiastic about the technological developments in cognitive radio, the so-called next generation of software defined radio. Cognitive radio takes the ability of SDR to adapt to changing communications protocols and adds a new element – the ability to recognize the world around it and learn from experience. Cognitive radio in theory has the ability to provide multi-dimensional reuse of spectrum. And could potentially ease some of the spectrum and bandwidth limitations that currently impair wireless broadband deployment in the U.S. and overseas.

Though cognitive radio is still in its early stages, radios with cognitive capacity are already in use. Some wireless local area network devices already integrate cognitive capabilities in order to sense spectrum use and adjust power output in order maximize spectrum efficiency.

In late 2003, the FCC issued a Notice of Proposed Rulemaking to explore how we can encourage and support the development of cognitive radio. Just a few months ago, we also released a Report and Order to ensure that the Commission's rules keep pace with this cutting edge technology. I appreciate the efforts of our Office of Engineering and Technology in pushing these discussions forward. Later today, you will have an opportunity to hear more on these developments from OET's Jim Schlicting and former OET-chief Ed Thomas. This work, in addition to other items, such as the 3650 MHz and ultra wideband proceedings, demonstrates our increased willingness to explore innovative ways to open spectrum to new uses.

Cognitive radio technology can help address two of my critical issues in spectrum management policy. First, how can we increase the public benefits that are derived from use of radio spectrum? And second, how can we accommodate the increasing demand for spectrum-based services within our, some would say "out-dated," spectrum policies? There has been explosive growth in the demand for access to spectrum-based communications from consumers, the business community, and the government. It has long been my position that we need to get spectrum into the hands of people who are ready and willing to use it.

Cognitive radio has the potential to optimize spectrum use by allowing devices to co-exist while minimizing interference. A cognitive radio can sense whether particular channels are being used. If a channel is unoccupied, it uses it. If another user is using the channel, or a higher priority user wants to transmit, a cognitive radio device can switch to another channel, or it can alter its power and modulation to avoid interference. Of course, we always must be mindful of harmful interference, particularly when our most congested bands are involved, such as those used for cellular and PCS services.

But that is the beauty of cognitive radio. It is both intelligent and polite. It is smart enough to recognize a vacant channel, but is well-mannered enough to vacate that channel when someone else needs to use it. For these reasons, I remain very interested in continuing our exploration of cognitive radio's ability to facilitate secondary markets through interruptible spectrum leasing. Again, this is just another example of how this promising technology can allow us to help more people use spectrum more efficiently, and in ways that best suit their needs.

Spectrum Facilitation

As I touched on earlier, a principal benefit of both software defined and cognitive radio technologies lies in the role I believe they will play in optimizing spectrum use. Spectrum touches our lives in so many ways. Whether calling for help with a flat tire, staying in touch with our family, or checking in with work from the airport, spectrum is the medium we use to make our lives safer and more productive. The incredible progress we have made in wireless is also enhancing the security and economic growth of the whole country.

Of the many challenges Congress has charged us with, spectrum management is always a top priority. As some of you may know, I have set out an approach for spectrum policy that I call a

"Framework for Innovation." In dealing with spectrum, I believe the Commission does have a responsibility to establish ground rules for issues such as interference and availability. The Commission also has an important role in working with foreign administrations through the ITU and regional organizations to develop international sharing and interference criteria. But, to the greatest extent possible, we should let innovation and the marketplace drive the development of spectrum-based services. My goal is to maximize the amount of communications and information that flow over the Nation's airwaves, both on earth and through space.

While the Commission' duty to prevent harmful interference to users is paramount, it is also important that the Commission's actions be guided by something I have coined "spectrum facilitation." This means stripping away barriers – regulatory, economic, or technical – to furnish spectrum to operators serving consumers at the most local levels. To achieve these ends we rely heavily on technology. Engineering and innovation will drive increased performance, increased capacity, and more and better services for consumers.

In the broader scheme of things, software defined and cognitive radios offer the promise of helping us leave the world of command-and-control behind. It can help create an environment where a framework for innovation can thrive. These technologies have the capability to literally leapfrog the technical and legal problems that currently hamper many of today's spectrum access opportunities. They have tremendous potential to provide more options for the deployment of spectrum-based services in underserved communities both here in the U.S. and across the globe.

Challenges

Clearly, globalization will continue to fuel the demand for software defined radios. The proliferation of spectrum-hungry technologies and multiple international standards makes it critical to have devices that will operate in many countries, regardless of varying spectrum allocation and protocols. A single software defined radio can be programmed to operate over a range of frequencies, bandwidths, and transmission standards anywhere in the world. In order to realize this level of interoperability, it is important that we work to develop standards that will allow multi-national multifunctional devices, while also providing security and protecting the integrity of our nation's spectrum policies.

Spectrum policy is a two-sided coin: a framework for innovation on one side, with spectrum facilitation on the other. But in order to achieve these goals, we also must ensure that there are adequate security measures and standards to protect against any adverse consequences associated with these new technologies.

For example, the current FCC regulations allow equipment to be modified by a third-party – but only if the equipment is certified as SDR and it complies with security requirements to prevent unauthorized modifications to RF operating parameters. Such an approach could help stimulate an industry comparable to that of the personal computer industry, in which hardware and software can be purchased from companies other than the original computer manufacturer. But for this to happen, either a common set of standards or some way to determine compatibility between the hardware and software must exist. And adequate security requirements are critical to ensuring the integrity of the underlying SDR device.

As with any computer, software driven radios are subject to attack through hacking, viruses, and human error. Successful deployment of software and cognitive radios will depend on generating confidence that required security mechanisms are in place to prevent system misuse and malfunctions, interference – both intentional and unintentional – and exposure of confidential information.

The challenge for the FCC and other regulatory bodies is to set security standards that will protect against these dangers, but not hamper the advancement of these nascent technologies. In its cognitive radio Report and Order, the Commission largely left the implementation of appropriate SDR security measures to industry. After all, the people in this room are at the cutting edge and in a good position to determine what kinds of security measures are best. I am confident that through continued work between government and industry, we can together ensure that these technologies will reach their optimum capabilities while providing essential security measures.

Conclusion

The right kind of spectrum management policy can promote development by pushing boundaries to accommodate new technologies and services. As policy makers, we always need to consider the latest technologies in managing the spectrum. And it is my hope that software defined and cognitive radio technologies will open new avenues for innovation and service to improve the quality of communications for people the world over. With the right framework in place, we will continue to see exciting innovations increase performance and capacity. These will offer consumers more and better services, no matter where they live.

Thank you for the opportunity to speak with you today, and best of luck with the rest of the summit.