Technical Advisory Council
Federal Communications Commission
Summary of Meeting
March 10th, 2014

The Technical Advisory Council (TAC) for the FCC was convened for its twelfth meeting at 1:00 P.M. on March 10, 2014 in the Commission Meeting Room at the FCC headquarters building in Washington, DC. A full video transcript of the meeting is available at the FCC website at http://www.fcc.gov/encyclopedia/technology-advisory-council together with a copy of all materials presented at this meeting. In addition, all materials presented at this meeting are included in electronic form in an Appendix to this document.

In accordance with Public Law 92-463, the entire meeting was open to the public.

Council present:

Shahid Ahmed, Accenture	Brian Markwalter, Consumer Electronics Association
John Barnhill, Genband	Milo Medin, Google, Inc
Mark Bayliss, Visual Link Internet, Lc	Lynn Merrill , NTCA
Nomi Bergman, Bright House Networks	Paul Misener, Amazon
Peter Bloom, General Atlantic	Vish Nandlall, Ericsson North America
Mark Bregman, Neustar	Jack Nasielski, Qualcomm, Inc.
John Chapin, DARPA	Ramani Pandurangan , XO Communications
Lynn Claudy, National Association of Broadcasters	Mark Richer, Advanced Television Systems Committeee, Inc.
Marty Cooper, Dyna LLC	Dennis Roberson, Illinois Institute of Technology
Brian Daly, AT&T	Jesse Russell, incNetworks
Pierre De Vries, Silicon Flatirons Center for Law, Technology, and Entrepreneurship University of Colorado at Boulder	Marvin Sirbu, Carnegie Mellon University
Adam Drobot, OpenTechWorks	Kevin Sparks, Alcatel-Lucent

Russ Gyurek, Cisco Systems	Paul Steinberg, Motorola
Dale Hatfield, Silicon Flatirons Center for Law, Technology, and Entrepreneurship University of Colorado at Boulder	Harold Teets, Time Warner Telecom, Inc.
Theresa Hennesy, Comcast Corporation	David Tennenhouse, Microsoft
Doug Jones, Verizon	Glen Tindal, Juniper Networks
Kevin Kahn, Intel Corporation	
Fred Kemmerer, Genband	
Steve Lanning, Viasat, Inc	

*** Remote Attendance**

Mark Gorenberg, Zetta Venture Partners	Dick Green, Liberty Global, Inc

FCC staff attending in addition to Walter Johnston and Julius Knapp included:

Michael Ha, FCC	Robert Pavlak, FCC
Chris Helzer, FCC	Robert Weller, FCC
Henning, Schulzrinne, FCC	

Meeting Overview

Dennis Roberson, TAC Chairman, began the meeting by introducing the TAC members and discussing the need to develop recommendations that were actionable by the FCC. Each TAC Work Group chairperson next discussed their mission objectives, the work group members participating in the work group, the issues and challenges in fulfilling their mission statement and where they intended to focus their work efforts.

The meeting concluded with Dennis Roberson thanking all members for their participation.

A copy of all presentations is attached herein.

FCC Technological Advisory Council

2014

TAC Work Groups

- **Spectrum and Receiver Performance**
  - Chair: Lynn Claudy (National Association of Broadcasters)
- **Cybersecurity Initiatives**
  - Chair: Paul Steinberg (Motorola)
- **Advanced Sharing and Enabling Wireless Technologies**
  - Chairs: 1) Ed Chen (Verizon), 2) Brian Daley (AT&T)
- **Internet of Things**
  - Chairs: 1) Dave Tennenhouse (Microsoft), 2) Russ Gyurek (Cisco)
- **Supporting the Transition to IP**
  - Chair: Nomi Bergman (Bright House Networks)

Technological Advisory Council

Spectrum and Receiver Performance

Working Group

10 March 2014

Working Group Members

- Lynn Claudy (Chair)
- Kumar Balachandran
- Milind Buddhikot
- David Gurney
- Dale Hatfield
- Gregory Lapin
- Brian Markwalter
- Geoffrey Mendenhall
- Jesse Russell
- Pierre de Vries
- Patrick Welsh
- Matthew Hussey*
- Julius Knapp*
- Bob Pavlak*
- Chairman emeritus Dennis Roberson

* FCC Liaisons

2014 Mission

- **The working group will make recommendations in areas focused on improving access to and making efficient use of the radio spectrum from a system and receiver perspective**
- **The working group will provide support as the Commission considers TAC recommendations related to the proposed interference limits policy**
- **The working group will conduct analyses and make recommendations related to enforcement issues in a rapidly changing RF environment**

Working Group Areas of Focus

- Complete white papers and briefings (initiated 2013)
- Develop proposed charter for MSH group in 3.5 GHz band
- Propose interference limits and spectrum access policy guidance
- Interference Resolution, Enforcement & Radio Noise
  - Share information about interference incidents
  - Investigate noise floor impact on radio services
  - Recommend strategies to address RF environment challenges

White Papers and Briefings

- **Published White Paper on Introduction to Interference Limits Policy (posted on FCC TAC website Mar 5, 2014)**
- **Publish White Paper on "Introduction to Interference Resolution, Enforcement and Radio Noise" (Mar-Apr '14)**
- **Presentation to TAC members and FCC staff on "Impact of New Receiver Technologies on Changing Standards and Spectrum Allocation" (Apr-Jun '14)**
  - **Receiver hardware technology**
  - **Dynamic interference cancellation**
  - **Software Defined Radio (SDR) technology**

Multi-Stakeholder Organization (MSH)

- Develop scope and initial charter for interference limits MSH group in 3.5 GHz band
  - Develop scope statement
  - Propose charter, goals and objectives
  - Develop specific recommendations regarding
    - Governance
    - Timeline / Phasing
    - Funding

Interference Limits and Spectrum Access Policy

- Evaluate use cases and types of interference scenarios
  - How spectrum access policies will work between stakeholders
  - How interference limits policy can be implemented
  - Statistical considerations
  - Standard list of questions about receiver performance and causes of inter-system interference

Interference Resolution, Enforcement and Radio Noise

- **Broad white paper draft targeted for March-April 2014**
- **Near-term: release additional information on interference complaints and investigations**
  - **Commission should take steps to release publicly, in summary form, information on interference complaints and investigations, including ones that are voluntarily resolved by the affected parties**

Interference Resolution, Enforcement and Radio Noise

- **Commission should convene a workshop of:**
  - **academic researchers and their funding agencies working in the field of interference resolution and enforcement, and**
  - **Industry practitioners and other experts (federal and non-federal) in the field of interference resolution and enforcement**

Interference Resolution, Enforcement and Radio Noise

- **2014: Interference resolution, enforcement, and radio noise**
  - **Investigate the costs and benefits of a Public-Private Partnership to voluntarily and systematically share information on interference incidents**
  - **Identify, analyze and recommend new strategies for interference resolution and enforcement in an increasingly challenging interference environment**
  - **Investigate the changing noise floor and impact on radio services**
  - **Investigate the need to change emission limits**

Major Milestones

- **2Q'14**
  - **Complete white papers and technology briefing**
- **3Q'14**
  - **Propose charter for Multi-Stakeholder Group in 3.5 GHz**
  - **Recommendations for analyzing interference risk on a statistical basis**
  - **Workshop and investigation report on interference resolution, enforcement, and radio noise**
- **4Q'14**
  - **Group report and recommendations for all focus areas**

THANK YOU

Cybersecurity Working Group

Chair: Paul Steinberg
Vice Chair: TBD
FCC Liaison: Jeffery Goldthorp

Mission Statement

New security vulnerabilities in software and hardware continue to emerge, imposing even greater externalities and societal costs on users. Security software is widely available, but most security solutions aim to protect software and hardware after systems have been built and deployed. Software and hardware security are too frequently seen as an afterthought or a potential hindrance to businesses, routinely addressed after a product is released into the marketplace. Improving security and reducing the aftermarket and social costs of security failures requires building security into software and hardware at the initial stages of the design and development process.

- What collaborative activities within or between industry and government organizations focus on building security into software and hardware, and how can these or other collaborative activities be strengthened, modified, or initiated to more effectively address security problems? How can the FCC act to promote the effectiveness of these activities?
- How can the FCC collaborate with academic institutions to bridge the gap between current computer sciences curriculums, which lack focus on security as a core tenet, and the need for secure coding as an integral piece of computer sciences degrees?

Mission Statement Key Objectives

- How do threats appear in the supply chain paradigm, and how can supply chain resiliency be improved to address these issues?
- What are the most important considerations that should be addressed in determining how software and hardware are designed and developed to reduce the number of security patches that are needed post-deployment?
- Who are the important stakeholders, and how can new or smaller manufacturers and vendors be included in the process?
- What processes are needed to allow for the open sharing of software and hardware security threats and solutions, while providing adequate safeguards for confidential information?
- Where can new or modified procedures highlight and address software and hardware security concerns in the design and development process?
- What technical measures can manufacturers and vendors take, as part of the design and development process, to reduce the risk their products will have security issues post deployment?
- How can training be improved to help manufacturers and vendors build security into software and hardware?
- What roles, if any, do testing and auditing have to play in building security into software and hardware, and how can they be used more effectively?

Primary Strategies

- Analyze the Ecosystem
  - Identify most Relevant and Widely Adopted Standards
  - Identify Industry Best Practices
- Identify Mechanism for Industry Sharing
  - Real time Threat / Remediation Sharing
  - Best Practices
- Identify means to influence HW/SW Suppliers
  - Early engagement (design phases)
  - Incorporate Intrinsic Security Resilience Measures

Recommended Working Group Members

- WG Chair: Paul Steinberg, Motorola Solutions
  Vice Chair: TBD
- FCC Liaison: Jeffrey Goldthorp
- Potential Members:
  - Peter Bloom, General Atlantic
  - Adam Drobot, Open Tech Works
  - Jeff Foerster, Intel
  - Russ Gyurek, Cisco
  - John Howie, Cloud Security Alliance (TBC)
  - John McHugh, NTCA
  - Mike McNamara TW Telecom
  - Vish Nandlall, Ericsson
  - Jack Nasielski, Qualcomm
  - Deven Parekh, Insight Partners
  - Ramani Pandurangan, XO Communications
  - George Popovich, Motorola Solutions
  - Jesse Russell, incNetworks
  - Kevin Sparks, Alcatel Lucent
  - Harold Teets, TW Telecom
  - Jack Waters, Level 3 Communications

FCC TAC: IoT

What is the impact of IoT on the network in 3 years, 5 years, 10 years?

IoT WG

March 10, 2014

- Russ Gyurek- (WG Co-Chair)
- David Tennenhouse- (WG Co-Chair)
- Shahid Ahmed
- Mark Bayliss
- Greg Chang
- Kevin Kahn
- Brian Markwalter
- Vish Nandlall
- Jack Nasielski
- Ramani Pandurangan
- Deven Parekh
- Marvin Sirbu
- Glen Tindal
- Jack Waters
- John Barnhill
- Jeff Forester
- Kevin Cage
- Lynn Merrill
- Walter Johnston (FCC)
- Other SME's: GE, Researchers, IBM, Sprint, NEST

Charter

- Identify key areas in the evolving Internet that should drive the work of the Commission or areas where the Commission should seek key information
- What new demands will the Internet of Things (including M2M) place on the network?
- What technology policy challenges exist in the evolution towards an Internet of Things?
- Explore how the FCC can foster IoT innovation and leverage federally funded R&D in this area

Key Areas of Focus

- Why IoT? Social and Economic Benefits
- Data growth / # of Devices and its impact on the network
- IoT security, spoofing, device vulnerability
- IoT data privacy
- Spectrum challenges and opportunities
- Public safety opportunities
- Business Models: Implications for the net, blockers, etc.
- Standards and Best Practices

Sample Taxonomy

Source: Machine2machine

External Organizations to Engage

(as of 3.2014 / not comprehensive)

- Govt agencies & advisory bodies
- IEEE
- IETF
- OneM2M
- 3GPP- Mobile Systems Release 13
- ETSI
- ITU-T Focus Group on M2M
- Open Geospatial Consortium (OGC)

Work Plan (first draft)

- Leverage past IoT / M2M WG outputs (S. Ahmed)
- Taxonomy and Matrix (Classes of IoTs vs focus areas)
- Fact Finding:
  - Forecasts, Use Cases, Business Models
  - What is inevitable? What can be influenced?
- Prioritize and scope activities within context of FCC
- Deep dives on key opportunities / challenges
- Initial list of opportunities / concerns (by focus area)
- Proposed recommendations relative to focus area

Logistics

- Weekly team meetings
- Create sub-groups within WG on key topics
- Reach out to industry SMEs (non-TAC)
- Reach out to standards organizations
- Work with FCC advisor on “network focus” for IoT
- Work with related government agencies (EG. FTC)
- Draft list of proposals by June TAC meeting

Comments and Feedback

Technological Advisory Council

Advanced Sharing and Enabling Wireless Technologies Working Group

10 March 2014

Charter

- Establish an advanced sharing framework to enhance spectrum efficiency while protecting incumbent services, including both Federal and non-Federal services
- Identify and evaluate enabling technologies to enhance sharing efficiency, develop requirements for protection of incumbent services, and encourage co-existence of Federal and non-Federal systems
- Provide recommendations to the Commission regarding the establishment and objectives of “RF Model City” where the proposed advanced sharing framework and enabling technologies can be tested and evaluated

WG Members

- Co-Chairs:
  - Ed Chan, Verizon
  - Brian Daly, AT&T
- FCC Liaisons:
  - Michael Ha
  - Chris Helzer
  - Robert Weller
  - Kamran Etemad
  - Janet Young

- WG Members:
  - John Chapin, DARPA
  - Lynn Claudy, NAB
  - Vish Nandlall, Ericsson
  - Kevin Sparks, Alcatel-Lucent
  - Paul Steinberg, Motorola Solutions
  - Mark Bayliss, Visual Link Internet
  - Jack Nasielski, Qualcomm
  - Milo Medin, Google
  - David Tennenhouse, Microsoft
  - Marty Cooper, Dyna LLC
  - Adam Drobot, OpenTechWorks
  - Kevin Kahn, Intel
- There may be additional invited WG contributors as appropriate

Advanced Sharing

- The CSMAC recommended a framework to share AWS-3 bands between Federal and Non-Federal operations
  - The current framework is static and generated fixed circles for protection/coordination zones
- The Commission has adopted or is in discussion on more dynamic sharing schemes in other bands, including
  - White Space in TV bands
  - SAS in 3.5GHz band
  - DFS in 5GHz UNII band
  - 70/80/90GHz “Green light/Yellow light”
- Advanced Sharing may encompass the currently proposed sharing schemes or their combination with other enabling technologies that the WG will explore

Potential Enabling Technologies

- Examples of Enabling Technologies
  - Interference Detection and Cancellation
  - Advanced Antennas/Beam-forming
  - Time/Space/Frequency Coordination
  - Centralized Spectrum Database Management and Signaling
  - Device Based or Infrastructure based Sensing Technologies
  - Infrastructure/RAN Sharing?

- WG will identify the leading companies on the enabling technologies and solicit their feedback

Systems Under Considerations

- Commercial Systems
  - Fixed/Terrestrial
  - Satellite
- Federal Systems
  - Airborne
  - Radar
  - Fixed/Terrestrial
  - Satellite
  - Passive
- Frequency Bands
  - Initial focus on frequency bands under 10GHz
  - There may be a specific bands of interest as the WG identifies certain technologies that may be more suitable to specific sharing scenarios, systems or frequency bands

RF Model City

- PCAST report has introduced the concept of “Test City”
  - “…creation of an urban Test City, complemented by a Mobile Test Service to support rapid experimentation and gain essential operational test data to establish the dependability of both the technology and the management techniques supporting the new spectrum architecture.” (Appendix G of the PCAST Report)
- WG will provide recommendations on key areas of RF Model City creation
  - Scope/Definition of the RF Model City
  - Logistics of RF Model City (*i.e*. Location, Systems to be involved, Frequency Bands, Operational Constraints, Timelines/Phases/Objectives, etc.)
  - Sharing technologies to be considered

Key Milestones

- June TAC Meeting
  - Identify the areas/technologies of focus for Advanced Sharing
  - Participate in the RF Model City Discussion
  - White paper on the current sharing models
- September TAC Meeting
  - Recommend technical, operational, and policy directions/changes that may facilitate the Advanced Sharing of Federal/non-Federal frequency bands
  - Continue participation in the RF Model City Discussion
- December TAC Meeting
  - Provide specific recommendations on the framework of Advanced sharing
  - Recommendations may include strategic fit in the RF Model City

Technological Advisory Council

Supporting the Transition to IP

Working Group

10 March 2014

2014 Mission

- Examine opportunities for new communication technologies to better serve the needs of people with disabilities
- Identify potential opportunities for improvements in emergency alerting and information support during disasters enabled by an IP infrastructure and associated technology
- Identify opportunities for experiments or R&D that would support the understanding of the impact of tech transitions on the enduring values
- Analyze potential for new fiber technologies and wireless systems to better serve low population areas ensuring that rural communities are connected to the evolving broadband environment
- Identify opportunities and objectives for trials designed to support advanced communication capabilities to rural areas
- Support activities focused on improving acquisition of information on deployment of broadband technologies

Working Group Backgrounder

- This came out of the TAC, a few years ago. This was one of our early declarations. While people were thinking about it, the TAC really brought it to the table. The vision is there.
- Now we need to finish the job.
- Let's frame is as "where we are going," rather than what we are leaving behind.
- Networks evolve. We cannot be luddites.
- How fast should we go? If it is good for tomorrow, why not today?

Trial Approach – WHY?

- **We want to be a learning government, not a command-and-control government. These trials, or experiments are not to decide, but to inform.**
- **Breaks us from Innovators' Dilemma, and from an approach of merely focusing on incremental improvements to deployed solutions → to seeking new solutions to the same core questions.**
- **To remain consumer-focused, as we preserve competition, innovation and public safety.**

What do we expect from networks?

- Connectivity – universal access
- Certain consumer protections
- Access to emergency services
- Competition, innovation

We will want to consider how these basic values transfer over to our new, more capable IP networks.

WG1: Consumer Protections - Examine opportunities for new communication technologies to better serve people with disabilities

- IP compatible technologies for people with disabilities
- Illustration: Consider how Siri provides improved access; talking guides; etc.
- What matters, as we ascertain the impact on consumers? What should we measure and report?
- The Commission's Consumer Bureau has a lot of resources in this area. We might task one or two members to work with the Consumer Bureau.

WG2: Access to Emergency Services - Examine opportunities for improvements in emergency communications.

- IP compatible technologies which will change how we handle emergency situations, power outages, etc.
- Illustration: Consider how Location Tracking for Cellphones might improve emergency services.
- What matters, as we ascertain the impact on consumers? What should we measure and report?
- CSRIC is already doing a lot of work in this area. We should seek to learn from their work.

WG3: Competition - Commissioning Experiments to Encourage Innovation.

- To learn about the evolution and capabilities of networks
- Not only are services being replaced, but they are being replaced by something better.
- Yet, there are always tradeoffs. One rarely realizes only benefits from any change.
- Illustration: Multi-modal communications enriching Customer Service experiences; Innovations stemming from more robust speeds and capacity; etc.
- What matters, as we ascertain the impact on consumers? What should we measure and report?

WG4: Connectivity. Universal Access.

- New HFC, fiber, wireless and satellite technologies and their feasibility for finding new solutions to serve areas with less density. With advanced solutions.
- Illustrations: Evolving LTE, Satellite and HFC solutions.
- What matters, as we ascertain the impact on consumers? What should we measure and report?

Next Steps for TAC 2014 Work

- Review, refine these working groups together.
- Discuss how we might approach foundational questions such as how do we measure the effectiveness of these trials? Should the measurements resembles today's traditional scorecards?
- Seek a leader for each.
- Gather talented working group members.

Potential Working Group Members

- Mark Bregman (Neustar)
- Theresa Hennesy (Comcast)
- Kevin Kahn (Intel)
- Fred Kemmerer (Genband)
- Steve Lanning (Viasat)
- Jack Nasielski (Qualcomm)
- Marvin Sirbu (CMU)
- John Barnhill (Genband)
- Doug Jones (VZ)
- Tom McGarry (Neustar)
- Russ Gyurek (Cisco)
- Dale Hatfield (UCol)
- Kitty O'Hara (VZ)
- Harold Teets (TWC)
- Mike McNamara (TW Telecom)
- Lynn Merrill (Monte R. Lee)

THANK YOU