Technical Advisory Council
Federal Communications Commission
Summary of Meeting
September 19th, 2017

The Technical Advisory Council (TAC) for the FCC was convened for its twenty-fourth meeting at 12:30 A.M. on September 19th, 2017 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, 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, SME	Karri Kuoppamaki, T-Mobile
John Barnhill, Genband	Steve Lanning, Viasat, Inc
Mark Bayliss, Visual Link Internet, Lc	Gregory Lapin, Independent Consultant
Nomi Bergman, Advance Newhouse Communications	Kevin Leddy, Charter Communications
John Chapin, Roberson & Associates Consulting	Brian Markwalter, Consumer Technology Association
Lynn Claudy, National Association of Broadcasters	Lynn Merrill , Monte R. Lee & Company
Marty Cooper, Dyna LLC	Jack Nasielski, Qualcomm, Inc.
Brian Daly, AT&T	Dennis Roberson, Illinois Institute of Technology
Pierre De Vries, Silicon Flatirons Center for Law, Technology, and Entrepreneurship University of Colorado at Boulder	Jesse Russell, incNetworks
Jeff Foerster, Intel Corporation	Marvin Sirbu, Carnegie Mellon University
Russ Gyurek, Cisco Systems	David Tennenhouse, VMWare
Dale Hatfield, Silicon Flatirons Center for Law, Technology, and Entrepreneurship University of Colorado at Boulder	

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

Rashmi Doshi (Remote)

Meeting Overview

Dennis Roberson, TAC Chairman, began the meeting by calling for attendance. The Chairman then introduced Walter Johnston who presented the TAC recommendations that the FCC Chairman had decided to act upon for 2017. This was based upon the two or three prime recommendations that each TAC workgroup was asked to provided. Mr. Johnston noted that these recommendations represented a starting point and that where this ended up would depend upon the work itself as it enfolded. He then reviewed each accepted recommendation. Regarding Software Defined Radio software, a multi-stakeholder group would be pursued to develop recommendations. The Consumer Technology Association (CTA) had agreed to spearhead this effort. Further, the spectrum management policies developed by the TAC in 2016 would be issued as a Public Notice by the FCC. Regarding recommendations on the noise floor, the FCC has begun a testing program on switching power supplies and would then proceed on this information perhaps issuing an NOI or NPRM based on results. Another recommendation made in 2016 was to build a liaison to law enforcement organizations. The FCC PSHSB is now developing recommendations and strategies on how best to accomplish this. The Next Generation Internet group recommended in 2016 that the FCC seek more information on the home networking environment. The FCC is looking soliciting information in this area. In 2016, the TAC recommended that the FCC pursue of policy of supporting spectrum allocations in low, mid-band, and upper band frequencies. The FCC believes it has been successful in pursuing such a policy and instead is considering how it may make its strategies in this area more public. In addition, the FCC will consider a list of strategic technologies that it is focusing on. Regarding training of FCC staff, the Chairman has asked to realign the TAC proposals to the realities of expected budgets.

The TAC workgroups next proceeded to review their work objectives. A copy of all presentations is attached herein.

Walter Johnston, Chief EMCD-OET
FCC

FCC
Technological Advisory Council

Technological Advisory Council Agenda

- Introduction - (Dennis Roberson)
- 2016 Recommendations - Walter Johnston
- Broadband Deployment Technical Challenges
- Recommendations for Removing Obsolete or Unnecessary Technical Rules
- Mobile Device Theft Prevention (MDTP) Work Group
- Implications of Next Generation TV Broadcasting Technology
- Satellite Communications Plan
- Wrap-up

2016 TAC Recommendations Adopted by FCC Chairman

September 19th, 2017

Software Configurable Radio – Frequency Security Mechanisms

- Recommend that the FCC encourage formation of a multi-stakeholder forum to find a way in which manufacturers can strike the appropriate balance between embedding security mechanisms into SCRs and their ecosystem to ensure compliance with FCC service rules, while allowing innovation and the flexible addition of features, and fostering cybersecurity overall.
- FCC has begun working with CTA to establish a multi-stakeholder group focusing on security mechanisms for SCRs to ensure compliance with FCC rules while supporting innovation and flexibility of use by end users.

Spectrum/Receiver Performance – Policy Statement

- Given increasing challenges of efficient and fair allocation of spectrum in the congested RF environment, the FCC should initiate a Policy Statement setting forth spectrum management guidance. This should include: 1) Formalizing and implementing the TAC's receiver recommendations and spectrum allocation principles as policies; 2) Adopting risk-informed interference assessment and statistical service rules; 3) Implementing the steps outlined by the TAC for improving enforcement, including: a) The Next Generation Enforcement Architecture; b) Creating a public database of past enforcement activities; and c) Incorporating interference hunters in the enforcement process.
- As initial step, FCC will issue a public notice inviting comment on TAC spectrum management recommendations, including the associated white paper.

Spectrum/Receiver Performance – Impact of Increasing Noise on Services

- Responses submitted to the TAC Technical Inquiry, ET Docket 16-191, reveal that the proliferation of noise sources in the spectrum is increasingly harming current and future communication services. We recommend that: 1) the FCC direct the OET Lab to measure advanced lighting and switching power supplies on the market to ascertain if they meet regulatory noise limits; initiate enforcement if not; and 2) Issue NOI/NPRMs to gain more information about the advisability of rule changes to: a) deal with advanced lighting and switching power supplies; and b) to reduce noise in the spectrum.
- FCC is testing lighting and switching power supplies. Staff is working on preparing a set of recommendations for the Commission looking towards issuing an NOI/NPRM. (Commission decision).

Mobile Device Theft Prevention

- **Tracking Program Effectiveness:** The FCC TAC recommends that the FCC work with State, Local, Federal, and Tribal Law Enforcement to assess the effectiveness of the mobile theft prevention measures implemented by the wireless industry. Consequently, information is required from state, local, federal and tribal law enforcement regarding the patterns and trends in mobile device theft in order to assess the effectiveness of the mechanisms that have been implemented by the wireless industry.
- The approximately 18,000 law enforcement agencies in the U.S. make this a difficult task. FCC PSHSB has volunteered to engage with their interfaces in law enforcement regarding mechanisms to obtain mobile device theft data and will develop recommendations.

NG Internet - Public Notice

- Modern service delivery is dependent on quality of in-home networks. For most households, in-home networks are “managed” by consumers, often with no experience or tools. Despite the progress that has been made in understanding broadband performance, no public data is available on the impact on user experience of the network within the Home. We recommend that the FCC issue a Public Notice on in-home networks and their contribution to overall Quality of Service/Experience.
- FCC to issue a PN to gain insight into how wireless home networks affect the user experience of broadband service. The PN could be issued by the Commission, OET, or the TAC.

Future Game Changing Technology – Balanced Spectrum Allocations

- The key ingredients for leading in the wireless revolution – ensuring a balance in spectrum allocation for best use, emphasizing the importance of spectrum efficiency, and exerting strong leadership in international standards and open source bodies to advocate positions important to American National interest. FCC should work closely with the Administration and Congress to ensure a flow of spectrum balanced across high, middle, and low spectrum bands for commercial use, and promote flexible-use policies that support experimentation across a range of frequencies and access approaches, including exclusive flexible use licensing, light licensing, sharing, and unlicensed. FCC should establish a 'technology watch list' (evolving 4G and emerging 5G) of priorities for the US market, and use to guide an ongoing dialogue with industry to ensure they are met in standardization and open source activities.
- The Commission is pursuing this objective: completion of incentive auction, 3.5 GHz, 5G, etc. FCC will seek to outline to public overall spectrum policy and highlight key technical drivers. A number of auctions and rulemakings have made spectrum recently available at 600 MHz, 700 MHz, 1700 MHz, 5 GHz, 28 GHz and above. In addition, Commission NOI on Mid-Band Spectrum recently released.

Future Game Changing Technology – Institutionalize Planning

- TAC recommends that the FCC should institutionalize a process at the FCC for anticipating and keeping up with major shifts in technology, usage patterns, and business models. The FCC should engage in an annual facilitated study exercise to gain essential insights on the impact of emerging technologies and innovations for disruptive change in the communications sector. FCC staff, representative of all key Bureaus and Offices, would interact in a highly focused workshop environment with experts representing industry, academia and other stakeholders on key forward challenges and opportunities facing the FCC. The results of this exercise should be the foundation for the development of plans and strategies to address anticipated change, in support of a robust US digital innovation economy and the furtherance of societal goals.
- FCC will work with TAC to develop a draft plan, including estimated costs consistent with FCC budget constraints.

Broadband Deployment Technology Challenges Working Group

WG Chairs: Nomi Bergman and Adam Drobot
FCC Liaison: James Miller and Walter Johnston

SWG Chairs: Marvin Sirbu – Technology Roadmap
SWG Chair: Lynn Merrill – Universal Access
SWG Chair: David Young – Policy and Regulations

19-September-2017 Washington, DC

BDTC Working Group Charter for 2017

Broadband Deployment Technological Challenges: This group would bring together technical experts from a broad cross section of the communications industry – including among others: wireline, mobile, cable, satellite, and broadcast, – to study and provide information on available technologies, their limitations, and any technical rules or policies that impede broadband deployment. This group's work may also provide a ready resource for technical support for the FCC's Broadband Deployment Advisory Committee (BDAC).

Working Group Members

- WG Chairs: Nomi Bergman, Advance Newhouse
  Adam Drobot, OpenTechWorks
- SWG Chairs: Lynn Merrill, NTCA
  Marvin Sirbu, SGE
  David Young, Verizon
- FCC Liaison: James Miller and Walter Johnston
- Members:

Shahid Ahmed - SME
John Barnhill - Genband
Mark Bayliss - Visuallink
Nomi Bergman - Advance
KC Claffy - CAIDA UCSD
Brian Daly - AT&T
Adam Drobot - OpenTechWorks
Russ Gyurek - Cisco
Dick Green - Liberty Global
Dale N. Hatfield - Silicon Flatirons

Working Group Members Cont'd

Mark Hess - Comcast
Jason Livingood - Comcast
Tom McGarry - Neustar
Milo Medin - Google
Lynn Merrill - NTCA
Jack Nasielski – Qualcomm
Chuck Powers - Motorola Solutions
Dennis Roberson – IIT
Mark Richer - ATSC
Marvin Sirbu - SGE
Rob Alderfer - Cablelabs
Paul Steinberg - Motorola Solutions
Michael Tseytlin - Facebook

Kevin Sparks, Nokia
David Young – Verizon
Kevin Leddy – Charter
Michael Bugenhagen – CenturyLink
Henning Schulzrinne
Stagg Newman – Land of Sky Regional Council

Paul D'Ari - FCC
Walter Johnston - FCC
Padma Krishnaswamy - FCC
James Miller - FCC
Zach Ross - FCC

SME Presentations and Discussions

May 26th	Stagg Newman – Discussion Current Broadband Issues
June 2nd	Blair Levin – Lessons learned from the Broadband Plan and Broadband Futures
July 28th	Jonathan Chambers and Randy Klindt – OzarksGo – A Regional Business Model, Low Cost Deployment, and Partnering
August 4th	Robert Whitman and Claudio Mazzali – Corning – Cost Model for Rural Fiber Deployment and Future Fiber Technology
August 11th	John Chapman – Cisco – Infinite DOCSIS

Broadband Deployment Technological Challenges SWGs

- **Universal Access** dealing with coverage in rural, sparsely populated, and underserved areas
  - Lynn Merrill Chair
- **Broadband Technology Roadmap** to guide future investments
  - Marvin Sirbu and Kevin Sparks Chairs
- **Critical Policies and Regulations Review** to encourage Broadband Deployment
  - David Young Chair

Executive Summary

- We have been in listening mode, learning from technologists, rural success stories, organizations with relevant experience (such as FirstNet and TUCOWS).
- And, we are seeking to learn from innovative business models which have deployed productive solutions.
- We are coalescing what we have learned, to determine whether we might be able to derive successful solutions templates, and views on emerging technologies and solutions worth watching.
- As we learn more, we hope to structure solution approach model and domains of use, addressing subsets of use cases for which solutions are sought:
  - Rural Communities without service or connectivity
  - Rural extensions without service
  - Rural communities or extensions with service below FCC guidelines

Universal Access SWG
Lynn Merrill

SWG Participants

• Lynn Merrill – Chair	NTCA
• John Barnhill	GenBand
• Michael Bugenhagen	Century Link
• Russ Gyurek	Cisco
• Kevin Leddy	Charter
• Jason Livingood	Comcast
• Jack Nasielski	Qualcomm
• Stagg Newman	Land of Sky Region
• Chuck Powers	Motorola
• Mark Richer	ATSC
• Marvin Sirbu	Carnegie Melon
• Michael Tseytlin	Facebook
• Rob Alderfer	CableLabs
• Mark Hess	Comcast
• Henning Schulzrinne	Columbia University
• Eliot Weitz	ViaSat
• James Miller	FCC
• Walter Johnston	FCC

Universal Access SWG

- **Statement of the problem:**
  - There is no single link as to why broadband is less prevalent in the rural and sparsely populated area versus suburban/urban counter parts. The common thread breaks with density, though other factors such as technology, SPs' goals, community involvement, funding opportunities /available support, i.e.. play equally important roles.
  - Universal Access SWG in conjunction with serving as a technical resource to the BDAC, will examine how technology, processes, implementation and applications affect BB deployments in rural and sparsely populated areas

Presentation Schedules

- July 28 Conexon Rural Electric Cooperatives
- Aug 11 CableLabs Rural Reach with HFC
- Aug 18 CTC Partnering w/Rural Power for BB
- Aug 25 FirstNet BB in Rural Areas
- Sept 1 Hawkeye360 RF Usage
- Sept 8 CableLabs HFC PWR for 5 G rural towns
- Sept 22 Mitchell /Noss Community Fiber Projects
  Community BB Initiative Net. & TUCOWS
- Sept 29 Moss Adams Cost Consultants on USF
- Oct 6 Vacant
- Oct 13 Century Link CDNs NFV and Cloud Edge for Rural areas

Buildout Scenarios for Rural Areas

- Build out of New Areas
- Extensions of Existing Plant to Unserved Areas
- Existing Operators

- Business Disruption
  - Revenue Uncertainty

Buildout of New Areas

- Construction Costs
  - Incremental decrease: Largest impact is from expedited permitting
  - Electric Utilities has advantages using power space
  - Required investment in middle mile for last mile construction
  - Leverage joint construction with Highway and other infrastructure projects
- Ongoing Costs
  - Tax incentives
  - Pole Attachment Fees
  - Billing, customer support, maintenance shared by communities
    - Larger scale economies occur with back office cost
- Partnering: operators realize scale economies in const., opex and market
- Revenue
  - Provision of Video: NCTC is key to minimize content licensing
  - Develop pre-commitments and long term contracts
  - Anchor tenants and backhaul of wireless
- Financing
  - Payback Period
  - Municipal bonding (lower interest rates)
  - State, CAF support, grants, etc

Extension of Existing Plant in Unserved Areas

- Construction Costs
  - Incremental costs: Last Mile, drop and CPE
  - Electrical holds advantage for use of power space
  - May be able to obtain aid to construction for individual long drops
  - Work with other infrastructure projects during construction
- Ongoing Costs
  - Few incentives given
  - Fix costs spread across additional users
- Partnering: Not applicable
- Revenues
  - Incremental revenues supports construction
  - Pre-sign up techniques create up front service demand
- Financing
  - State, CAF Support, grants, etc

Areas with Existing Operators Service Below 25/3 Mbps

- How to determine poor service areas
  - Speed test
  - Crowd sourcing of data
  - Mapping
- How to solve issue
  - Assist with upgrade
    - Community help with development of grants
    - Community provide assistance in tax incentives to obtain improved plant
    - Partner with existing provider to construct new facilities
    - Assist with backhaul construction to improve services
    - Community can serve as anchor tenant
  - Assist with overbuild of existing plant
    - Solicit BB providers within region to overbuild existing network
  - Community to construct own facility
    - Construct, own and operate BB facility to serve community
    - Partner with regional provider to use city facilities to build out area

Revenues: Disruption of Services

- Long term revenue streams are needed to support builds in rural areas
- Disruption of revenue streams places hardships on providers
- Disruption include
  - Replacement of the portions of the triple play (Video and Voice)
  - OTT Services offered by others
  - Loss of Support
  - Unable to offer newest services or highly watched content
- Look for new revenue sources
  - Applications within community
  - Metering
  - Public Safety

Service Provider's Structure

- Cooperatives
  - Have a vested interest to serve those customers which are owners
  - Takes on higher economic risk with longer payback terms
- Local Providers
  - Vested interest to serve the communities where they live and associate
  - Takes on higher economic risks with longer payback terms
- Community Owned Networks
  - Looks to fill the gap left by non-performing BB providers
  - Vested interest; grow community, attract business and expand tax base
  - Can take on risk weighted against gains from growth in other areas
- Regional Providers
  - Interested in serving customers as deep as possible and be economical
  - Long-term risk for extensions more difficult with shorter term funding

SWG Continued Work

- Understand support funding and its impact to rural construction of BB infrastructure and on-going operation
  - Universal Service Funding under ACAM and BLS
  - USDA RUS loan and grant programs
  - FCC experimental BB grant program
  - CAF Phases I and II
- Obtain better understanding of FirstNet's buildout
- List organization to assist in the development of partnerships for operation
- Better identifying where BB exists today and how to track
  - Real-estate industry to assist in process on nationwide bases
  - National Agricultural Associations
- Examine alt. business models (muni's involvement)
- Use cases and success stories
- Build simplified matrix to use as playbook to begin process

Broadband Technology Roadmap SWG

Marvin Sirbu

Broadband Technology Roadmap

- Focus on Technologies that will enable economic deployment in rural, underserved areas
- Consider the ability of a technology to evolve to support higher data rates as user demand evolves

BB Deployment TCO Components

Total cost of ownership = Capital Deployment Cost* cost of capital/ Payback years + Total Make Ready (easement. Poles, and facilities) + Cost of service Delivery + ∫ Yearly Operational Expense to maintain& Repair plant + Unusual Natural disaster & Damage repairs

Plant = 20+ year depreciation

Nodes = 10 or less depreciation

- Middle Mile / Internet backhaul
- Power
- Attachments
- Customer Churn Op's activity
- Cable locates
- Trucks & Op's
- …..

- Customer Aq.
- Truck roll & turn Up
- End equipment
- Test equipment
- Testing systems
- …..
- (Drop & demark Cost depending on your Deployment type)

- Middle Mile / Internet backhaul
- Power
- Pole Attachments / easements
- Customer Churn & Service Delivery
- Cable locates
- Trucks & Op's
- Drop repairs
- …..

- Storm damage
- Man made facility damage
- Construction changes

First year Build costs

Yearly Costs

Source: Michael Bugenhagen

Wired Network Approaches

- Primary technologies are FTTH and HFC
  - Telcos are no longer investing in DSL
  - For new builds, many (most?) cable operators using FTTH and DOCSIS Provisioning over EPON (DPoE)
- Either approach is scalable to higher bit rates over time

Cost Reduction Technologies for Fixed Broadband Plant Deployment

- Costs dominated by plant construction
  - Aerial
    - Pole make ready costs 25-50%
    - ADSS fiber installed in the power space reduces make ready costs
      - CableLabs estimates $35-65K/mile for aerial deployment
      - Rural Electric Coops estimate $18K/mile
  - Underground
    - Advances in slit trenching and direct buried fiber

- Reductions of fiber handling and splicing costs
- Long reach optoelectronics

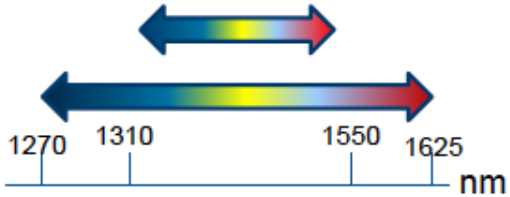
Focus of Innovation for Broadband Access is on solutions to enable cost efficient deployment of Fiber

Connection resilience

Bend-resistant fiber

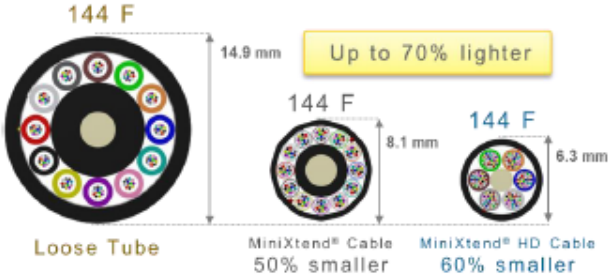
Corning® SMF-28® Ultra Fiber

Transmission agility



Broad spectrum fiber

Network congestion



Installation speed

Cables with Binderless FastAccess® Technology

Pre-connectorized cables

Fast-splice ribbon cables

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Middle Mile and Opex Costs

- Middle Mile capacity requirement strongly affected by location of CDNs
  - Substantial capacity savings if CDN servers located close to customers
- General shift to more distributed CDNs can reduce backhaul costs.
- But, if new middle mile fiber is required, cheap to increase bit rate over it.

- Increasing reliability of field electronics reducing truck rolls

Wireless Technologies

- Many flavors
  - Fixed LTE
  - WiFi
  - WiMax
  - TV White Spaces
  - LTE via balloons
  - …

Wireless Technology Trends

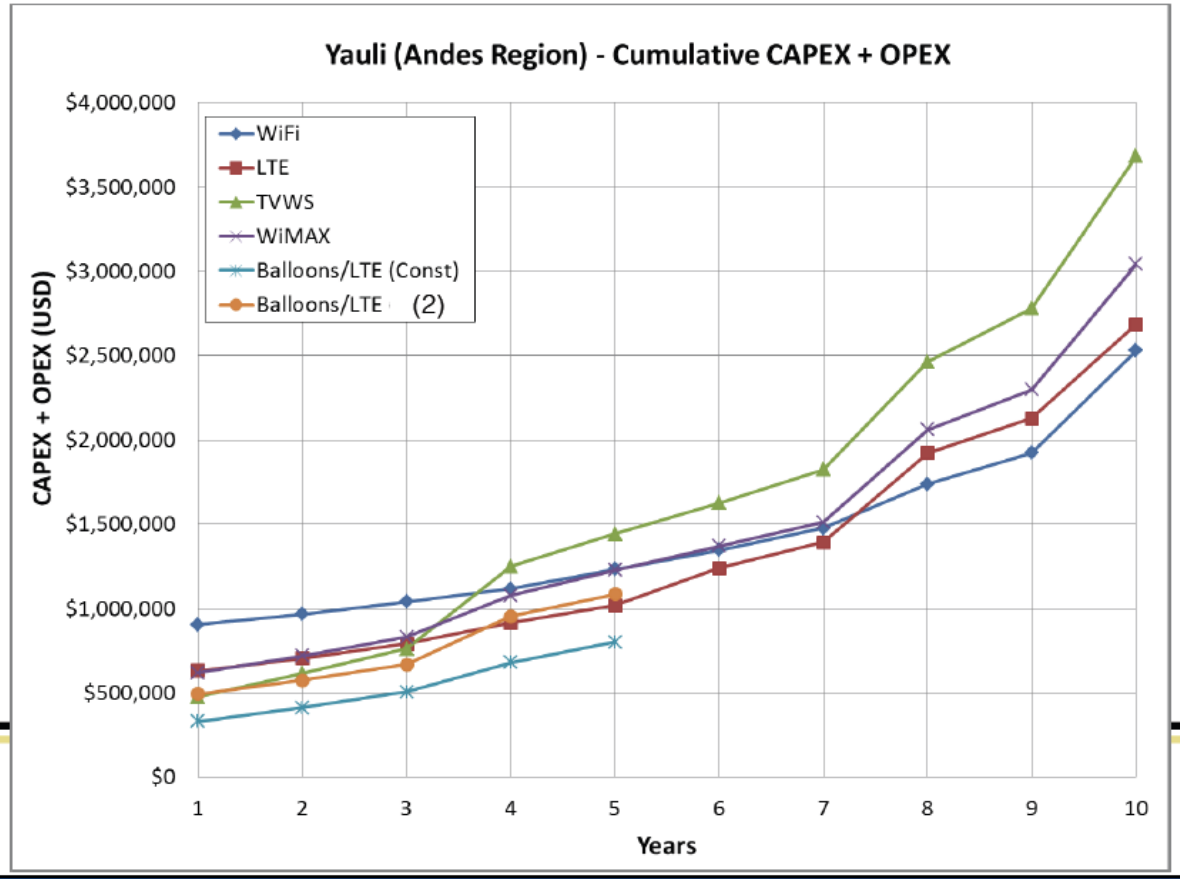
- Beamforming antennas (Massive MIMO)
- Higher SNR
  - ➔greater reach
  - Allows up to 10x the throughput at a single tower*
    - ➔fewer towers needed to provide capacity
  - Greater throughput per tower requires greater backhaul
    - Fiber vs wireless
- Challenge of growing wireless capacity as user needs increase

* *Sprint, Ericsson tout field tests for 2.5 GHz Massive MIMO*

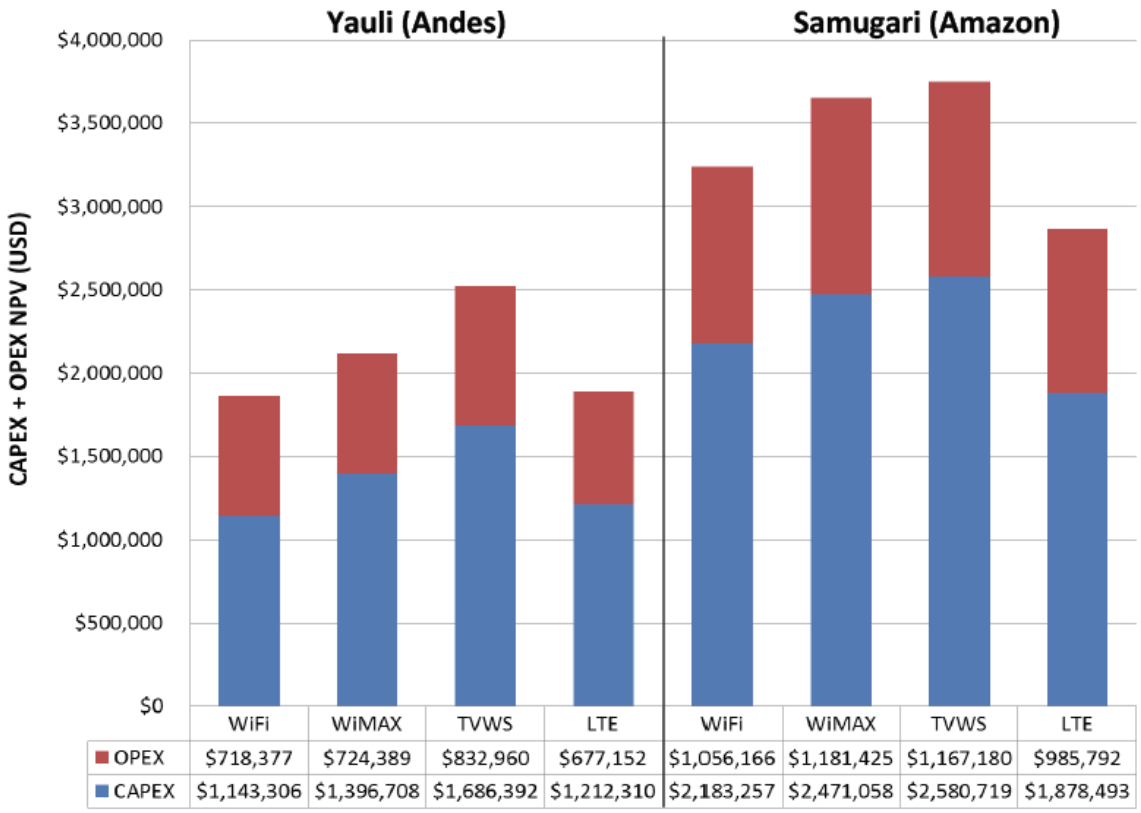
Comparison of Wireless for Rural Areas

- David Reed (U of Colorado) presented to the WG an economic comparison of these technologies for a deployment in rural South America
- Best Roadmap
  - LTE via balloons initially when takeup and desired bitrate is low
  - Migrate to terrestrial fixed LTE as demand increases
- Highly sensitive to traffic, penetration rate and available spectrum assumptions

Estimated Comparative Costs



30-40% Variation in Total Cost By



	WiFi	WiMAX	TVWS	LTE	WiFi	WiMAX	TVWS	LTE
OPEX	$718,377	$724,389	$832,960	$677,152	$1,056,166	$1,181,425	$1,167,180	$985,792
CAPEX	$1,143,306	$1,396,708	$1,686,392	$1,212,310	$2,183,257	$2,471,058	$2,580,719	$1,878,493

Continuing Work of SWG

- Presentations on new LEO approaches
  - Coordinated with Satellite group
- Better understanding of wired vs wireless tradeoffs

Backup Slides

Rural Electric Cooperatives Providing BB

- Jonathan Chambers and Randy Klindt
- 850 Electric Coops serving 42 million people
- Average users are 5 to 10 meters per mile
- BB rural electric FTTH Model
  - Feasible as low as 8 customers / HHs / meters per mile
  - 100 Mbps at 49.95 or 1 Gbps at 79.95 - Average revenue w/triple play $120 to $130/M
  - Placing fiber in power space eliminates make ready costs; NESC separation with same owner has less separation requirements than Communications
  - Estimated incremental aerial fiber construction costs for last mile $18k per mile
  - Electric Coop builds fiber and lease all fiber (non smart Grid) to Subsidiary to use for BB
  - Fiber lease and pole rental rolled into one agreement
  - Loan on project useful life (18 to 22 years)
  - Video through NCTC
  - Receives no USF would require support (USF, Grant or other) below 5 customers per mile
- Recommendation or take away
  - Receives large benefit from being in power space reducing or eliminating Make Ready Costs other providers are required to work around
  - Electric and BB entities have shared sheath costs reducing overall build costs for BB
  - Has a relationship with customer for electric service transfers over to BB service

Cable Network Build Considerations

- Rob Alderfer and Ron Reuss, CableLabs
- Construction cost and other items derived from short survey of CATV Companies
  - Aerial Construction cost from 30K to 65K per mile
  - Pole Attachments and Make Ready biggest expense up to 50 percent
  - Buried Construction costs from 50K to 100K+ for underground
  - Actual costs and revenues vary across US
- Requires at least 20 HH pass per mile to be economical (assuming aerial plant, low costs & utility fees, normal service revenue and economic considerations)
  - Higher pole attachment / make-ready / franchise fees or other local requirements will push minimum required density much higher
  - States / localities / customers can assist with costs for organically uneconomic areas
  - Reflects today's technologies and market conditions; some business lines may grow (e.g., IoT) and others may shrink (e.g., video and voice) – these factors not reflected in current economics

Continued Cable Network Build Considerations

- 'Core' construction costs are largely fixed (e.g., design, build) as a function of local circumstances, but local utility and regulatory considerations can add significant inorganic cost volatility that affect area builds
  - Pole attachment, Make Ready
  - Delays placed on aerial construction may make underground the only option
  - Localities pressing for underground reduces areas that can be economically reached
  - Permitting and other related requirements for Fed/State or Local increase cost and delay project implementation
- DOCSIS provides a migration path for higher speed without having to convert to complete FTTH network
  - Step upgrades as needed, significantly extends coax network's life allowing customer's growth in speed, throughput and reduced latency
  - Video channels can be reduced by changing compression schemes to gain BB capacity
  - Drive fiber deeper into the network and reduce the nodes to zero
- HFC has capacity and the power pass through allowing for future powering of 5G (CableLabs to validate)
- http://www.cablelabs.com/cable-broadband-technology-gigabit-evolution/

Continued Cable Network Build Considerations

- Cable Network Take Away
  - Cost for aerial construction are relative equivalent to electric's FTTH when removing the cost for Make Ready
  - Cable providers look to expand BB service outside communities where profitable along rural routes with customer assistance in reaching sign up goals
  - Larger providers relying on Wall Street Capital have a loan or payout of six (6) years

Telco and Power Partnering for BB

- Kevin Larson & Joe Buttweiler Consolidated Telecommunications
- Arrowhead Electric received ARRA Grant services 551 miles
- Arrowhead Electric built FTTH and CTC operates system
- Used GPON, 70 % aerial with 4000 accounts (includes summer) with no video service
- Both companies are Cooperatives with same purpose
- Partnering saves on
  - Internet connection cost
  - Justifies CND
  - Save on Operation costs for back office, support staff, etc

Continued Telco Power Partnering for BB

- Take away
  - Elements for Developing a Successful Partnership
    - Similar Mission statement
    - Champions on both sides of the table
    - Time to build trust
  - Building one successful partnership allows for the building of others (Consolidated has eight (8) others partnerships in place or working on)
  - Rural Areas with low densities require either a 70% grant or 30% USF operations costs to create a stable entity for rural operations

FirstNet

- Jeff Bratcher CTO FirstNet
- AT&T obtained the contract and will use FirstNet's 20 MHz in conjunction with existing frequency bands
- AT&T will prioritize FirstNet Users within opt in states with priority status on all AT&T networks
- FirstNet has rural buildout requirements - any buildouts made by AT&T will add BB coverage to rural areas

- Take Away
  - SWG looking to receive feed back from FirstNet on rural square miles that AT&T will add to its existing network that will enhance rural BB service

Hawkeye 360

- Rob Miller and Rob Rainhart
- New Satellites to perform RF Detection
- Launch after first of year proof of concept by aircraft
- Creates a heat map of certain RF frequencies
  - Rural areas greatest benefactor
  - Assists with interference or rogue transmitters
  - Determine where frequencies are not being used
- Take Away
  - Works in rural areas only
  - Interest to FCC Enforcement Bureau (locate unauthorized users)
  - Interest to FCC in determining if spectrum is being used or warehoused
  - Wireless providers can use to help eliminate self interference
  - Measure noise floor of RF levels over a period of time

Massachusetts Broadband Initiative

- Peter Larkin and David Charbonneau
- MA received an NTIA Grant for middle mile 1,200 miles with 900 anchor institutions
  - Contracts out all network operations
  - Leases dark fiber down to individual circuits
- MA through MBI set aside $50 M to build last mile to 24,000 HH with in 53 unserved communities
  - Communities must provide (2/3) of funding
  - MBI requires 93% coverage to HHs
- Developed playbook for towns to obtain HED grants
  - Broadband 101
  - Cost estimates, bonding methodology
  - Technology (FTTH GPON, Coax, or Fix wireless)
  - Requirements for sustainable operations

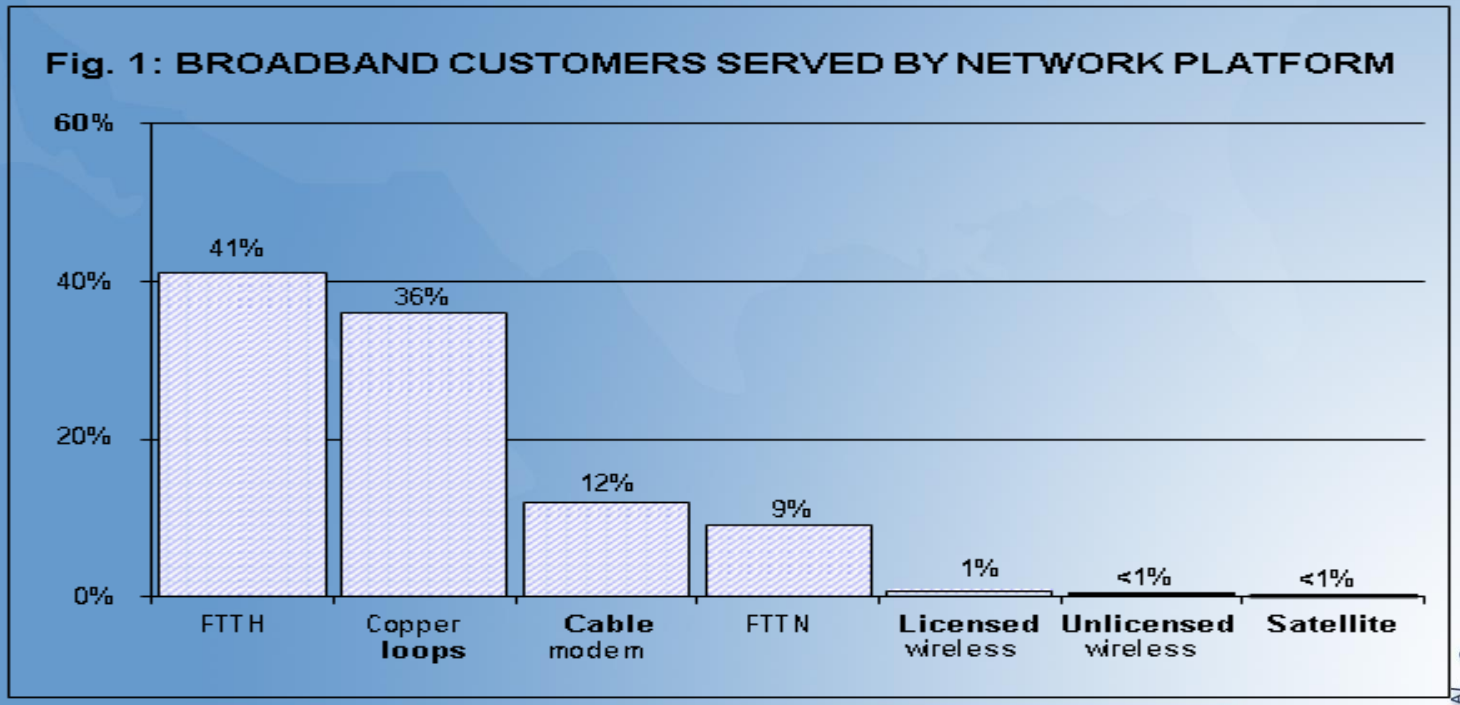
Continued MA Broadband Initiative

- Limited Cellular Coverage
  - FirstNet: AT&T to build 10 sites in area helps to provide BB service
- Issues for Communities
  - Large Tier LEC not interested in wireline BB service only wireless service
  - How to meet build expectations - Using a third party to manage projects, design FTTH, coordinate make ready
  - Timing for Make Ready
    - Taxing on Power Company Resources delays projects
- Take Away
  - Opportunity for communities in other states to learn about buildout of networks using MBI's playbook if made available
  - Grants or support is required to build and operate in rural towns
  - Grant requirements eliminate communities desire to want to complete projects in their own way

NTCA Broadband Survey 2016

- 172 members responded (29% total membership)
- 31 % surveyed has FTTH to all customers
- All surveyed offers BB service to a portion of its customer base
- 68 miles average distance to Internet Connection Point

https://www.ntca.org/images/stories/Documents/Advocacy/SurveyReports/2016ntcabroadbandsurveyreport.pdf



Recommendations or Actionable Items

- Understand micro buildout models for adjacent areas to existing plant
  - Calculations based on consumer take rates, ease of construct, permitting and other associated cost (poles attachments)
  - Use of crowd sourcing to obtain sufficient public interest to obtain economic take rates
  - Determine amount of grant or support needed to serve areas

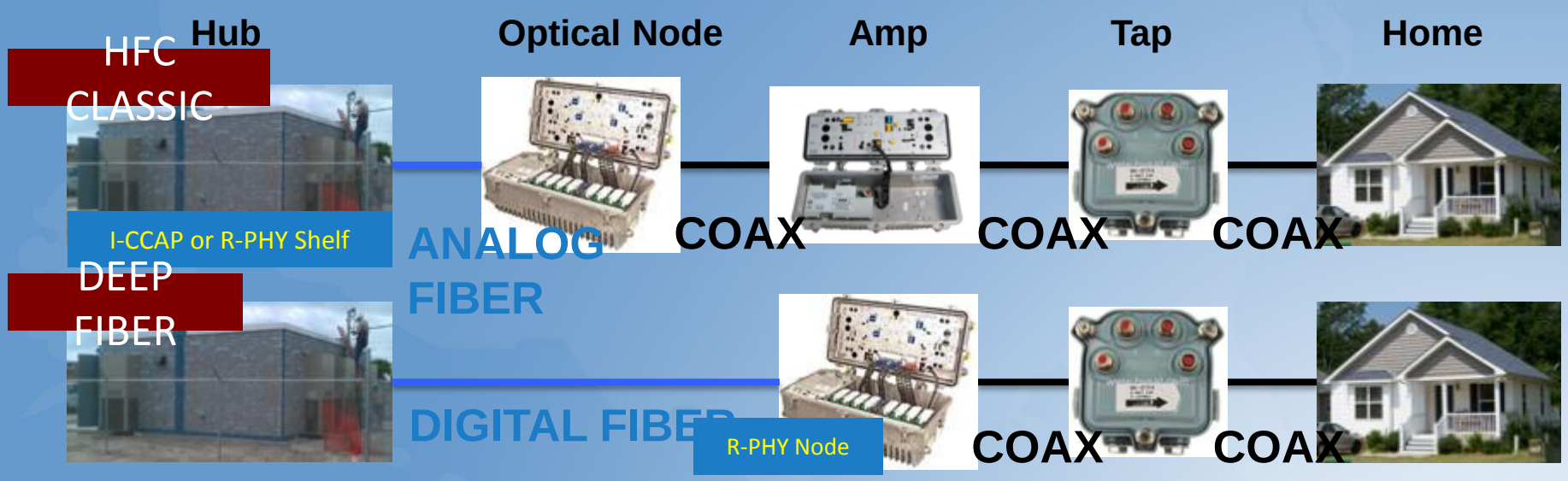
Continued Recommendation or Actionable Items

- Corporate Structure makes difference in buildout in rural areas
  - Larger companies use capital first for higher density areas. Smaller companies use capital in same manner but start with lower density rural areas.
  - Companies with RUS loans have longer payout periods (18 years or longer), companies without government assistance loans use 6 years for payout
  - Create avenues for rural providers to receive long-term funding specific areas
- Rural Partnerships
  - Assist in the development of partnership workshops for power, municipalities or other new infrastructure providers to gain advantage as startup by partnering with non competitive service providers
- Understand MBI model and consider for duplication in other areas

Cable Broadband Trends

- Cable speeds continue to evolve without change to outside plant
  - DOCSIS 3.1 increases bits/Hz
  - More cable spectrum being allocated to broadband vs video
- Cable Plant
  - No major cost reducing technologies visible
  - Urban plant upgrades to use more fiber, shorten coax, eliminate amplifiers “Node +0”
    - More spectrum
    - Allows full duplex
  - New plant will use more fiber and less coax
    - FTTH with DOCSIS Provisioning over EPON (DPoE)

Phase 2: Deep Fiber



500 HHP reduced to 50 HHP

- 10x to 20x the node count.
- D3.1, 1.2 GHz, 6 OFDM, 10 Gbps

Deep fiber requires Remote PHY

- RPD can segment to 4 SG. 15 HHP
- RPD increases SNR, ~+1 bps/Hz

Source: John Chapman, Cisco

Coming Next with Deep Fiber

Massive Scale

- ≥10x nodes.
- 4x4 node segmentation

Digital Optics

- The new network is Ethernet over fiber

- Full Spectrum D3.1 with FDX
- Remote PHY for scaling, higher bits per Hz

Source: John Chapman, Cisco

Thank you!

Recommendations for Removing Obsolete or Unnecessary Technical Rules

Chairs: Russ Gyurek, Cisco
John Barnhill, Genband

FCC Liaisons: Walter Johnston, Matthew Pearl, Jeffrey Neumann, Zachary Ross, John Kiefer

Date: September 19, 2017

2017 Working Group Team Members

- Mark Bayliss, Visualink
- Marty Cooper, Array Comm
- Brian Daly, AT&T
- John Dobbins, Windstream
- Jeffrey Foerster, Intel
- Dick Green, Liberty Global
- Lisa Guess, Juniper
- Dale Hatfield, Silicon Flatirons
- Stephen Hayes, Ericsson
- Greg Lapin, ARRL
- Tim Kagele, Comcast
- Brian Markwalter, CTA
- Tom McGarry, Neustar
- Lynn Merrill, NTCA
- Jack Nasielski, Qualcomm
- Mike Nawrocki, ATIS
- Kevin Sparks, Nokia
- David Tennenhouse, VMware
- David Young, Verizon

Simplified Working Group Mission

- Goal: Reduce the "friction" of working with the FCC
  - Reduce the regulatory burden and identify defects in current processes
  - Seek recommendations from multi-stakeholder groups
  - Seek FCC staff input on areas to improve process and leverage industry input
  - Identify list of relevant standards bodies and multi-stakeholder groups
  - Balance industry impacts from new or changed rule implementations
  - Develop realistic timelines that recognize impacts and costs to small, medium, and large industry segments as new rules or rules changes are adopted

Fundamental Question for Telecommunications Industry

- How should the commission deal with the sunset of legacy technologies (Pay Phones, VRS/ TRS, Alarms, etc).
  - Do you have to wait until the final user drops the service before it can be sunset?
  - Who turns off the lights?
- Should regulations have a sunset clause? (TTL)
  - There is inherent obsolescence in any rule
  - Create categories with built in TTL (eg. 7yrs, 14yrs, 20yrs)
- What principles should guide decision making through these transitions?

"Enduring Values" of FCC Technical Transitions

Technology Transitions, GN Docket No. 13-5

- **Public safety**
  - Public safety communications must be available no matter the technology
- **Universal access**
  - All Americans must have access to affordable communications services
- **Competition**
  - Competition in the marketplace provides choice for consumers and businesses
- **Consumer protection**

\+ **Protecting the commons (shared resources)**
  - spectrum usage, utilization, sharing

How do we achieve these principles while promoting innovation and growth?

Feedback Summary from Various Organizations

- Process for working with 3rd party organizations
  - Guidelines
  - Examples
- Reporting Requirements
- Technology focus in FCC
- Certification burdens
  - Testing examples
  - Current state of certification and testing
  - Proposing a Grading system for greater self testing

Work Group Activities Through 2Q 2017

- Reviewed current FCC actions seeking to reduce and simplify
  - Released Technical Inquiry (ET Docket 17-215) on reforming Technical Regulation
- Continued stakeholder engagements
  - Industry Associations
  - Standards Bodies
  - Equipment Manufacturers
  - Public Interest
  - Commission Staff
- Next Gen Policy
  - Create a framework proposal of how to leverage 3rd parties in policy creation: Standards, Panels, Advocacy Groups, etc,

Industry Engagements: Stakeholder Organizations

Associations and Standards Organizations

Additional Engagements

- ACA
- WTA
- Regulatory Group Radio TAG
- NARUC
- WISPA
- Public Knowledge
- IEEE

Key Themes From Industry Presentations

- Reporting Burdens on Small Companies
  - NTCA, SCC
- Certification requirements for devices
  - FCC, Intel, CTA, Cisco, CTIA
- Standards and 3rd party engagements
  - TIA, ATIS, CTIA

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Tech Advisors to Assist FCC in Faster Approvals for New Devices

Wiley Rein LLP

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TAC Seeks Comment on Potential Reform of FCC Technical Rules

August 31, 2017

TVTechnology

NEWS | EXPERTISE | OPINIONS | EQUIPMENT | SHOW NEWS | RESOURCES

FCC Investigating Possible Reforms to Technical Regulations

Technological Advisory Council seeks comments by Oct. 30

September 1, 2017

Technical Inquiry,

REFORMING TECHNICAL REGULATIONS

PUBLIC NOTICE

POSTED AUGUST 30, 2017

http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0901/DA-17-800A1.pdf

PUBLIC NOTICE

Federal Communications Commission
445 12th St., S.W.
Washington, D.C. 20554

News Media Information 202 / 418-0500
Internet: https://www.fcc.gov
TTY: 1-888-835-5322

DA 17-800
Released August 30, 2017

OFFICE OF ENGINEERING AND TECHNOLOGY ANNOUNCES TECHNOLOGICAL ADVISORY COUNCIL (TAC) TECHNICAL INQUIRY INTO REFORMING TECHNICAL REGULATIONS

ET Docket No. 17-215

Comment Deadline: October 30, 2017

The FCC's Technological Advisory Council (TAC), an advisory group to the FCC operating under the Federal Advisory Committee Act, is investigating FCC technical regulations and the processes by which they are developed to determine if increased efficiency and decreased regulatory burden can be realized while still maintaining the purposes and responsibilities of the FCC. In this public notice, the Office of Engineering and Technology (OET) announces the TAC's public inquiry, seeking comments and answers to the questions below, about technical regulations and the regulatory process for adopting and updating them.

TAC Technical Inquiry- Overview

To more effectively ensure that its rules keep pace with the rapidly changing technology in communications, the FCC has asked its Technological Advisory Council to help identify FCC technical rules that are obsolete or may be ripe for change in light of current communications technologies. The TAC is made up of a group of technological experts in various communications sectors who advise the FCC in technical matters. The TAC is issuing this Technical Inquiry to gather feedback from users and purveyors of communications technology who are affected by such technical rules.

Technical Inquiry – August 30 2017, Reponses Due October 30
The TAC is looking for responses related to:

1. Regulations that should be removed because they have become outdated, inhibit innovation or would be better handled by the involved parties.
   - What would replace such regulations if they are removed?
2. Regulations that should be retained because they promote competition, protect incumbents from interference, regulate unlicensed frequencies, are necessary to comply with international agreements, or support the purpose of the FCC.
3. Regulations that should be modified because technical reporting requirements are too burdensome, data contained in the reports are no longer used, or existing regulation does not fully apply to new technology.
   - If the technical requirements are too burdensome, should the FCC automate existing reporting or leverage other data or reporting from third parties or organizations?

Technical Inquiry – August 30 2017, Reponses Due October 30
The TAC is looking for responses related to:

4. Processes to resolve competing interests:
   - Is there a better way to mediate conflicts between different parties, perhaps that is quicker and does not require as many resources from interested parties?
   - Is there potential for a 'body' other than the FCC to host this role and what are the legal impediments, if any, to delegating certain conflict mediations to other parties?
   - How would a new process work?
5. Regulations that can be combined:
   - What general principles that apply to all forms of a type of communication?

Technical Inquiry – August 30 2017, Reponses Due October 30

6. How should the FCC approach coordination between regulations and standards bodies or industry consortia?
   - Should regulations be written by leveraging industry standards?
   - How should the regulatory process (which must be available to all parts of our society) be tied to the standards update process?
   - How would the requirement for public availability of documents related to federal rules be met when referenced standards are copyrighted?
   - How can regular changes to standards upon which regulations are based be propagated to the rule making processes that are required when regulations are changed?

Technical Inquiry – August 30 2017, Reponses Due October 30

7. How can FCC work processes best be improved?
   - Increasing use is made of external multi-stakeholder groups to develop complex technical requirements, systems, and procedures necessary to implement Commission service rules.
   - How can the Commission leverage these efforts to accelerate the introduction of new technologies and services?

FCC TAC

RECOMMENDATIONS- PRELIMINARY

Recommendation 1: Industry, 3rd Party Engagement

- FCC Guidelines on 3rd party engagement:
  - Clearly defined need, expectation and goals
    - Set timeline:
    - May have legislated constraints
  - The process must be open
    - Fair Industry representation- seek and engage relevant participants/ orgs
    - Work activities need to be available to all known and future parties
  - Commit from FCC for staff support
    - Effectively use Commission to drive towards consensus
    - Must include adequate budget, travel to fully participate
  - Determine if there is an existing organization that fits the technology focus

Rec 1: Examples of Effective Collaboration

- Winforum – Wi-Fi vs LAA
  - Parties involved resolved- FCC drove collaboration
- Cellular Alerting Standard – 9 month interval
  - ATIS, FEMA, DHS (adapted interface as its national standard)
- Digital Television Transition
  - Congressional mandate with funding
- RoboCalling/CallID initiative
  - ATIS/SIP Forum, FCC, FTC, IETF, Consumer Reports, etc

EXAMPLE of Successful SDO/ Government Action:

Focus Changes to Robocalling/ Spoofing

Interconnection

- **2012** — Shockey (SIP Forum) Seeks to build "Coalition of the Willing"
- **Dec** — SIP NNI -Task Force Created by ATIS & SIP Forum - Initial Focus around VoIP Interconnection
- **Jan** — SIP NNI - Task Force Announced
- **Jul** — NNI Document and Routing Document Released
- **Oct** — ATIS exparte On Work program
- **Mar** — ATIS Provides Work program Update to FCC
- **Apr** — ATIS Paper on Robocall/ Spoofing Mitigation
- **Feb** — ATIS/ SIP Forum Release SHAKEN Spec

Robocalling/ Spoofing

2012

- **Oct** — FTC Workshop on Robocalling and Caller ID Spoofing

2013

- **Mar** — IETF Call to action
- **May** — IETF Context Meeting on Approaches to CLID Spoofing

IETF STIR Charter *Approved Aug 2013*

2014

2015

- **Nov** — FCC Workshop on Robocalling & Caller ID Spoofing

2016

- **Jul** — FCC Announces Industry-Led Robocall Strike Force
- **Oct** — Strike Force Read-out

2017

- **Mar** — FCC Issues NPRM & NOI
- **Jul** — FCC Issues 2nd NOI

Recommendation 2

- FCC Technical focus and engagement
  - FCC Staffing commit to support technical needs
  - Standards engagement: (ex. 3GPP, IETF, IEEE, ATIS)
    - Standards liaisons for key technical focus on current matters
    - Direct commission involvement in standards bodies relevant to technical direction on policy drivers
    - When the technology moves, the Commission needs to stay on top of it
  - Consortia engagement: TIA, Incompas, USTelecom, CTIA, 5G Americas, GSMA, etc
    - Develop strong consortia liaisons to leverage industry expertise and experience
    - Continual process, involvement on consortia turf
  - Data gathering: participate in reporting
    - Filing times and related burden
    - Understand procedure from industry execution
    - Data gathering: participate in audit process- on site visits

Recommendation 1 and 2

- FCC making public key technology areas of focus:
  - 5-10 year plan
  - Flexibility needs to be built into the plan

- Impact on Recommendation #1
  - Focus areas can guide the creation of multi-stakeholder organizations
  - FCC staffing and engagement should fit this view
- Impact on Recommendation #2
  - this will provide direction for what standards, consortia to engage
  - External parties can prioritize their involvement with the FCC

Certification Sub Working Group (SWG)

- Intel- Jeff Foerster, John Roman, Robert Paxman
- Cisco- Russ & David Case
- Juniper- Lisa Guess
- Qualcomm- Jack
- ALU/Nokia: Kevin Sparks
- CTA: Brian Markwalter
- Stephen Hayes: Ericsson
- Adam Drobot
- John B.

Rashmi provided team a basis for recommendation(s)

Recommendation 3 – Key Areas of Exploration

- Move to more self-certification
- Explore a “grading” system
- Create an NOI?
- Workshop with multi-stakeholders engagement
- Harmonization of international standards
- Impact of IoT in terms of grants and certification needs
- Update Certification program to include SDoC for some radios
  - Times have changed, but the rules and process have not (much)
- 2.803 and 2.805 issues on marketing devices- not an FCC function
- Output: propose a phased program for change

Recommendation Direction for Removing Certification Barriers

- Review and update Part 2.803 and 2.805 Marketing Rules to streamline process to current needs of industry.
- Review and update Part 15.31 (H) for composite systems as the rules are outdated.
- Work to complete NOI 13-84 on RFE, and in interim update power density averaging area to 20 cm^2 >6GHz
- Work to complete open issues in NPRM 15-170 including Permissive Changes, Module Approval , and other open issues
- Set up workgroup to look at issues restricting the expansion of SDoC for low power wireless devices.
- Consider adoption of Internationally developed standards such as EMC and RFE testing standards in general
- Update Experimental license Web page to make it more user friendly .
- Allow Experimental Licensees under Program. Experimental license to file confidential reports to keep research confidential

Next Steps

- Firm up external engagement process proposal
- Integrate comments from Public Notice into recommendations
- Certification SWG
  - Seek wider input from industry
  - Analyze the potential impact of IoT (massive device growth) on certification process
  - Consider formation of a multi-stakeholder group to come up with a detailed proposal on how to update the current process
- Finish key industry group feedback on areas to reduce regulatory burdens

THANK YOU!

Mobile Device Theft Prevention WG
Report to the FCC TAC

September 19, 2017

2017 MDTP WG

- The MDTP Work Group has focused on analyzing the theft of mobile devices in the United States; working with industry and law enforcement to increase the security of mobile devices, facilitate coordination of theft related data between industry, law enforcement and the consumer, and track trends in the theft of mobile devices.
- Prior work has led to alignment of theft prevention features among smartphone manufacturers and initial development of an industry information portal to coordinate theft data among stakeholders.
- The work group is tasked in 2017 to build on this early work. It will focus on:
  - Working with law enforcement in assessing the benefits of the information portal to relevant stakeholders
  - Make recommendations for the continuing involvement of law enforcement in industry theft prevention efforts, and analyzing the ongoing effectiveness of past efforts in combatting device theft.
- Study future mobile device threats in an evolving ecosystem and make further recommendations on actions to combat theft.
- Develop baseline statistics on device theft based on data from directed consumer surveys and law enforcement data to help track long term progress and identify theft scenarios.

WG Participants

- Co-Chairs:
  - Brian Daly, AT&T
  - Rob Kubik, Samsung
- FCC Liaisons:
  - Walter Johnston
  - Charles Mathias
  - Elizabeth Mumaw
  - Theo Marcus
  - Michele Wu-Bailey
- Dennis Roberson, FCC TAC Chair
- Document Editor: DeWayne Sennett, AT&T

- Jason Novak, Apple
- Timothy Powderly, Apple
- Ogechi Anyatonwu, Asurion
- Jay Barbour, Blackberry
- Brad Blanken, CCA
- John Marinho, CTIA
- Jamie Hastings, CTIA
- Mike Carson, ebay
- Mike Rou, eBay
- David Mersten, ecoATM
- Max Santiago, ecoATM
- Christian Schorle, FBI
- James Moran, GSMA
- Craig Boswell, Hobi
- Chris Drake, iconectiv
- Chip Stevens, iconectiv
- Sang Kim, LG

- Gunnar Halley, Microsoft
- Joseph Hansen, Motorola
- Joe Heaps, National Institute of Justice
- Thomas Fitzgerald, New York City Police Department
- Jack Mcartney, Recipero
- Les Gray, Recipero
- David Dillard, Recipero
- Mark Harman, Recipero
- Maxwell Szabo, City and County of San Francisco
- Gary Jones, T-Mobile
- Samir Vaidya, Verizon Wireless
- Samuel Messinger, U.S. Secret Service

Thank You!

Focus Areas for 2017

- Investigate possible methods to obtain regular data updates:
  - Law enforcement statistics refresh
    - Select sample list of cities to refresh stolen phone statistics obtained in 2014 to see trends post implementation of on-device mobile theft solutions
    - Develop procedure to obtain regular updates of the data
  - Getting more operators engaged both domestically and internationally
  - Analysis of 5G and what 5G may offer in terms of additional solutions
  - Enhancements to the Stolen Phone Checker
- IMEI Security
  - Reliability and issues of compromising the IMEI
  - Where is the industry on this?
- Where are stolen devices ending up?

Smartphone theft statistics

- Smartphone robberies (taking smartphones by force, threat of force or by putting the victim in fear) from one major U.S. city:
  - 2013 – 2,368
  - 2014 – 1,728
  - 2015 – 1,528
  - 2016 – 1,191
- That's a promising 50% decline….
  - There are many efforts underway, outreach, word of mouth, lists, etc. that may be contributing to this decline
  - We do not know which program(s) are working/not working towards this decline
- However, results and trends cannot be extrapolated from a single data source
  - **Statistics from additional locations are needed before any type of statistical analysis can be performed and before any conclusions can be drawn**

GSM Association Initiatives

Provision of statistics about the trafficking of stolen devices to overseas markets

- GSMA has no visibility of what devices connect to individual mobile networks so we cannot provide any insights into the migration of devices, stolen or otherwise, from one network to another
- One option is to ask network operators that are connected to the IMEI Database to report on instances where they notice connection attempts by device IMEIs that are downloaded from the database
- Second option is to extract data from GSMA's Device Check service which could indicate instances where an IMEI blacklisted in one jurisdiction is queried in another, suggesting the device has moved

Connecting more network operators in other countries to the IMEI Database

- Fundamental desire of GSMA and getting operators connected to the IMEI Database is also a very difficult undertaking
- GSMA has decided to focus on, and prioritize, the countries in which regulatory attention to be particularly high at present
- Efforts are best focused in Africa in the near future as many regulators there are interested in taking action and we have real prospects of being successful
- But there is still much work to be done in the US where there are just five operators out of approximately 50 GSMA member networks connected

IMEI security hardening

- Last year GSMA reviewed and updated the IMEI security technical design principles and the IMEI security weakness reporting and correction process.
- GSMA has not received a single report of a compromised IMEI implementation from the US - how much of an issue this really is in the US?
- First activity is to review and increase device and chipset manufacturer participation in the IMEI security initiatives to reflect the current device market
- Second activity is to restore an outsourced service to monitor and report device models that have had their IMEI implementations compromised

GSMA International Engagement

- GSMA's international engagement to date has highlighted an area in which the FCC may be able to help
- Relates to a tendency in some regions for local regulators to develop their own local systems to share stolen device data and to ignore the global solutions that have been developed and available to address the same need
- The failure to align solutions with those already in place globally results in undesirable fragmentation and unnecessary duplication of effort and costs for all stakeholders
- Possible recommendation in development – identify how the FCC can help and what options and avenues are available to complement GSMA's lobbying efforts so that we can better understand how we may be able to work together to help other nation states

CTIA Harris Poll Survey 2017

- Mobile Users & Cybersecurity: Attitudes and Behaviors in an Increasingly Digital World
  - In 2012, Harris Poll conducted a public poll for CTIA on cell phone users' perceptions and behaviors surrounding cybersecurity.
  - Since then, follow up waves were conducted in 2015, 2016 and now 2017.
  - These surveys examine mobile device users' attitudes towards mobile device technologies including security features, mobile financial transactions and mobile -to –vehicle communications

Trended Summary of Behaviors – Improvement over time

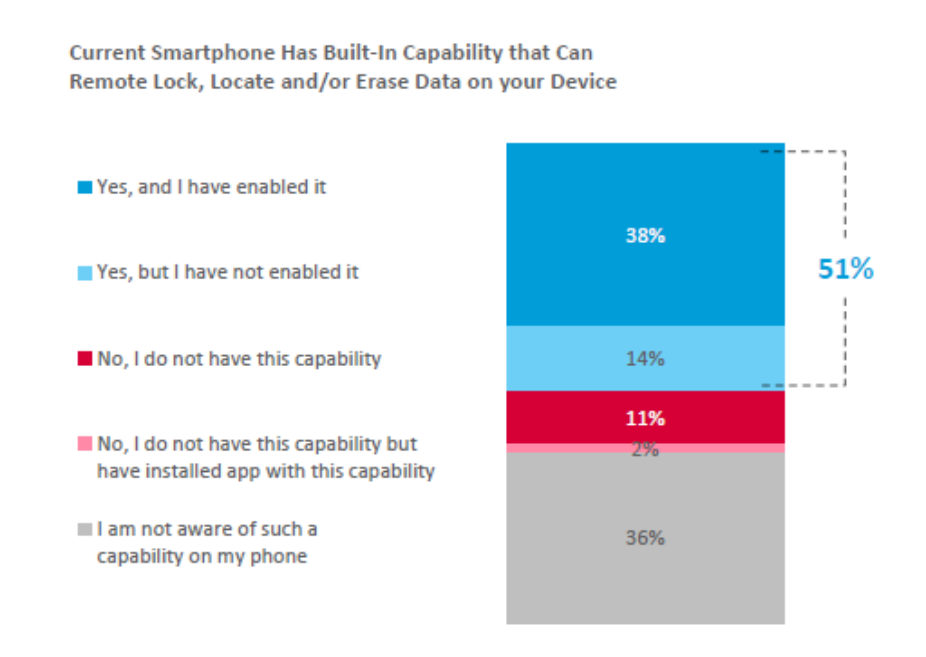
	SMARTPHONE			TABLET		
	2015	2016	2017	2015	2016	2017
Uses PIN/Password	61%	69% ↑	77% ↑↑	58%	66% ↑	70% ↑
Updates Software Every/ Almost Every Time	70%	73%	77% ↑	70%	69%	74%
Has Anti-Virus Software (% Pre-installed)	40% (14%)	51% ↑ (21% ↑)	49% ↑ (17%)	45% (14%)	50% (19%)	53% ↑ (19%)
Has Remote Lock Software	NA	51%	51%	NA	NA	NA

↑ = significant difference since 2016 at the 95% CL

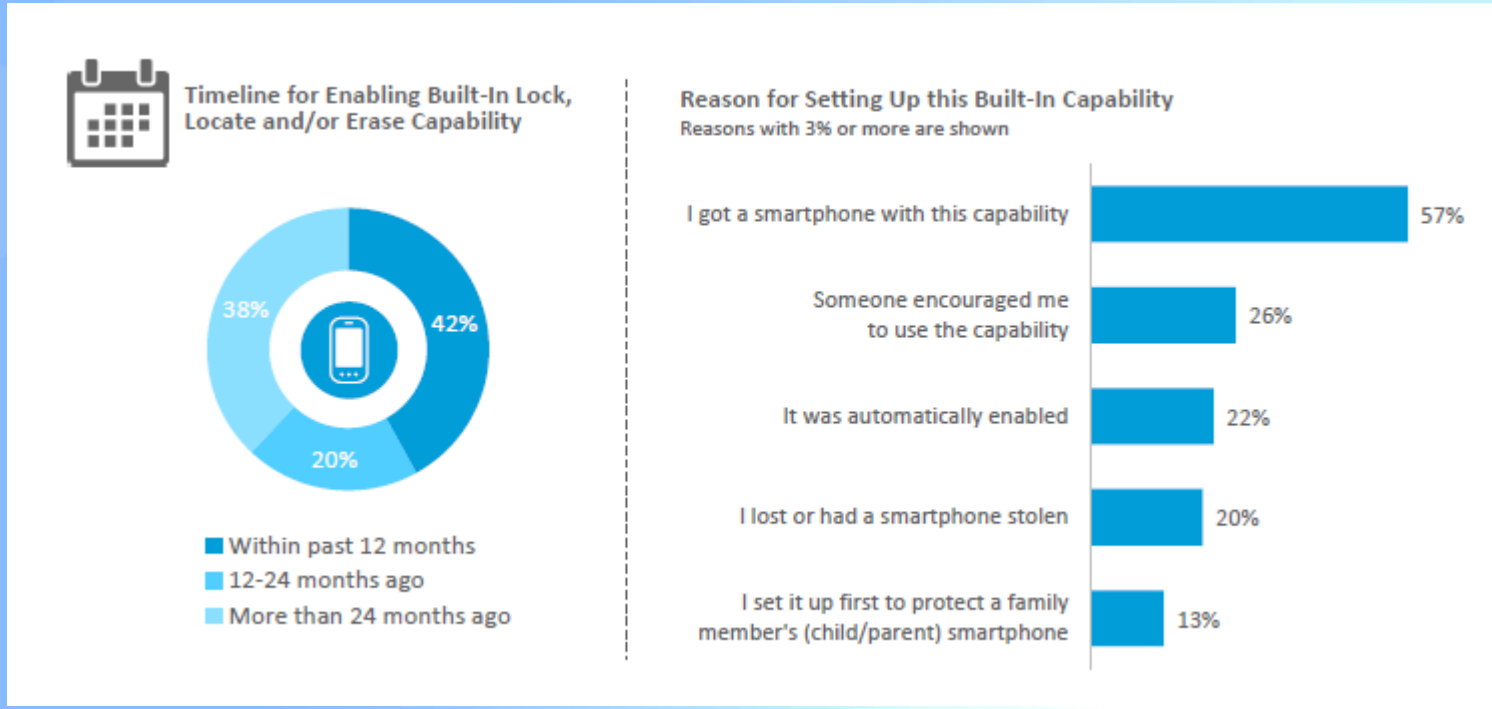
↑ = significant difference since 2015 at the 95% CL

Half of Smartphone Users Have Remote Lock/Locate

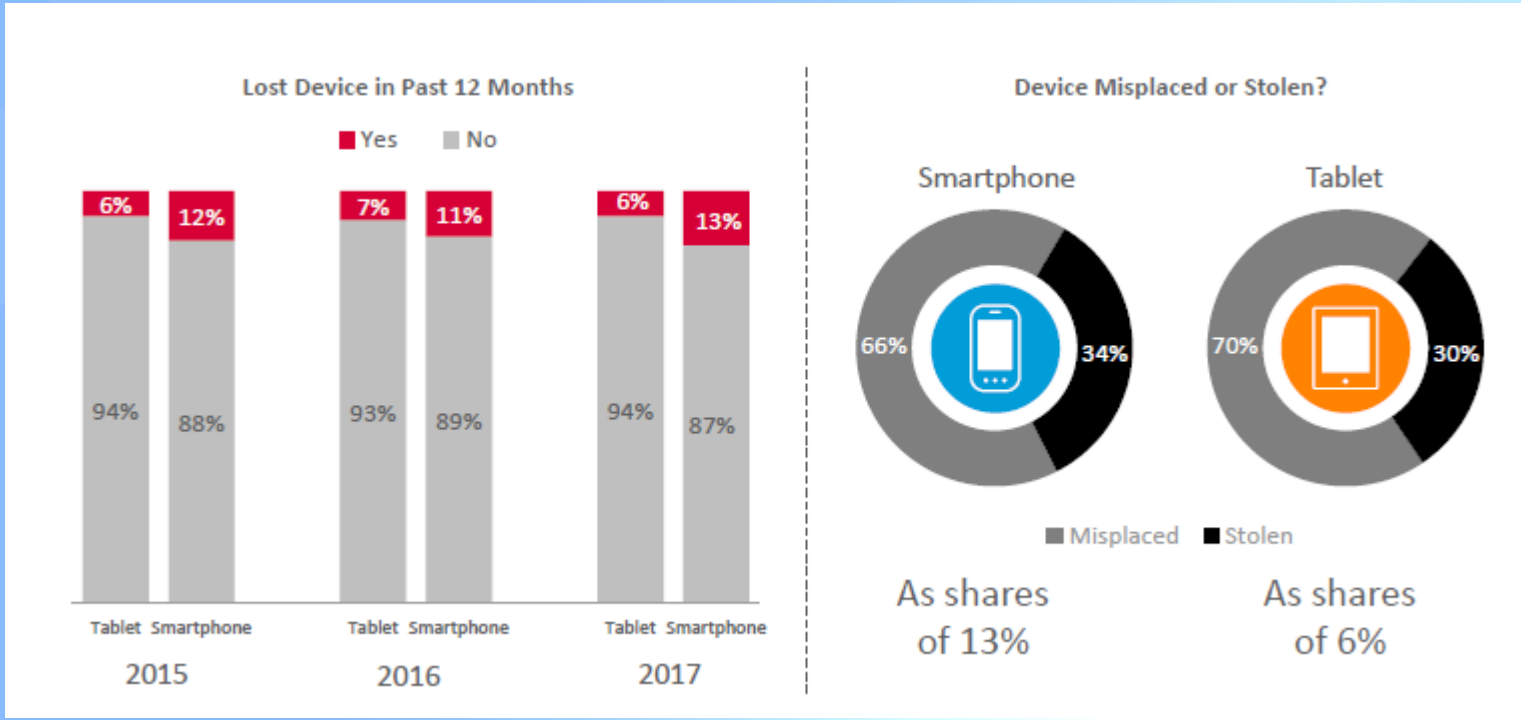
- Over 1/3 of owners did not know if they have this feature
- 14% had the feature but didn't enable it



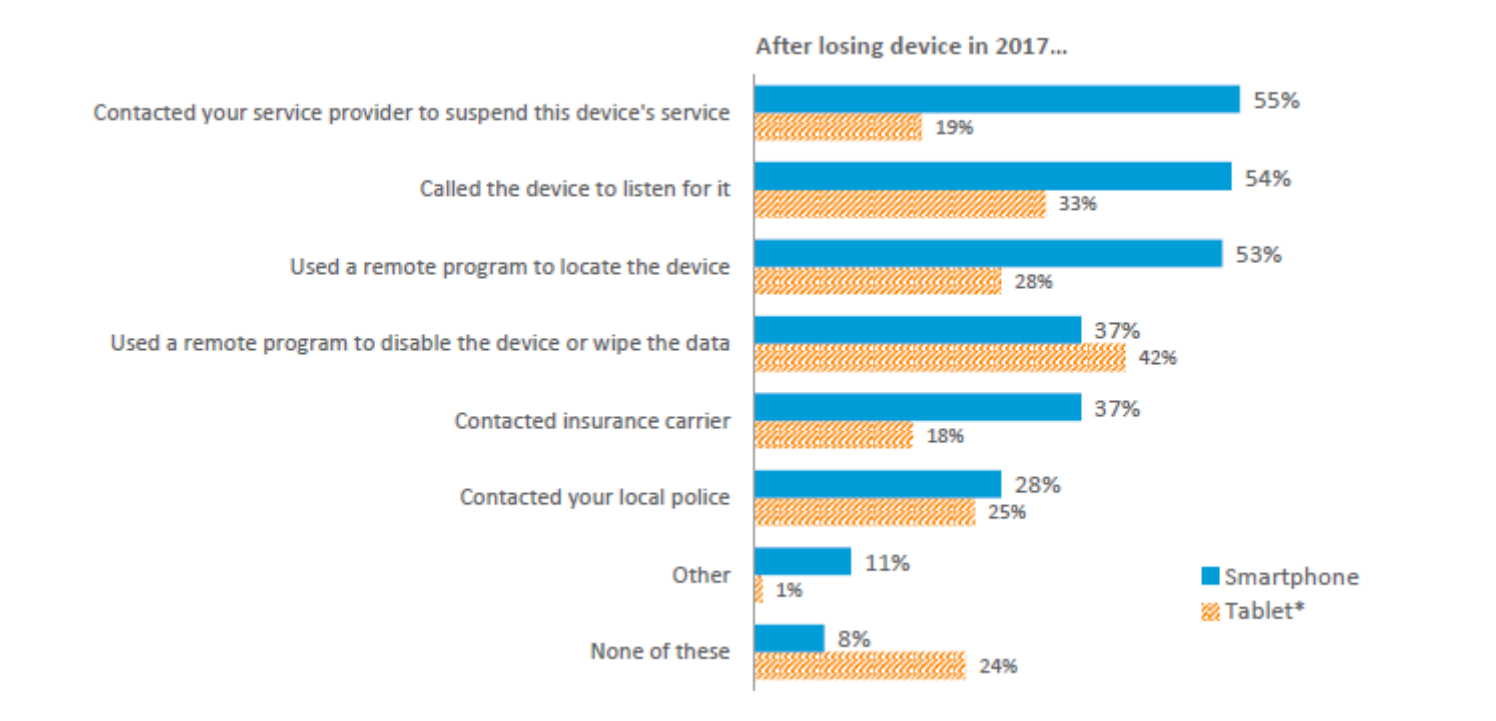
Almost 2/3 of users enabled the remote lock/locate capability in the last 2 years …



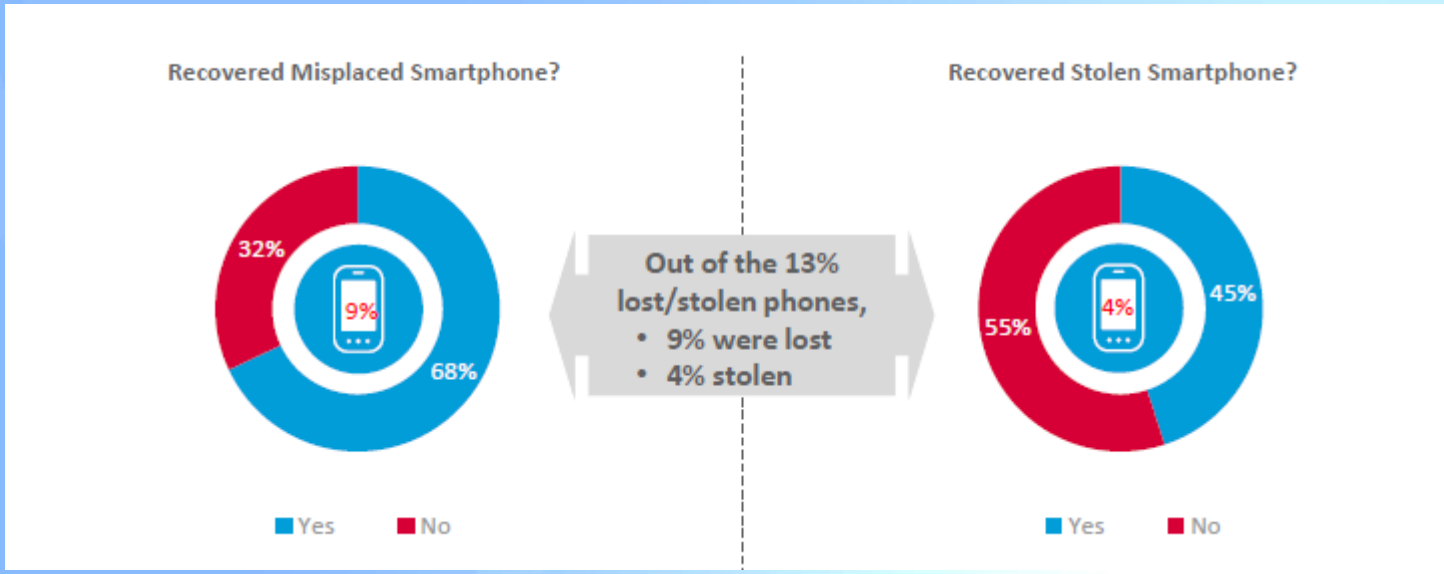
Lost devices much more likely misplaced vs. stolen



Those who lose a smartphone are more likely to contact their service providers …



Almost half of stolen smartphones were recovered …



Individual action/behavior when phone is missing similar since most assume phone is lost vs. stolen

There is not much difference between stolen and lost as most don't immediately assume the phone is stolen

Search house, car, yard and try to locate there

Attempt to call the phone
- Listen for the ring
- Hope someone answers

Try to retrace steps and/or reach places have been recently
- Try to remember where last had/saw it

Track phone using locator app or onboard tracking software

Contact service provider
- Help locate device
- Suspend service

Additional steps
- Change passwords to various sites, email, apps, banks, etc.
- File police reports / insurance claims
- Remote lock the device
- Once certain it is gone, initiate remote wipe or have carrier wipe phone

If Determined Phone is Stolen
- Wipe the phone
- Change passwords
- File a police report
- File an insurance claim

Take aways …

Deciding if LOST or STOLEN

- Location: Consider where the phone went missing (was it at home, in a busy public location, etc.)
- Find my Phone tracker places the device somewhere user has not been and/or shows movement
- Phone logs show activity after phone went missing

REMOTE WIPE or NOT

- Tracker shows phone in strange location or does not ping phone at all – will wipe the phone immediately
- If reasonably certain phone is stolen, will wipe within 24-48 hours or less
- Remote wipe is executed via the phone's app or native software OR by contacting the service provider or phone manufacturer for help disabling the phone and wiping the data

Biggest roadblocks continue to be not knowing about the feature and/or not knowing how to use or enable it

Two respondents voice concerns that data could be accidentally wiped once enabled

How to make consumers aware of remote features:

- Include it in the setup wizard / make it part of initial device setup
- Salespeople / store techs should inform customers at time of purchase of these features while performing the initial setup

Next Steps

- Analyze future threats and consequences of mobile phone theft solutions
- Determine the impact of the Stolen Phone Checker & provide any suggested improvements which can be submitted to CTIA for consideration
- Determine the mobile device theft prevention activity effectiveness especially as related to stolen phones international destinations
- Continue working on establishing communication channels with Law Enforcement to obtain theft statistics & to hold additional discussions with Federal/State/Local/Tribal Law Enforcement
  - Providing the Police Chiefs with a briefing on the Stolen Phone Checker
  - Soliciting feedback from the Police Chiefs on the Stolen Phone Checker
  - Request the Police Chiefs to advertise the Stolen Phone Checker with their Law Enforcement colleagues.
- Finalize recommendations around CTIA surveys and GSMA initiatives
- Work with GSMA NAFFSG to develop a plan to bring its best practices implementation to fruition in order that we have consistency of approach and policy to device blocking and data sharing that the FCC MDTP sought

Technological Advisory Council

Implications of Next Generation TV Broadcasting Technology

Working Group

September 19, 2017

Implications of Next Generation TV Broadcasting Technology Working Group

- **Co-Chairs:**
  - Lynn Claudy, NAB
  - Mark Hess, Comcast
- **FCC Liaisons:**
  - Martin Doczkat
  - Jonathan Levy
  - Jeffrey Neumann
  - Matthew Pearl
- **Participants / Contributors:**
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  - Adam Drobot, Open TechWorks
  - Dick Green, Liberty Global
  - Lisa Hobbs, Ericsson
  - Kevin Leddy, Charter
  - Brian Markwalter, CTA
  - Tom McGarry, Neustar
  - Maureen O'Connell, Charter
  - Mark Richer, ATSC
  - Marvin Sirbu, Special Gov't Employee
  - Charlie Zhang, Samsung

Working Group Charter (1)

- "TV broadcasting is poised to introduce its next generation standard ATSC 3.0. The new standard differs from the traditional TV broadcasting standard in several important ways. It has the capacity to carry not only what can be characterized as traditional content (in a high definition format), but also provides substantial additional capacity to offer new services. The task of the work group is to consider how the new standard might fit into the overall communications landscape of the future."

Working Group Charter (2)

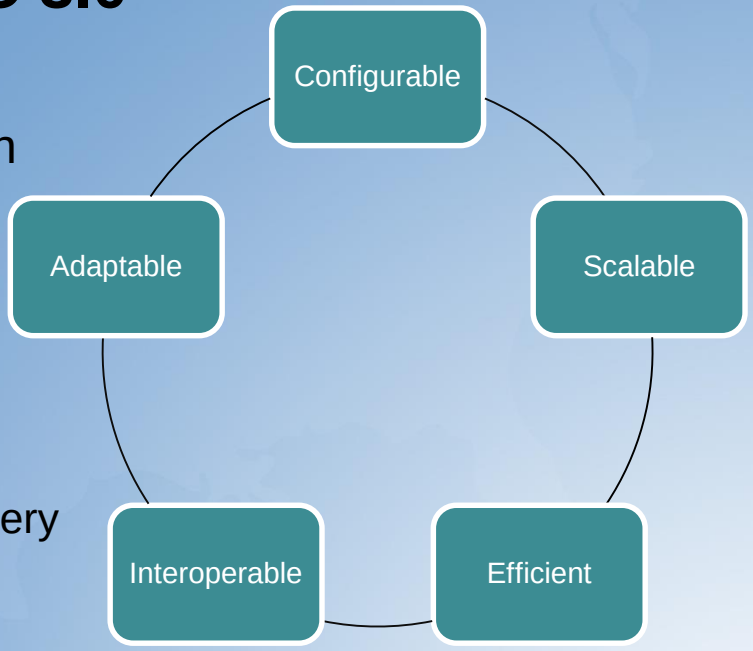
- “The intention is specifically not to address the topics raised in the Commission’s planned rulemaking to facilitate ATSC 3.0 but rather to look ahead to how implementation may impact the future of communications generally.”

Meetings

- 1st meeting April 13: Organizational
- 2nd meeting May 4: Review of Charter
- 3rd meeting May 11: ATSC 3.0 tutorial
- 4th meeting May 25: 5G tutorial
- 5th meeting June 1: slide review for June 8 TAC meeting

The Basic Features of ATSC 3.0

- Next generation broadcast television
  - Significantly higher data capacity
  - Flexible spectrum use
  - Higher physical layer robustness
  - Future extensibility
  - Mobile / handheld support
  - Hybrid broadcast + broadband delivery
  - Advanced A / V compression
  - Immersive audio, UHD video
  - Interactivity and personalization
  - Potential for new business models
  - Provide a path to the future of broadcasting



5G will multiply wireless network capacity

Meetings since June 8 TAC meeting

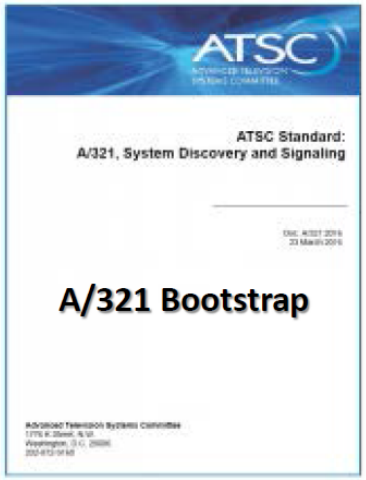
- 6th meeting June 29: ATSC 3.0 applications (NBC)
- 7th meeting July 13: ATSC 3.0 applications (Sinclair)
- 8th meeting: August 3: Group Discussion
- 9th meeting August 17: ATSC 3.0 Gateway (NAB)
- 10th meeting August 31: Wi-Fi (CableLabs)
- 11th meeting September 14: slide review for Sept 14 TAC meeting

What have we learned?

- Sinclair (Mark Aitken)– Large television group operator
  - Emphasized the primacy of delivery to mobile devices
- NBC (Glenn Reitmeier)– broadcast television network
  - Unique RF features of ATSC 3.0 enable both new and better services
- NAB PILOT (So Vang)– broadcast trade association
  - PILOT is the innovation arm of NAB
  - Interactive and hybrid broadcast/broadband applications will expand traditional broadcast service
- CableLabs (Ralph Brown)– research organization for cable industry
  - Cautionary note: Statistical multiplexing makes the Internet work but broadcasting synchronizes everybody
  - In dense, populated areas, interference limits Wi-Fi

Sinclair: “Mobile First” strategy facilitated by ATSC 3.0 architecture

“Mobile First” Leverages ATSC A/321 Bootstrap (Extensibility)



ATSC 3.0

A/321

Battery Powered Devices

ATSC 3.0 | ATSC 3.0 | Mobile First | ATSC 3.0 | ATSC 3.0

Frames Carrying Different Waveforms Starting with Universal Bootstrap

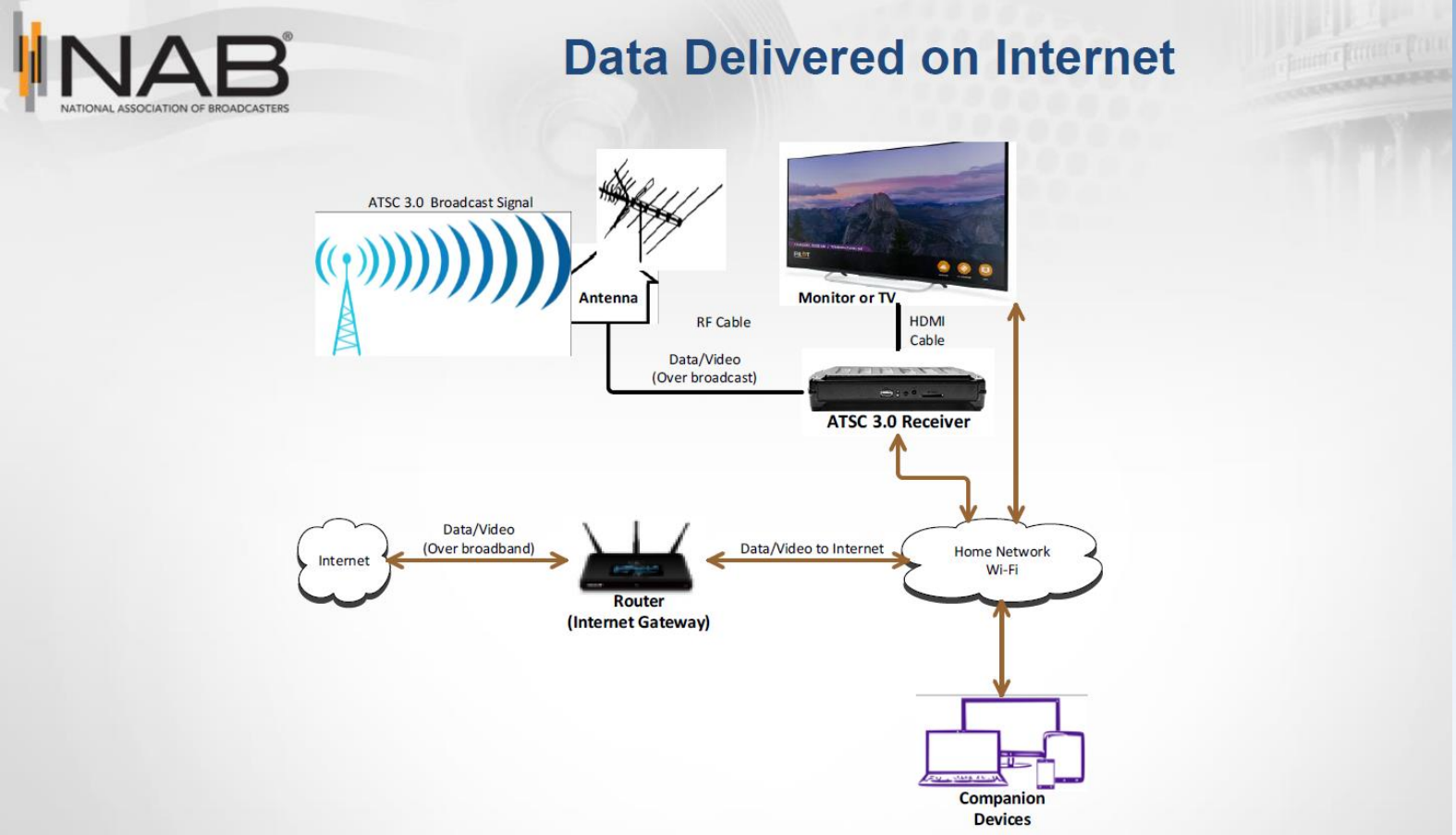
NBC: New tools for broadcast allow integration/optimization

Summary

… a long-term view of ATSC 3.0, in a post-transition timeframe…

ATSC 3.0 Capability	Potential Future Impact
System Discovery - Extensibility	• New types of broadcast signals can be phased into use without suddenly 'breaking' 3.0 receivers • Powerful concept that could be applied to other future standards beyond broadcasting – it could enable a more flexible approach to spectrum management
System Discovery - Emergency Alerting	• Advanced Emergency Alerting and "EAS Wake-up" Are Important New Capabilities That Can Be Integrated with 4G/5G and Other Systems
Virtual Channels and Scalable Coding	• Signal can be Configured for Various Services, Considering Geography, Terrain and Receivability Factors • Robust indoor and mobile reception are new capabilities for Broadcasters
Single Frequency Networks	• Can Boost Signal Strength, Improving Indoor Reception and/or Increasing Broadcast Bitrates – Without Causing Interference Into Adjacent DMAs • In some DMAs, Could Help To Make Future Spectrum Packing More Efficient By Reducing Co-Channel Separation Requirements
Channel Bonding	• New Options For Spectrum Use and Efficiency – Increased Video Capacity and/or Use of UHF & VHF
IP Transport	• Seamless integration of Broadcasting and Internet based services • Future Landscape of Heterogeneous IP Connectivity Can Include 4G/5G, WiFi and Broadcast
Security	• Incorporates well-established internet security standards developed in IETF and W3C (as should all future IP-based systems)

NAB: Wi-Fi "Gateway" devices share Wi-Fi resources



Working Group Charter's Questions

- "For example, to what extent will this new service compete or integrate with services that are offered by commercial wireless services?
- To what extent might the implementation of ATSC 3.0 raise issues such as expanded deployment of distributed transmission systems that could face issues such as tower siting?
- What are the ways that ATSC 3.0 is likely to be deployed that could intersect with other communications facilities and devices such as the use of gateways that could rely on Wi-Fi to distribute multiple video signals throughout a dwelling?
- If a gateway and Wi-Fi were used, how would they interplay with wireless routers used for other services in the same dwelling?
- What other synergies or interfaces might exist between broadcast data services and commercial wireless services?"

What's next?

- Guest expert to present wireless broadband industry's view of 5G and next generation TV broadcasting
- Develop answers to questions posed in working group charter
- Summarize work and submit recommendations at December 6 TAC meeting

THANK YOU

FCC Technological Advisory Council Working Group:

Satellite Communication Plan

September 19, 2017

Satellite Communication Plan Working Group

Working Group

- Jack Nasielski (Qualcomm)
- Karri Kuoppamaki (T-Mobile)
- Michael Tseytlin (Facebook)
- Dave Tennenhouse (Vmware)
- Dale Hatfield (CU - Boulder)
- Mark Bayliss (Visualink)
- Adam Drobot (OpenTechWorks)
- John Chapin (IEEE)

FCC Liaisons

- Matthew Pearl (FCC - Wireless)
- Robert Pavlak (FCC - OET)
- Padma Krishnaswamy (FCC)
- Jose Albuquerque (FCC - International)

Chairs

- Steve Lanning (ViaSat)
- Pierre de Vries (CU - Boulder) – subgroup Chair

Satellite Communication Plan Working Group Contributors

- Mariah Shuman (OneWeb)
- Christine Hsu (OneWeb)
- Mihai Albulet (SpaceX)
- Patricia Cooper (SpaceX)
- Zachary Rosenbaum (O3b/SES)
- Joe Cramer (Boeing)
- Alex Epshteyn (Boeing)
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- Brennan Price (EchoStar)
- Fernando Carrillo (Hughes/EchoStar)
- Jonathan Sheffield (Facebook)
- Giselle Creeser (Inmarsat)

Satellite Communication Plan Charter

- This work group will look at recommendations for processes and communication solutions to support both startup venture satellite operations as well as massively scaled satellite operations.
- The work group will assess the challenges faced by these new satellite ventures in the context of current and planned communication/telemetry solutions.
- The work group will focus on streamlining the regulatory process, the impact on current satellite operations from expected scaling of operations in both frequency and number, the effect of possible interference from satellites operation in MEO and LEO orbits, and proposals that would allow for higher spectral efficiency and lower costs for satellite communication needs.

Charter and Work Plan

- Driver of our work: scaling issues
  - As with cases like Nextel, there was no interference problem until demand scaled when Nextel started using spectrum intensively that had previously been used for taxi dispatch
- Work areas
  1. NGSO sub-group focused on interference risk assessment and mitigation. Output is a white paper
  2. Identify use cases that are driving demand for satellite communications of all types. Output is a white paper
- Other possible study areas
  - price and performance of the phased array antennas
  - interaction between FCC and ITU rules

Summary Of Selected Presentations

- Joe Fragola: 40 years experience in aerospace, offshore oil, and nuclear industries, including leading Principal Investigator of the 1995 Space Shuttle Risk Assessment – more detail to follow
- Daryl Hunter: protection criteria for GEO above 30 GHz. Main learning: can express consequences of interference as reduction in throughput
  - WP4B proposes %DTp as the new metric rather than BER
  - work will be further developed at the next WP4B meeting in October. Too early to recommend that FCC consider adoption of a work in progress, but reasonable to recommend tracking it and considering alignment

Dr Joseph Fragola on probabilistic risk assessment (PRA)

- Benefits of risk assessment
  - Prioritizing/focusing attention on key elements of design
  - Motivates engineers to talk across silos
  - Determining system features and identifying design weaknesses
- Guidelines
  - Use all possible sources of information, including historical data, expert intuition, understanding of system behavior, modeling
  - Need to understand overall system goals, e.g. reducing risk in a sub-system can increase risk overall (i.e. local vs. global risk)
  - Often identifying what risk is not (e.g. exposing misconceptions) is more important than calculating what it is
  - Engineers and managers want to be optimistic: challenge assumptions; as knowledge grows, go back to test assumptions

Fragola (ctd.)

- Scoping
  - Important to establish in broad terms which domains are more or less risky, to focus analytical effort
  - Start with top-down view – “carve nature at its joints” – before calculating risk
  - Often order-of-magnitude estimates can quickly establish when a risk assessment is wrong
- Multi-stakeholder bodies
  - Sharing data is essential for risk reduction
  - North Sea rigs after Piper Alpha: Norway required PRA, needed database of failure rate of devices
  - Operators unwilling to reveal to each other
  - Set up 3rd party database – contributors got free access, non-contributors paid
  - Reduced risk, but also reduced operating costs since data on part failure increased reliability

Selected Presentation Overviews – cont'

- AGI created pilot data center and ran pilot operation that lead to Space Data Center and AGI continues technology advisor and trusted agent for satellite operators
  - AGI leverages a significant code base to provide location and interference data to satellite operators including dynamic link analysis and modeling
  - Explained how it is a long slow road to get some operators to trust and join, but number of members is increasing
  - Ties in well with Fragola recommendations regarding risk mitigation
  - Clear that AGI has no role to arbitrate difference, but does provide data that helps customers resolve differences with one another and other third parties. Ideal state is to avoid arbitration with regulatory bodies like the FCC
- Jennifer Manner Hughes on 3GPP
  - It is imperative to include satellite in the 5G standards process to achieve an optimal 5G world. Users would be denied the benefits of wide coverage and cost-effective solutions that are unlikely to be available if satellite is not included
  - Work on 3GPP satellite platforms for 5G has been initiated

Satellite Communication Plan Working Group Presentations

Done

- Jennifer Manner and Brennan Price (Hughes/EchoStar on evolution of GEO technology
- Professor Albin Gasiewski (University of Colorado) research perspective on Remote Sensing.
- Jennifer Manner: update on ITU
- Daryl Hunter and Fernando Carrillo Protection Criteria for FSS Interference Above 30 GHz
- Joe Fragola: expert review of how to conduct a risk assessment

Planned

- Christine Hsu OneWeb
- David Payne Analytical Space
- Patricia Cooper SpaceX
- Alex Epshteyn: Boeing's NGSO plans and Boeing studies of sharing between GSO and NGSO
- White paper review on Risk Informed Interference Assessment
- White paper review on Use Cases

Risk assessment framework for NGSO/NGSO coexistence

- Outline a risk assessment framework (not calculations) of NGSO/NGSO coexistence to help frame coexistence debate, delivered as white paper for December TAC meeting
- As reviewed in September, original scope was GSO/NGSO, now have tighter focus on NGSO/NGSO in V-band (40–50 GHz)
- Situation
  - Constellations in non-geostationary orbit (NGSO) offer wide-coverage, low-latency broadband
  - 9 networks have applied for V-band authorization in U.S.
  - Constellations vary in size from 3 to 7,518 satellites in V-band
  - Challenge: interference avoidance and mitigation

- Risk assessment steps (this exercise focuses on #1 and #2)
  1. Make inventory of hazards & mitigations: baseline and coexistence
  2. Define consequence metric(s) to quantify impact of hazards
  3. Calculate likelihood-consequence values for each hazard

Hazards and Mitigations

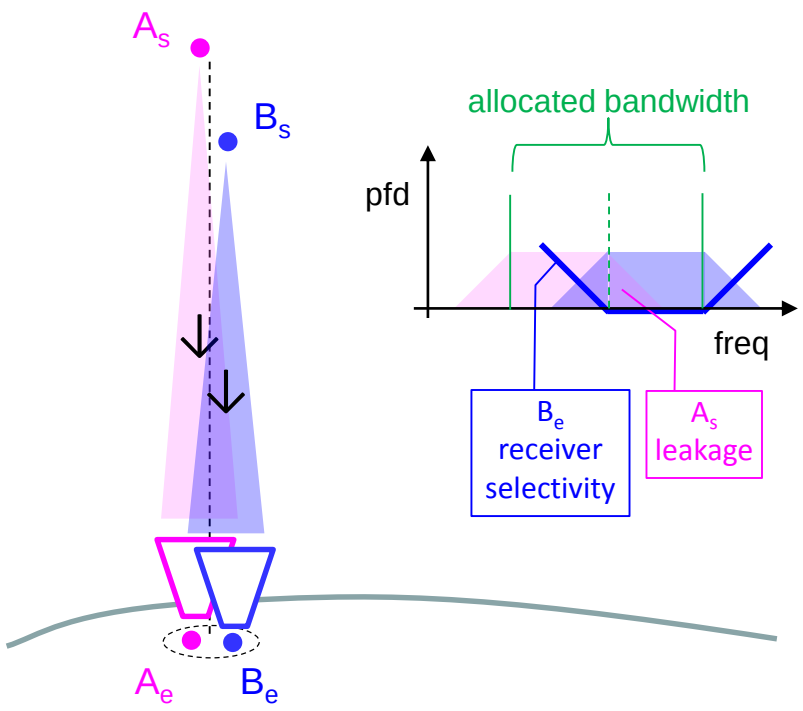
- Baseline hazards
  - degradation of desired signal, e.g. gases, rain & cloud, beam divergence, elevation angle
  - non-interference faults and failures, e.g. misconfiguration, hardware faults
- Coexistence hazards
  - Co-channel and adjacent channel
  - Dominant mode: alignment of space-earth or earth-space beams (cf. “in-line events”)

	Earth station TX	Space station TX
Earth station RX	Negligible risk	Downlink, in-line: Interference at ground station
Space station RX	Uplink, in-line: Interference at space station	Negligible risk

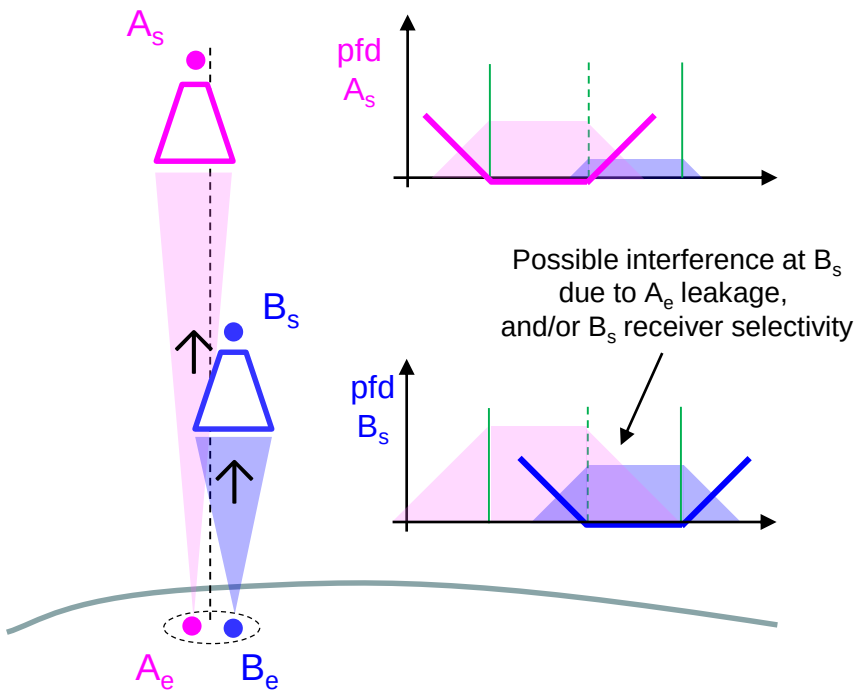
Risk factors and mitigation strategies

- Inactive satellites (alignment doesn't cause interference if satellites are inactive)
- Satellite diversity (hand off traffic to satellites not in an in-line configuration)
- User geo-separation (steerable beams can avoid downlink in-line events, provided earth station locations are sufficiently well separated)
- Adaptive links (power control, adaptive coding etc. can partially compensate for increased interference during in-line events)
- Uplink EIRP (minimal rules for uplink EIRP, low/high systems could use different power levels)
- Antenna gain/spot size (greater ability to discriminate reduces alignment impact)
- Cross-channel interference (transmitter leakage and receiver selectivity may cause interference during in-line band splitting)

In-line event, no coordination → band splitting

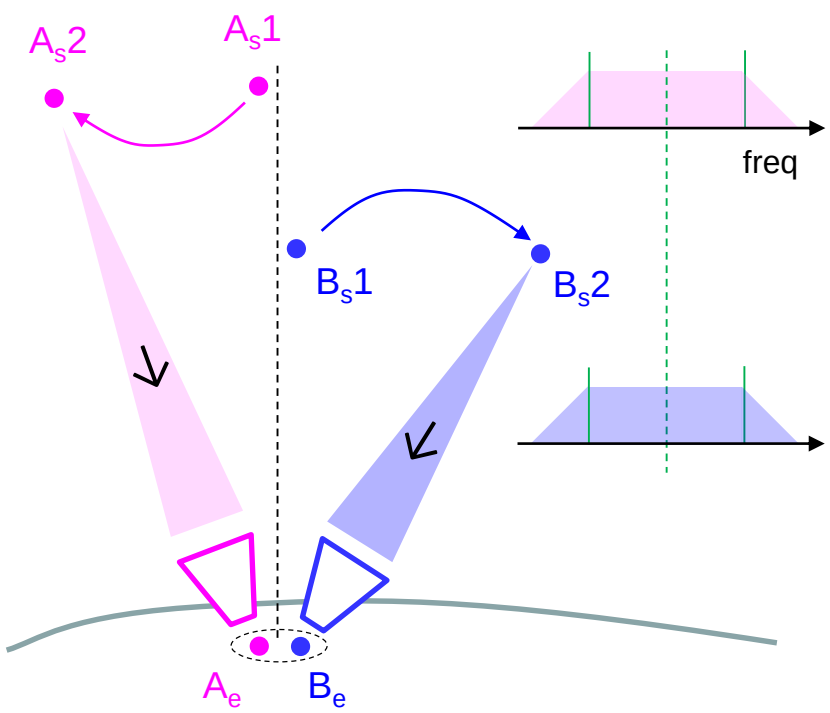


Downlink, split bandwidth
Equal pfd at ground, no cross-channel interference

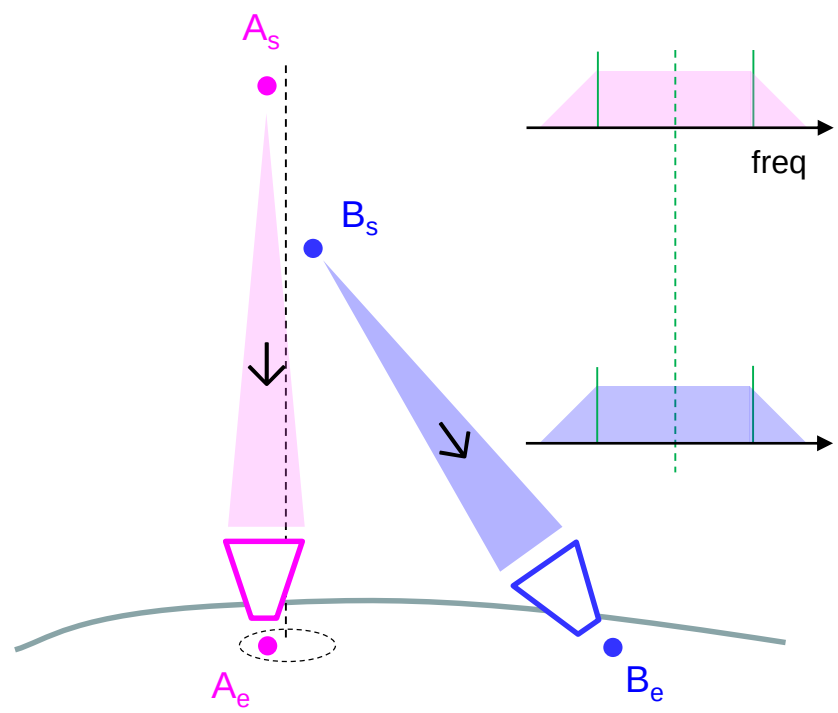


Uplink, split bandwidth
Cross-channel interference at B_s if A_e's EIRP is high

Potential in-line event, but coordination → no splitting



Satellite diversity: A_e and/or B_e both steer to alternate space stations. Both get full bandwidth



Geographic diversity: If B_s is pointing off alignment, both get full bandwidth

Consequence metrics

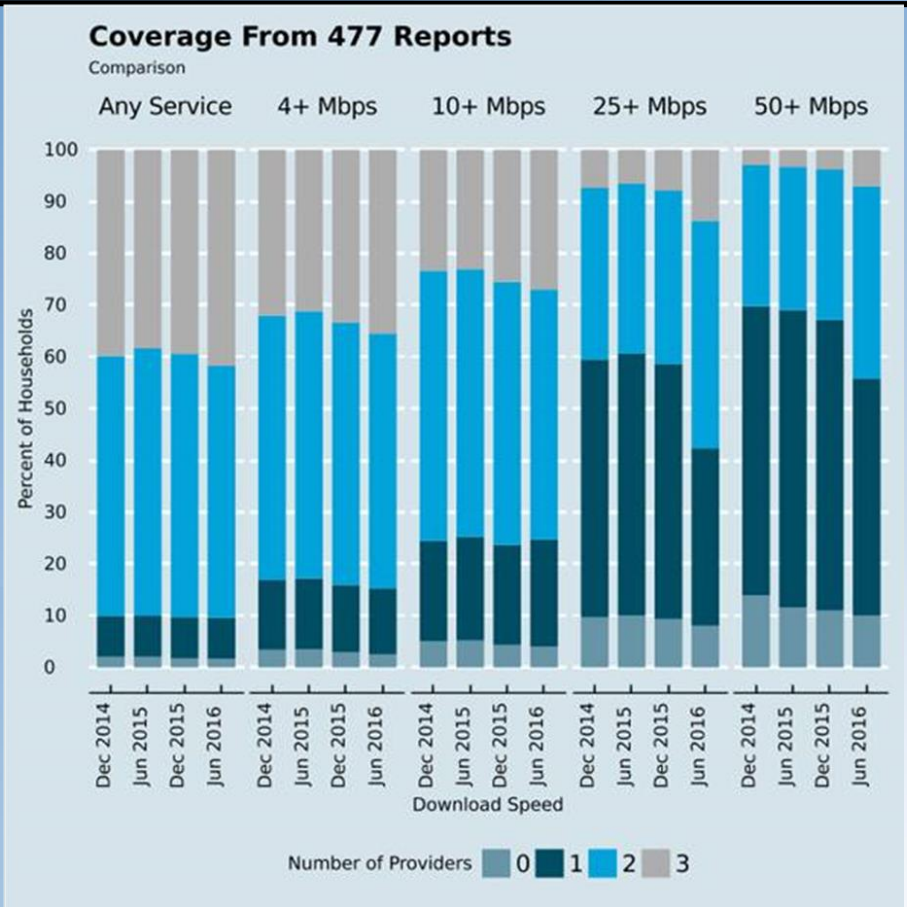
- A consequence metric quantifies the severity of an interference hazard
- There are many potential consequence metrics, in three broad categories: corporate, service, and RF metrics.
- Consequence metrics are used to compare the impact of different scenarios, e.g. mitigations or rule choices
- Options discussed so far include:
- RF metrics
  - Spectral efficiency, e.g. bit/s per m^2.
  - Link (un)availability
  - Percentage change in link (un)availability vs. baseline
- Service metrics
  - Throughput, e.g. bit/s per terminal
  - Percentage degradation in throughput
- Discussion on-going

Multi-stakeholder body to coordinate interference mitigation

- Interference avoidance relies heavily on coordination.
  - Relatively straightforward if just two parties; more may require protocols and institution to exchange data. Given the complexities, perhaps most efficient for industry to develop the details
- Possible roles for multi-stakeholder body/process
  - Develop protocols and incentives for sharing data
  - Act as trusted third party
  - Notify and/or resolve potential interference events
- Groups with similar goals or activities
  - ITU coordination groups
  - Space Data Association: Space Data Center tracks objects in orbit, alerts re collision
  - American Institute of Aeronautics and Astronautics (AIAA)
  - IEEE Microwave Theory and Techniques, Internet of Space Initiative
- Potential TAC work items
  - Derive a best practices checklist from current/prior frequency coordination situations
  - Outline what factors justify setting up (and the FCC encouraging) a multi-stakeholder body/process?
  - For the inter-NGSO case: scope and deliverables for multi-stakeholder body

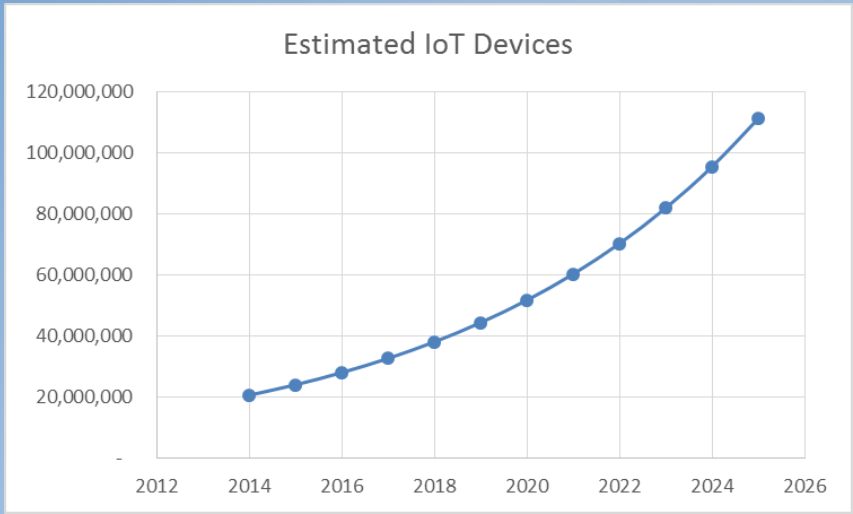
Use Case White Paper Outline

- Higher Percentage of zero options for highest package options
- Worldwide growth in actual data rates increases 0.8 mbps per year which sets increasing standard for acceptable experience means ever higher data rates are necessary
- Current GEO generation competes at 10 mbps
- New GEO generation coming online competes at 25 – 50 mbps with unlimited caps
- LEO constellations will have lower latency
- IoT and other applications require ubiquitous coverage and terrestrial networks have many holes



Use Case White Paper Cont'

- IoT has many areas of application shared in previous TACs
- Estimate cost of ubiquity from available Connect America Cost Model FCC has published as part of CAFII and Rural Broadband Experiment (capped at $3200 in annual support and not $1750)
- Sensitivity on cost of Ubiquity
- Inventory of application areas



Actionable Recommendations

- None agreed to by working group yet. Things for discussion:
  - Do high cost support funding mechanisms create barriers to entry in areas that might have service from satellite or 5G providers without such support. Should FCC phase out high cost support given changes in technology?
  - Should FCC encourage multi-stakeholder body to coordinate interference mitigation?

Thank You