

Report : Fifth Meeting of the FCC Technological Advisory Council

Executive Overview

The Federal Communications Commission Technological Advisory Council (FCC TAC) held its fifth meeting on Wednesday, June 28, 2000 in Washington, D.C. As described in previous meeting reports, the Council is to provide scientifically supportable information on those emerging technologies likely to fundamentally impact the work of the FCC. The TAC is currently organized into three focus groups with moderators to address: spectrum management; network interconnection and access; and access to telecommunications by persons with disabilities. Each of these groups reported out findings developed in the interim and expanded each area during a roundtable discussion.

The Spectrum Management Focus Group is organized into three working subgroups. The TAC previously accepted the recommendation from the *noise environment* subgroup of a proposed noise study. The FCC fully supports the objectives of the proposal and the TAC has decided to solicit funding for a study some of the noise floor issues—most importantly a review of the existing literature. Funds would be collected from the organizations that the TAC members are associated with, but the National Science Foundation (NSF) would handle the actual project management and disbursements. It is our understanding that there is no legal problem if money is solicited only from the TAC members. Several TAC members have already indicated their willingness to contribute. We have suggested \$10,000 per member, with a \$1000 minimum.

Weighing heavily on the decision to allow the approval of UWB (Ultra Wideband), a spectral overlay technology, is a growing sense that there is already excessive interference and congestion in the Part 15 bands. The TAC *UWB subgroup* will determine if this is indeed true and try to see if there are some possible solutions that could be recommended to the FCC by the TAC. To set the stage for a comprehensive analysis, an overview of some of the issues surrounding congestion in the Part 15 bands was presented.

The *software defined radio (SDR) subgroup* reminded us that we are now waiting for replies to the SDR Notice of Inquiry (released by the FCC on March 21, 2000). After analysis of the NOI contributions, it is anticipated that it will first be necessary to delineate the rights and responsibilities of SDRs – what we have previously referred to as “Part X” regulations –including a general philosophy of certification. Introduction of SDRs will likely start as overlay devices in existing bands, followed by domination by intelligent devices with widespread multiband deployment.

Concern has been voiced over the harm that might be done to victim receivers by UWB transmitters. Additionally, SDR transmitters require a cooperating receiver. The noise floor only becomes an issue when it interferes with a receiver. In light of all these issues, it was instructive to look at the regulatory status of receivers relative to that of transmitters and a review of receiver regulation was presented

As we move into an era of software defined *everything* we need to construct operating principles that are derived from a somewhat higher point of view than we have been considering up until now. We

need a “Bill of Rights” that would be the permanent basis for the governance of all intelligent devices. The target is to create a document which, like the original Bill, could remain relevant for hundreds of years. It would anticipate a wireless-rich world with millions of wirelessly interconnected appliances of various types. The group has begun the task of identifying fundamental guiding principles so as to produce a compelling one-page document, not a rule book. This is an ongoing activity open to all who care to participate.

The Interconnection and Network Access Focus Group gave an overview of the issues associated with Internet interconnection. The 1996 Telecom Act requires “telecommunications service providers” to interconnect, but Internet Service Providers (ISPs) are not currently subject to this requirement. The question is: Do ISPs adequately interconnect today? And, as QoS (quality of service) is introduced into the Internet, will the largest ISPs have an economic incentive to interconnect for the provision of QoS? The question for the FCC is whether the free market is motivated to solve this problem or if intervention is needed. It is risky to make rules before all of the key technologies are fully developed. On the other hand, with so much of the economy being bet on the Internet it is risky to be wrong on this issue. TAC must also consider the possibility that transport will become so inexpensive that the whole problem will vanish in the rising tide of massive capacity improvement. The TAC should act in an “early warning” mode on this issue. To be sure that we are aware of the latest developments in this area, an expert speaker will be invited to the next meeting to review the current state of QoS and interconnection related technology.

Themes being addressed by the Access to Telecommunications by Persons with Disabilities Focus group include exploring: how changing technologies affect access for the disabled which the FCC is assigned to address; the different types of assistive technologies (AT) and the implications of compatibility; and whether or not the FCC from a technical viewpoint can help facilitate the migration away from older, legacy AT (such as TTY). The FCC must address the basic issue of whether it is necessary to promulgate new regulations to require companies to make their products and services accessible to people with disabilities, and, if there are accessibility regulations which apply to a particular technology, should the same regulations carry over to new technologies as the new technologies evolve and take over the role of the old technologies.

The next formal TAC meeting will be on Wednesday, September 27, 2000.

Prepared by J. A. Bellisio

Approved by R.W. Lucky

August 1, 2000

Report: Fifth Meeting of the FCC Technological Advisory Council

1.0 Introduction

As announced, the fifth meeting of the FCC TAC took place on Wednesday, June 28, 2000 at The Portals, 445 S. 12th Street, SW., Washington, D.C. Designated Federal Officer (DFO) David Farber opened the meeting. This report is a reorganization and distillation of discussions at that meeting written to facilitate the work of the Council. A complete videotape of the meeting serves as the verbatim minutes (see Annex 1). This report reviews the presentations and remarks made at the open meeting, but does not, per se, necessarily represent the final recommendations of the TAC as a whole.

The mission and operating principles of the TAC were described in the Report of the First Meeting of the TAC (April 30, 1999), available on the FCC web site <http://www.fcc.gov/oet/tac/>. As described in that report, the FCC has made five official requests to the TAC for technical work. These requests fall into three major areas: spectrum management; network interconnection and access; and accessibility for disabled persons. Focus groups with moderators were formed at the first meeting to address each of the three areas. At this fifth meeting, the activities of each of the groups was reviewed. The meeting's roundtable discussion, which followed each presentation, and resulting action items are also reported. Additional and more extensive information relative to each of the working groups can be found on the web sites for those groups. *See Annex 4.*

The next formal TAC meeting will be on Wednesday, September 27, 2000. A meeting has also been scheduled December 6, 2000.

2.0 Agenda

TECHNOLOGICAL ADVISORY COUNCIL Agenda -Fifth Meeting

Wednesday, June28, 2000
Federal Communications Commission Meeting Room
The Portals, 445 12TH Street, SW
Washington, D.C.

10:00 AM	Opening and Remarks by DFO	David Farber Designated Federal Officer
10:20 AM	Introductions of Council Members with Brief Remarks (if any)	Council Members
10:30 AM	Report of Interconnection and Network Access Focus Group	Marvin Sirbu
10:50 AM	Access to Telecommunications by Persons with Disabilities Focus Group	Gregg Vanderheiden
11:40 AM	Report of Ad-Hoc Group on Software Defined Radio "Bill of Rights"	Bran Ferren
12:00 PM	Break	
1:00 PM	Report of Spectrum Focus Group	Chuck Jackson
2:00 PM	Discussion of new Topics for Study	Chair Bob Lucky
2:40 PM	Assignments, Organization and Going Forward	Chair Bob Lucky
3:00 PM	Wrap Up - Meeting Adjourned	David Farber Designated Federal Officer

3.0 Membership of the Technological Advisory Council

Dr. Stagg Newman is appointed as the newest member of the TAC. Dr. Newman had served as the first DFO of the TAC. A short biography of Dr. Newman is in *Annex 2*. The First Meeting Report contains biographies of other members.

Except as indicated(*), all of the following were present at the Fifth Meeting:

TAC Chairperson:

Dr. Bob Lucky – Corporate Vice President, Applied Research, Telcordia Technologies

Members of Council:

*Mr. Bruce Allan – Vice President and General Manager, Harris Corporation

*Mr. Jose M. Alvarez Caban – Assistive Technology Specialist, Puerto Rico Assistive Technology Project, University of Puerto Rico

Dr. Jules A. Bellisio, ***TAC Executive Director***, Chief Scientist and Telcordia Fellow, Executive Director, Applied Research, Telcordia Technologies

Dr. Vinton Cerf – Senior Vice President, Internet Architecture and Technology, MCI Worldcom

Ms. Susan Estrada – President and CEO, Aldea Communication

Mr. Bran Ferren – President, Applied Minds

*Dr. Richard Green – President and CEO, CableLabs

*Ms. Christine Hemrick - Vice President, Technology Communications, Office of the CTO, Cisco Systems, Inc.

Mr. Dewayne Hendricks – CEO - Dandin Group

Mr. Ross Ireland – Vice President – Engineering, SBC.

Dr. Charles E. Jackson – Independent consultant.

Mr. Kalle Kontson – Division Technology Manager, Center for Electromagnetic Science and Vice President IIT Research Institute

Dr. William Lee – Chief Scientist, AirTouch / Vodaphone.

Dr. Paul Liao – Chief Technology Officer, Panasonic and President of Panasonic Technologies.

Dr. Wah Lim –Vice President, Corporate Technology and Ventures, Hughes Electronics Corporation

Dr. Robert Martin – Chief Technology Officer of Bell Labs, Lucent.

*Dr. David Nagel – President AT&T Labs and CTO for AT&T

Dr. Stagg Newman – Senior Telecommunications Practice Expert, McKinsey and Company

*Mr. Glenn Reitmeier, Vice President, DTV and Web Media, Sarnoff Laboratories.

Mr. Dennis Roberson – Vice President & CTO, Motorola.

Dr. Marvin Sirbu – Professor of Engineering and Public Policy, Professor of Electrical & Computer Engineering, Professor – Graduate School of Industrial Administration, and Chairman of the Information Networking Institute, Carnegie Mellon University.

Dr. Gregg Vanderheiden – Professor – Human factors Group, Dept. of Industrial Engineering, University of Wisconsin, and Director of Trace Research and Development Center.

*Mr. Jack Waters – Chief Technology Officer, Level 3 Communications.

Dr. Pat White - Senior Advisor, Safeguard Scientifics, Inc

Mr. Robert Zitter – Senior Vice President, Technology Operations, Home Box Office.

Designated Federal Officer

Mr. David Farber, Chief Technologist, Federal Communications Commission.

Alternate Designated Federal Officer

Mr. Dale Hatfield, Chief, Office of Engineering and Technology, Federal Communications Commission.

****Not present at fifth meeting.***

About 50 members of the public observed the meeting and comments from the public are reported as appropriate.

4.0 Summary of Remarks by Representatives of the FCC

The Chair asked members of the Commission and TAC members to comment on what they felt was the biggest technical problem facing their part of the industry. Mr. David Farber, Chief Technologist, Federal Communications Commission, in his introductory remarks listed among his concerns: stability and security of the Internet; the adaptation of the regulatory framework from its original, slow moving origins to one that can work at speeds required today; the retention and training of people in advanced computer science programs in the face of the strong attraction of industry; and the related problem of faculty being drained off into lucrative commercial enterprises.

Mr. Hatfield's top concerns were related to the scarcity of spectrum. Mr. Sicker added that interconnection was a key issue.

4.1 Concerns of TAC Members

In response to the same general question from the Chair, members of the TAC each described their single biggest current technical concern:

Zitter: Appropriate architecture for the next generation of television - which we expect will be a system meant to be viewed as a customized nonlinear stream in time.

White: The re-engagement of the dot-com economy

Vanderheiden: Communicating what we have learned (about access for the disabled) with new companies just entering the field so that we can avoid repeating the mistakes of the past.

Sirbu: Deciding which technology will be the most economical for bringing broadband to the residence.

Roberson: Improving software productivity

Newman: Getting to the true high speed broadband Internet.

Martin: Quality of Service in packet networks.

Lim: Spectrum scarcity and must-carry rules.

Liao: Determining what consumers really want in their living rooms.

Kontson: Achieving the full potential of wireless technology in the face of rapidly changing spectrum policies and regulations.

Ireland: Scaling new optical networks.

Hendricks: The scarcity of qualified technical people, especially in Silicon Valley.

Ferren: Finding the appropriate business model for new companies embracing new technology, and dealing with obsolete regulations.

Estrada: Solving the telecom problems of a small company in a geographic area not equipped for full communications services.

Cerf: The scaling problems of making the Internet bigger.

Bellisio: The best way to build the large scale, high capacity, *mobile wireless* Internet.

Lucky: The business model problem posed by the conundrum that most traffic is data but most of the money is in voice.

5.0 Report of Interconnection and Network Access Focus Group

Marvin Sirbu gave an overview of the issues associated with access. With respect to Internet interconnection, the '96 Telecom Act requires "telecommunications service providers" to interconnect, but Internet Service Providers (ISPs) are not currently subject to this requirement. The question is: Do ISPs adequately interconnect today? And, as QoS (quality of service) is introduced into the Internet, will the largest ISPs have an economic incentive to interconnect for the provision of QoS? Right now, there are over 5000 North American Internet Access Providers (IAPs) who are regional or national, provide Internet access to end user customers using dialup or leased lines, and are customers of ISP Backbones. There are also 40 to 50 Tier 1 ISPs who, national or international, interconnect with other ISPs at Network Access Points (NAPs), (public NAPs or private bilateral peering points) and exchange traffic without settlements.

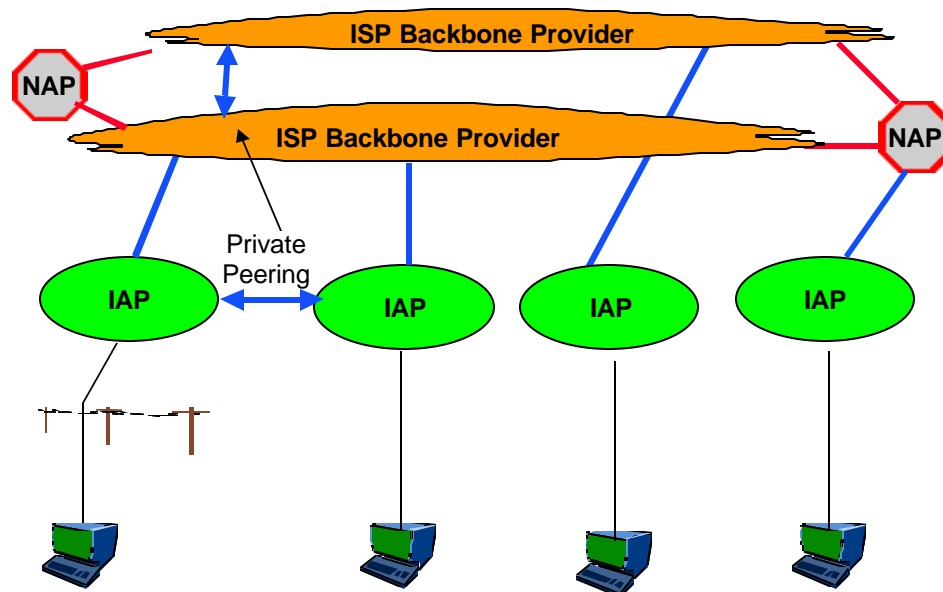


Figure 1 - Internet Tiered Architecture

A current interconnection issue is that packet loss at peering points seems to be substantially greater than within a backbone. In theory, the larger ISPs have an incentive to degrade interconnection in order to induce customers to connect to them directly. The evidence is a substantial rise in the demand for multihoming, and the creation of commercial "multihoming providers" such as Internap. Recently, major banks have created group to pressure ISPs to resolve peering problems.

The industry is developing QoS technologies for the Internet based on the "Differentiated Services" framework. Customers contract for specific QoS profiles with policing at the network periphery. In Fig.2, each "cloud" contracts for aggregate QoS traffic profiles, with policing at cloud-cloud boundary. This supports simple, bilateral business agreements.

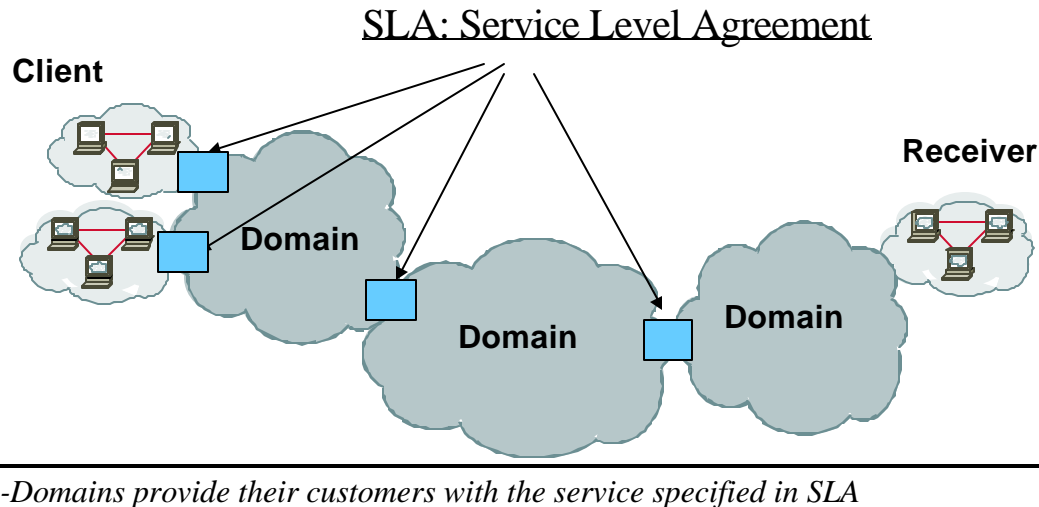


Figure 2 - Differentiated Service Architecture (Logical)

The Service Level Agreement (SLA) defines what forwarding service the customer will receive. The Traffic Conditioning Agreement (TCA) defines what the client must do to achieve the desired service and what the service provider will do to enforce limits. The client may be another service provider. At the current state of development, standards for per-hop behaviors are well developed and appearing in router products, but standards for bandwidth brokers and inter-domain QoS are lagging, and there are no signaling standards or well developed business models. It is virtually certain that intra-domain QoS will be introduced prior to inter-domain. During the period when only intra-domain QoS exists, the largest networks, offering greater network externality benefits, will have a distinct advantage over smaller networks. The longer this condition exists, the greater the risk of a tipping toward market dominance by one or two providers. We might ask: Should the FCC monitor the quality of interconnection by ISPs or jawbone the ISPs to move more quickly on inter-domain QoS?

5.1 Interconnection and Network Access Group Discussion

Since frame relay has been defined as a telecommunications service, it is interesting to see if interconnection is working better there. Vinton Cerf remarked that this is very challenging to do in frame relay. When customers are allowed to assign a QoS, there is little incentive for them to choose anything but the best level unless there is strong policing. We will probably see experimental QoS strategies introduced into the intradomain environment first, because until operators know exactly what is being traded, what the business models are, and it will be less difficult to introduce brokering. On the positive side, lack of firm definitions enhances good experimentation.

The question for the FCC is whether the free market is motivated to solve this problem or if intervention is needed. It is risky to make rules before all of the key technologies are fully developed. On the other hand, with so much of the economy being bet on the Internet it is risky to be wrong on this issue. We must also consider the possibility that transport will become so inexpensive that the whole problem will vanish in the rising tide of massive capacity improvement..

5.2 Interconnection and Network Access - Action Items

The TAC should act in an “early warning” mode on this issue. To be sure that we are aware of the latest developments in this area, it is requested that the group mediator invite an expert speaker to the next meeting to review the current state of QoS and interconnection related technology.

6.0 Report of Access to Telecommunications by Persons with Disabilities Focus Group and Group Discussion

Gregg Vanderheiden organized his presentation around three themes: (theme 1) how do changing technologies (technology advancements) affect access for the disabled which the FCC is assigned to address; (theme 2) what are the different types of assistive technologies (AT) and what does compatibility imply; and (theme 3) can the FCC facilitate the migration away from older, legacy AT (such as teletypewriters, TTY)? The FCC must address the basic issue of whether it is necessary to promulgate new regulations to require companies (or anyone) to make their products and services accessible to people with disabilities, and, if there are accessibility regulations which apply to a particular technology, should the same regulations carry over to new technologies as the new technologies evolve and take over the role of the old technologies. (For example, should regulations which apply to PSTN telephony also apply to IP telephony?) Should access regulations be treated the same as competition regulations (or more like fraud or other public good regulations)? Is it "a level playing field" to require companies providing a service using one technology (e.g., PSTN) to comply with accessibility rules that other companies, providing an essentially identical service, using another technology (e.g., IP) are not subject to?

There are fiscal implications of all policies. If current telecommunication services contribute to a universal service fund (or to purchase special equipment for people with disabilities), should the same charges be applied to new technologies (e.g. IP telephony) or should the charges only be paid by companies using the older technology (e.g., PSTN)? Does this provide for a level cost playing field? If the funds are only attached to older technologies, does that mean that the fund would eventually dry up and go away? With the new technologies will it be necessary for there to be a fund? Or will all users with disabilities be able to fully communicate using standard technologies - so no need for fund?

There are even more questions needing resolution. Are all types of access equally important or are some types more important than others? Is it politically and financially possible to migrate people using old technologies (e.g. TTYs) to new emerging technologies to ease or eliminate compatibility problems (at least in the long run)? What would be required of the new technologies to do this? What could industry or what could government do to facilitate this?

The group has come up with some preliminary conclusions:

The “readily achievable” concept or similar language is important to separate what is doable for all products from what is difficult or very difficult to do for standard products. Term “readily achievable” also important for allowing innovation. Essentially it allows all innovation to proceed and almost no innovation is blocked.

There are essentially three types of accessibility issues:

- Product designs which interfere with the assistive technologies used by people with disabilities (especially when there isn’t an alternative).
- Product designs (features which are either present or absent) which would put people with disabilities further behind everyone else. (increase the gap)
- Product features which empower people with disabilities, that is, allow people with disabilities to

do things with a phone that users ordinarily don't use a phone for such as controlling other devices, accessing labels on other products etc.

Everyone in the TAC subcommittee agreed that, although TTY's would clearly fade into history some day, it would be useful to lay out a road map for how this process might be facilitated so that the natural migration process would proceed more quickly.

6.1 Access to Telecommunications by Persons with Disabilities - Action Items

At the TAC meeting preliminary notes regarding the TTY migration topic were presented. These will need to be considerably revised in communication with stakeholders and others working in this area. A working group is being formed to study and work on this topic. A series of discussions with stakeholders is also being conducted. Persons (including those who are not members of TAC) interested in participating in the working group or participating in the stakeholder discussions please contact Gregg Vanderheiden at gv@trace.wisc.edu or Jim Tobias at tobias@inclusive.com.

7.0 The “Software Defined Radio Bill of Rights”

As described in the report of the previous meeting, Bran Ferren made a crucial observation. As we move into an era of software defined *everything*, an era where complexity and interaction are beyond the grasp of most people, we need to construct operating principles that are derived from a somewhat higher point of view than we have been considering up until now. By analogy to the Federal Constitution which provides a timeless and robust framework upon which all other laws can be tested, we need a “Bill of Rights” that would be the permanent basis for the governance of all intelligent devices. It would guide the responsibilities, obligations, rights and behavior of such devices so as to provide for both freedom of action and respect for the rights of humans and of other like devices. We need a set of high-level, overarching principles that describe how sophisticated equipment in conjunction with their human or mechanical users should behave so as to achieve the freedom and the equality of rights we desire.

A new ad-hoc focus group has been formed to address this concept, and Bran reported on the work in progress. The intent is to keep the thinking at a very high level and to use the real Bill of Rights and how people interact in real life as models. The target is to create a document which like the prototype, could remain relevant for hundreds of years. It would anticipate a wireless-rich world with millions of wirelessly interconnected appliances of various types. Uses with a hierarchy of values to the public should be accommodated. As with human interaction, the wireless radio equivalent of falsely shouting “fire” should be prohibited.

The group has begun the task of identifying fundamental guiding principles. Because this exercise is tied to technology, basic properties of range and propagation will have to be taken into account. Similarly, because we are moving to a software defined environment where over-the-air reprogramming is feasible, the whole importance of grandfathering legacy devices must be revisited. It may be possible to simply require that existing equipment reconfigure by download to new rules or waveforms.

7.1 Bill of Rights Initiative – Action Items

The objective of this activity is to produce a compelling one-page document, not a rule book. This is an ongoing activity open to all who care to participate. Persons interested in supporting this activity should contact either Bran Ferren (bran@appliedminds.net) or the TAC Executive Director (jules@research.telcordia.com). Bran should arrange to have a website for this group.

8.0 Report of Spectrum Focus Group and Group Discussion

Since the last meeting, a solution has been found to the funding and management issues associated with the noise floor study proposed and described in previous reports. According to advice received from FCC counsel, it appears to be both legal and appropriate for members of the TAC or the organizations which they represent to contribute to a fund to support the noise study. At this time, we can not recommend accepting money from entities other than those mentioned above. It is also proposed that the NSF (National Science Foundation) be engaged to both handle the money and act in a review capacity for the project. It is our understanding that the NSF can act quickly in this process and will can also arrange for the scientific peer review of the results. More details of this activity will be given below.

Chuck Jackson introduced the reports produced by the Spectrum Management Working Group which are summarized here. The Group is divided into three working subgroups, and the roundtable discussion of the meeting was organized around each of these areas. Full versions of the presentation visuals can be found at <http://www.jacksons.net/tac/#.June28Presentations>. The first presentation was review of receiver regulation by Charles (Chuck) Jackson.

8.1 A Review of Receiver Regulation

Concern has been voiced over the harm that might be done to victim receivers by UWB transmitters. Additionally, SDR transmitters require a cooperating receiver. The noise floor only becomes an issue when it interacts with a receiver. In light of these situations, it is instructive to look at the *regulatory status* of receivers relative to that of transmitters.

According to a theorem attributable to Coase, “Property rights and easy negotiations (zero transactions costs) result in efficient outcomes.”¹ But the problems are joint with transmitters and receivers. We observe, no receivers, no problems or, equivalently, no transmitters, no problems! Despite the fact that interference requires *both* transmitters and receivers, the FCC regulates transmitters extensively and receivers hardly at all. Similarly, the EPA regulates smokestacks but not lungs. The design of lungs was frozen some time ago, but the configuration of radio receivers is still evolving and amenable to control.

Historically, most regulation to control interference has focused on transmitters. Transmitter regulation is significant in most radio services. For example, we have limits on total power, specified modulation, specified frequency, and limits on out-of-band energy. In contrast, FCC regulation of receivers has been quite limited. In comparing this with other recommendations in the same area, we find that the NTIA has promulgated its own receiver standards. For selectivity, NTIA specifies that the passband be no greater than the authorized bandwidth of emission and that the selectivity characteristic outside the passband roll off at at least 100 dB/kHz. NTIA conforming equipment also must be capable of operation on any frequency within its tuning range (or 100Hz multiples with a synthesizer). For Federal government radio systems and civil receivers, we find that government systems can legally interfere with

¹Coase, Ronald, "The Problem of Social Cost.", Journal of Law and Economics, Vol. 3 (1960)

co- or adjacent-channel civil systems. Even if such civil systems are theoretically secondary or suffer interference due to poor receiver selectivity, the outcome is often that the government system must adjust (i.e., voters trump bureaucrats).

For completeness, we cite a Korean Statute: (Standards for Prevention of Electromagnetic Interference, etc.) – “The standards for preventing any electromagnetic interference by apparatus that causes the electromagnetic interference (hereinafter referred to as "apparatus causing electromagnetic interference") and those for protection from electromagnetic waves of apparatus influenced by electromagnetic waves shall be prescribed by the Ordinance of the Ministry of Information and Communication.” The European Radiocommunications Committee (ERC) in Recommendation (00)06 for Receiver Parameters says: “Where justified, administrations should seek to get receiver parameter limits included as essential parameters in harmonised standards or in national regulated interface specifications on a case by case basis ...” But by contrast Industry Canada now says that with the exception of receiver spurious emissions, receiver standards are *no longer part of the RSS* (Receiver Standards Specification).

The issues that must be considered in the design of a receiver include connectivity, interoperability, privacy, performance, interference susceptibility and efficient spectrum use.

There are existing rules covering many of these items:

- FCC Receiver Regulation: Connectivity/Interoperability
 - Competition: Sections 314 and 322 of the '34 ACT
 - Interconnection: Maritime watch requirements (section 355)
 - Section 624A (CE Compatibility)
 - Cable Television (CATV)
- FCC Receiver Regulation: Privacy
 - Section 705, Prohibitions on receiving messages meant for others
 - Section 302(d), Prohibition of cellular scanners
- FCC Receiver Regulation: Performance
 - All-channel receiver act
 - Sections 303(s) and 330
 - CUB petition on UHF Noise Figure/Attached Antennas
 - FCC adopted specific rules
 - Closed captioning
 - V-Chip
- FCC Receiver Regulation: Interference Susceptibility
 - Interference--302(b)(2) establishing minimum performance standards for home electronic equipment and systems to reduce their susceptibility to interference from radio frequency energy.
- FCC Inquiry on CB Interference to TV
 - General Docket No. 78-369
 - Staff report
 - Mandatory standards
 - Voluntary standards
 - Combined transmitter/receiver liability
 - Other transmitter liability
 - Labeling
- FCC Receiver Regulation: Efficient Spectrum Use and Repacking
 - Better receivers allow squeezing in more service
 - Incentive problem
 - What are the incentives for adopting more spectrum-efficient receivers?

There are many examples of problems where it is not clear where the most appropriate solution lies. Many hearing aids act as inadvertent receivers of TDMA cellular and PCS transmissions. Is the problem due to the radio transmitter or the design of the hearing aid? There are also examples of the impact of policy. We see repacking being applied to television with respect to UHF Taboos and the digital TV transition, in audio broadcasting, in the closer spacing of C-band satellites (from 4 degree to 2 degree spacing), in refarming in traditional land mobile, and in Cellular/PCS.

There needs to be a proper set of incentives if we are to have better receivers. More selective receivers increase costs but provide no new services in the short run—why should consumers buy them? If consumers have no incentive to buy, why should manufacturers build? This incentive problem appears to be most severe in broadcast services. As an example, double conversion, SAW filters at IF, and improved circuits would double the number of possible stations on the UHF TV band, but new receivers have to be in place before the new stations can operate. What are the incentives for consumers and manufacturers? In Washington, D.C., on May 17, 2000, the National Association of Broadcasters urged the Federal Communications Commission to adopt "strong, specific and decisive" pro-consumer actions to ensure a successful transition to digital television, including a requirement that all TV sets have the capability of receiving DTV signals.

We observe that the FCC often regulates receivers - but rarely in order to improve spectrum efficiency, and that weak incentives for the adoption of spectrum-efficient receivers lead to inefficient spectrum use in some services.

8.2 Noise environment

Dennis Roberson reported on the activities and findings of the Noise Environment Subcommittee. At a previous meeting, the group both accepted the recommendation from the subcommittee of a proposed noise study and officially forwarded it to the Chairman with the full support of this body. The first step of the proposed work would be a literature survey, followed by measurements of the noise sources themselves and then a modeling and analysis of the overall situation.

With respect to funding, FCC counsel agrees that it is acceptable and appropriate under FACA (Federal Advisory Committee Act) rules for organizations which have TAC members to donate money to a fund for the purpose of supporting the desired study. At this time it is not recommended that money be solicited from or accepted from organizations which do not employ TAC members. It was understood that for the results of studies such as the one proposed to have maximum impact, it was critical that there be no suggestion that the results were tainted by virtue of the funding source.

The National Science Foundation has both a review mechanism and a process for cross-agency funds transfer, and it is expected that these capabilities will be used to implement the study. It is projected that about \$100K to \$150K will be needed to fund the first phase - the literature study. It was formally and unanimously agreed to proceed with a solicitation of funds from the TAC. Contributions of \$10K from each member (with a \$1K minimum) are recommended.

8.21 Noise environment - *Action Items*

The Chair will send a letter to TAC members to solicit financial support for the noise study.

8.3 Software Defined Radio (SDR)

Kalle Kontson reminded us that we are now waiting for replies to the SDR Notice of Inquiry (released by the FCC on March 21, 2000). After analysis of the NOI contributions, it is anticipated that if a result favorable to SDRs is achieved there will be three phases to the implementation of the SDR

concept:

- A delineation of the rights and responsibilities of SDRs – what we have previously referred to as “Part X” regulations. This would include a general certification philosophy and an understanding of the operating space that can be logically reached in the future by means of software downloads to already deployed devices.
- Introduction of SDRs as overlay devices in existing bands.
- Transition to domination by intelligent devices with widespread multiband deployment.

8.40 Ultrawideband Radio (UWB)

Weighing heavily on the decision to allow the approval of UWB, a spectral overlay technology, is a growing sense that there is already excessive interference and congestion in the Part 15 bands. Complaints have already come into the FCC from the general public. The TAC should determine if this is indeed true and try to see if there are some possible solutions that could be recommended to the FCC by the TAC. To set the stage for this, Dewayne Hendricks provided an overview of some of the issues surrounding congestion in the Part 15 bands.

At a previous TAC meeting, we decided to study the issue of Part 15 congestion. An approach to the first phase would be to size the problem, gather facts, bring other TAC members up to speed on problem, then determine where to take the study next. To frame the problem we should limit the survey to Part 15.247 and 15.249 (spread spectrum, and low power emission rules) and look at both outside and inside use. We should form an opinion on whether or not the current FCC approach of labeling is still feasible. Labeling of equipment with the rules (which some have referred to as “Mirandizing”), in effect leaves it up to the consumer to deal with the issue.

To further scope the work, we will look at the following bands:

- 902-928 MHz
- 2400-2483.5 MHz
- 5.15-5.25 GHz, 5.25-5.35 GHz, 5.725-5.875 GHz (U-NII)
- 5.725-5.85 GHz (Spread spectrum)

Will we also consider various classes of users, such as various government entities, Part 18 (ISM – Industrial, Scientific, Medical) users, location services (e.g., “Lojak” / 900 MHz), amateur radio service (ARS) operators, and various Part 15 devices.

To reinforce the urgent nature of this work, we can point to anecdotes which have been appearing in the press. An April 27, 2000 article in the New York Times entitled “Preparing for a Collision of Wireless Services” reads: “If wireless networks proliferate as fast as many researchers predict, is it possible for the airwaves to become overloaded? Cell phones and some handheld organizers transmit and receive scores of messages a day. With laptop computers and other devices added to the mix, will there eventually be one big wireless traffic jam?”

Another example comes from the amateur radio world. ARS is ‘Amateur Radio Service’, (FCC Part 97) and has allocations in all of the Part 15 bands. ARS is a licensed service and has higher priority access than Part 15. In some cases, ARS has primary access to parts of the bands and can use power levels up to 1.5 kW for most emission modes and up to 100 W for spread spectrum (SS) with an automatic power control to force power minimization. There is very little use of SS today, but rules were changed last October to allow more liberal use of SS. The most used modes are FM repeaters and TV. A repeater in SF Bay area, operating since 1996, has seen a continuously rising noise floor over the last several years. This year the level has finally affected the base station operation, a problem mostly caused by outside high EIRP Part 15 operations, showing that things are definitely changing for the worse.

Another area of concern is the desire to use r-f for light fixture excitation. These are Part 18 (ISM)

devices that operate in 2400-2500 MHz ISM band, centered on 2450 MHz with *very* high power levels in-band. Rulemaking is now pending (ET 98-42) but Part 15 interests want the Commission to limit emission levels.

Some of the results of gathering facts in this area show that the press has picked up on the problem, that over 400 regional and local ISP's are using Part 15 for last mile bypass, and that there seems to be both disagreement inside the Commission as to exact role of Part 15, and consumer and manufacturer confusion about how Part 15 is intended to work. There is some belief that several of the current uses of Part 15 devices were unanticipated and unintended. Furthermore, while the industry seems to be in denial about the overall problem, more devices are being deployed on 2.4 GHz than anyone imagines. There may be 1 billion "Bluetooth" devices by 2005.

Problems outlined above are not an indication of the failure of Part 15, but rather are the result of the enormous popularity and innovative usage that has been stimulated by the success of unlicensed operation. As we revisit this issue, we should devise a philosophy that relieves some of the interference but continues to allow innovation to flourish.

9.0 Going Forward

Each focus group leader should summarize the action items as they see them for their group, and specific actions should be assigned as an individual responsibility to persons in the group for reporting at the next meeting.

The next scheduled formal TAC meeting is Wednesday, September 27,2000. A meeting has also been scheduled December 6, 2000.

Annex 1: Meeting Videotape

A VHS videotape of the June 28, 2000 meeting serves as a set of comprehensive minutes of that meeting. Copies of the tape can be obtained from the Commission's contracted copier, **In Focus**. They may be reached by phone at:

703.843.0100 ext. 2278

Annex 2: Member Biography

Dr. Stagg Newman
Senior Telecommunications Practice Expert
McKinsey and Company

Stagg joined McKinsey & Company, Inc., in January 2000 as Senior Telecommunications Practice Expert, where he provides technology advice and strategic technology analysis to client teams across the Firm's telecommunications practice.

Prior to joining McKinsey Stagg served as Chief Technologist at the FCC where he advised the Commissioners and senior staffers on strategic technology issues. Much of his work centered on the FCC's market opening initiatives for advanced telecommunications capabilities. This work included developing policy that encouraged competition in broadband access among cable companies, incumbent telephone companies, new entrant telephone companies and broadband wireless companies. Another theme of his work was "keeping the Internet safe from traditional telco style regulation."

Stagg started his telecommunications career with Bell Labs in 1976 and worked for various descendents of Ma Bell in voice, data, video, and wireless networking until his appointment to the FCC in Sept. 1997. From 1994 to 1997 he was Vice President, Network Technology and Architecture, Applied Research at Bellcore where he led the optical networking, wireless, and network access research program.

Stagg received his B.S. from Davidson College and his M.S. and Ph.D. from Cornell in Mathematics.

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Annex 3: FCC staff

FCC staff available to address questions from the TAC:

Contact David Farber as the DFO. With respect to specific Federal Advisory Committee Act (FACA) questions, a resident expert is FCC attorney:

Paula Silberthau, at: PSILBERT@fcc.gov
Phone 202-418-1874

Additional FACA information is at the Office of Government Policy web page at:

<http://www.policyworks.gov>

Annex 4: Focus groups , moderator, and group web addresses for interaction.

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<http://www.jacksons.net/fac>

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Intelligent Device Bill of Rights *ad-hoc* working group (Bran Ferren, Moderator)

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