

Appendix A

Prior General Assembly Presentation on the Interplay of Broadband,
Telecommunications, & Information Service



BROADBAND AND RURAL PA: BACKGROUND ON TECHNOLOGY, ECONOMIC & LEGAL ISSUES

COMMONWEALTH OF PENNSYLVANIA HOUSE OF REPRESENTATIVES HOUSE COMMITTEE ON AGRICULTURE

Joseph K. Witmer

Counsel to Chairman Gladys Brown Dutrieuille

Office of the Chairman

Pennsylvania Public Utility Commission

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(717) 787-3663; joswitmer@pa.gov

(the opinions here are those of the author not the Pa. PUC or Chairman Brown Dutrieuille)



Broadband Defined

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- Physical networks (“bricks”) and services (“clicks”)
- Rural Challenge: Building networks (bricks) to provide internet, voice, video, and wireless service (clicks) to rural consumers at affordable rates.



The Baker's Dozen

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- PA has mostly a “last mile” challenge but some “middle mile” challenges
- Last Mile: connection to the consumer from the cable or telco office
- Middle Mile: connection between starting network and ending network
- Two industries (cable and telco) have > 90% of last mile connections
- 3 Phone Companies (Bells) have > 80% of locations without broadband
- Chapter 30 funded broadband availability at DSL speeds (now dated).
- Costs to build (capex) or operate (opex) go up by service-location-speed.
- People (density) and topography (land) impact the cost of broadband.
- FCC and Pa.PUC support is small compared to cost: \$50B to \$500B
- Wireless no substitute for wireline; both are needed & federally supported
- Public wants faster speeds and mobile service (needs wireline backhaul).
- Basic Internet Access Service (BIAS) is a policy swing (Info to T2 & back)
- FCC support is large but USDA, DCED, and Ofc. Gov also give support



Broadband Challenge

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- *Technology:* Society is moving from a copper-analog network where distance matters to a fiber-digital network where information travels at the speed of light (187,000 miles/second).
- *Economics:* Tension between market pricing (providing service where margin exists from carrier-set prices) and policy pricing (service to all at just & reasonable prices with profit margin).
- *Law:* Is Broadband “telecommunications” (subject to state and federal law) or “information service” (subject only to federal law set by the FCC); increasing variation by administration as policy calls.



Technology

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- The old technology used copper lines and switches to provide voice or fax calls; costs increased with distance.*
- New technologies use Fiber-Internet Protocol (IP)(telco) and Docsis 3.0 (cable); technologies send voice, data, and video at the speed of light or 187K per second; distance is irrelevant;*
- “last mile” facilities from the telephone central office or remote and cable head-end to premises is the issue.*
- There are multiple platforms for technologies & content but last mile to consumers is largely cable and telco.*

Sources: Francis Caircross, *The Death of Distance* (Harvard Business School Press, 2001); *In re: National Broadband Plan*, Docket 09-51, Staff Update (9/29/9); *FCC Broadband Progress & Section 706 Report*, Docket 15-191 (1/29/16)



Broadband Technology

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- **Internet Protocol (IP):** technology uses digitized pulses of light (IP packets) made up of header, load, and footer.*
- **Routers & Servers:** routes IP packets using header that names sender, recipient, content, speed, & priority of message.*
- **Voice Packets:** Voice over Internet Protocol (VoIP) needs Real Time packet priority (RTP) to stop conversation drops, jitter, & latency.*
- **Video Packets:** Do not need RTP but needs buffering to store locally to resend video streams.*
- **Data Packets:** Do not need RTF nor buffering but can be quickly disassembled and reassembled.*
- **Legal Classification of BIAS:** Telecommunications or Information Service; telecommunications regulated by the States and FCC; FCC only information
- **Legal Status of BIAS Providers:** Common Carrier (carry all message without discrimination) or Not Common Carrier (can discriminate or favor)

Sources: Edward Felton, *Nuts & Bolts of Network Neutrality* (Professor of Computer Science and Public Affairs, Princeton University; 2006). <http://itpolicy.princeton.edu/pub/neutrality.pdf>; In re: National Broadband Plan, Docket 09-51, Pa. PUC Comment (7/15/10), (10/12/10), In re: *Open Internet*, Docket 14-28, Pa. PUC Comments (3/19/14), (7/15/14); In re: *Open Internet*, Docket 14-28 (3/12/15) appealed in *USTA v. FCC*, (D.C.C.A.), Docket No. 15-1073, affirmed 6/14/16; *Restoring Internet Freedom*, Declaratory Ruling, Report and Order (*Restoring Internet Freedom Order*), WC Docket No. 17-108, FCC 17-166 (Released on January 4, 2018), FCC upheld *Mozilla v. FCC*, DCCA: Docket No. 18-1051 (October 1, 2019), Petitions for Rehearing En Banc (December 12, 2019).



Legal Status Quo: Voice

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- Legal Class Determines Regulation: Information or Telecommunications*
- Information Service: FCC regulates*
- Telecommunications: FCC and the states regulate*
- States regulated intrastate telecommunications*
- FCC regulated interstate or international telecommunications*
- Telecommunications Act of 1996 (TA-96) put regulators into both domains.*
- Common Carrier: rooted in medieval law; service must be to all (mail service)*
- Public Utility: service provider with state-issued certificate*
- Universal Service: must serve all as a state public utility precondition.*
- Voice: Common Carrier under state law with a universal service mandate
- BIAS: Unclear – how will the service & provider be treated?

*Sources: 47 U.S.C. § 153; *AT&T Corp. v. Iowa*, 525 U.S. 366, (1999), *Verizon v. FCC*, 535 U.S. 467 (2001); Edward W. Felten, *Nuts & Bolts of Network Neutrality* (Prof. of CompSci & Public Affairs, Princeton University: 2006) <http://itpolicy.princeton.edu/pub/neutrality.pdf>; *In re: CAF*, Docket 10-90 (11/18/11) aff'd *In re: FCC*, 753 F.3d 1014 (10th Cir. 2014), cert den. Nos. 14-610 (5/4/15); NARUC Telecommunications Staff Subcommittee, *Federal Universal Service* (November 8, 2015), J. Witmer, Pa. PUC, editor



Legal Change: Broadband

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- FCC: 2011 *CAF Order* successfully claims power over intrastate networks & services as “conditions” to federal USF*
- FCC: Goal is a national ubiquitous broadband network.*
- FCC: Policy Swing on Basic Internet Access Service (BIAS) is “telecommunications” or “information service” – a decision now in its fourth appeal.
- Basic Internet Access Service (BIAS) classified as “information service” under Bush, reclassified as “telecommunications” under Obama, now classified as “information service” under Trump.
- Common Carrier: Telecommunications & Transportation but not Cable
- Public Utility – Telecommunications, Transport, Electric, & Gas but not Cable

*Sources: 47 U.S.C. § 153; *AT&T Corp. v. Iowa*, 525 U.S. 366, (1999), *Verizon v. FCC*, 535 U.S. 467 (2001); Edward W. Felten, *Nuts & Bolts of Network Neutrality* (Prof. of CompSci & Public Affairs, Princeton University: 2006) <http://itpolicy.princeton.edu/pub/neutrality.pdf>; *In re: CAF*, Docket 10-90 (11/18/11) aff'd *In re: FCC*, 753 F.3d 1014 (10th Cir. 2014), cert den. Nos. 14-610 (5/4/15); NARUC Telecommunications Staff Subcommittee, *Federal Universal Service* (November 8, 2015), J. Witmer, Pa. PUC, editor, *In re: Open Internet*, 14-28 (3/12/15) appealed in *USTA v. FCC*, Docket No. 15-1063 (June 14, 2016).; *Restoring Internet Freedom*, Declaratory Ruling, Report and Order (*Restoring Internet Freedom Order*), WC Docket No. 17-108, FCC 17-166 (Released on January 4, 2018), FCC upheld *Mozilla v. FCC*, DCCA: Docket No. 18-1051 (October 1, 2019), Petitions for Rehearing En Banc (December 12, 2019); NARUC Winter Retreat 2018, Presentation of Prof. Barbara Cherry, Indiana Univ. Law School.



Legal Issues: Voice & Broadband (VoIP)

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- ***Pulver.com***: Voice over Internet Protocol (VoIP) not using the public network and free is information service not telco.*
- ***Vonage***: states preempted from certificating or mandating 911 on VoIP but other authority retained.*
- ***Time-Warner***: transmission is wholesale telco regardless of the services provided over that network (VoIP or BIAS).*
- ***Missouri Decision***: Vonage preemption of the states goes only to “nomadic” VoIP (Vonage) not “fixed line” VoIP (cable).*
- ***Minnesota Decision***: The Vonage preemption included fixed and nomadic VoIP so states cannot impose mandates.*
- ***IP Enabled Services***: No decision yet if VoIP is telco or information; Cable-modem ISP is information service.*

Sources: In re: pulver, Docket 03-45 (2/29/4); In re: Vonage, Docket No. 03-211 (11/12/4); In re: TimeWarner, Docket 06-55 (3/1/7); Comcast v. Missouri, Case 06-4233-CV-NKL (1/18/7); Vonage v. Minnesota, Civ. No. 03-5287 (10/16/3); In re: IP Services, Docket 04-36, Brand X v. FCC, 545 U.S. 967 (2005).



Legal Issue: Legal Classification of BIAS

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- **Madison River:** Local phone company fined for blocking internet content under FCC's "ancillary" power in Title I.
- **Comcast :** Comcast fined for blocking Bit-Torrent internet content & Comcast appeals; court reverses FCC because Title I "ancillary power" has no power to fine
- **Verizon:** FCC issues rules on internet content blocking under Section 706; court reverses because the FCC said earlier 706 gives no power; FCC can change their mind.
- **Open Internet Order:** FCC rules Basic Internet Access Service (BIAS) is Title II telecommunications and that 706 also gives it power to regulate; FCC upheld on authority to treat BIAS as federal Title II telco for fixed and mobile BIAS, decision affirmed by DC Circuit 6/14/16.
- **Restoring Internet:** FCC rules that BIAS is information service; FCC upheld *Mozilla v. FCC*, DCCA: Docket No. 18-1051 (October 1, 2019), Petitions for Rehearing En Banc (December 12, 2019).*

Sources: *Madison River Communications*, File No. EB-05-IH-0110, 20 FCC Rcd 4295 (Enforcement Bur. 2005); *Comcast Corp. v. FCC*, 600 F.3d 642 (D.C. Cir. 2010); *Verizon v. FCC*, 740 F.3d 623 (D.C. Cir. 2014); In re: Open Internet, 14-28 (3/12/15) appealed in *USTA v. FCC*, Docket No.15-1063 (June 14, 2016); *Restoring Internet Freedom*, Declaratory Ruling, Report and Order (*Restoring Internet Freedom Order*), WC Docket No. 17-108, FCC 17-166 (Released on January 4, 2018), FCC upheld *Mozilla v. FCC*, DCCA: Docket No. 18-1051 (October 1, 2019), Petitions for Rehearing En Banc (December 12, 2019).



Technology & Law: Why It Matters

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- **Internet Protocol (IP):** technology uses digitized pulses of light (packets) made up of header, load, and footer; can use header to “prioritize” traffic.*
- **Routers & Servers:** route IP packets using header that names sender, recipient, content, speed, & priority of message.*
- **Voice Packets:** Voice (VoIP) needs real time packet priority (RTP) to stop conversation drops, jitter, & latency.*
- **Video Packets:** Do not need RTP but need buffering access to locally store and retrieve video streams.*
- **Data Packets:** Do not need RTP nor buffering but can be quickly disassembled and reassembled.*
- **BIAS as Title II Telco:** Cannot unreasonably prioritize packets.*
- **BIAS as Information Service:** Can prioritize packets.

Sources: Edward Felton, *Nuts & Bolts of Network Neutrality* (Professor of Computer Science and Public Affairs, Princeton University: 2006). <http://itpolicy.princeton.edu/pub/neutrality.pdf>; In re: National Broadband Plan, Docket 09-51, Pa. PUC Comment (7/15/10), (10/12/10), In re: *Open Internet*, Docket 14-28, Pa. PUC Comments (3/19/14), (7/15/14); In re: *Open Internet*, Docket 14-28 (3/12/15) appealed in *USTA v. FCC*, (D.C.C.A.), Docket No. 15-1073,; affirmed 6/14/16; *Restoring Internet Freedom Order*, WC Docket No. 17-108, FCC 17-166 (Released on January 4, 2018), FCC upheld *Mozilla v. FCC*, DCCA: Docket No. 18-1051 (October 1, 2019), Petitions for Rehearing En Banc (December 12, 2019).



Economics of Broadband

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- Monopoly: one provider serves all consumers.
- The old network used “policy pricing”, a practice where high cost rural areas were “averaged” with lower cost urban areas to set average or blended rate.
- The service provider had a Carrier of Last Resort (COLR) mandate to serve all.
- The old network had prices above cost in urban areas but below cost in rural areas; all consumers were served using average pricing and a COLR mandate.
- New regulatory approach relies on “market pricing” in which consumers pay the price to receive their service based on market costs & competition.
- Competition typically exists where average price is above cost (urban) but not where average price is below cost (rural); low-income challenges in both.
- Tension exists carrier desire to invest to serve consumers with margin under market pricing and COLR service regardless of cost with policy pricing.*
- Trebing competition definition: 5-7 firms of roughly equal size make providers price takers; 4-5 with over 60% is oligopoly with providers as price-setters.*

Source: Garfield & Lovejoy, *Public Utility Economics* (Prentice Hall, 1964), NARUC Telecommunications Staff Subcommittee, *Federal Universal Service* (November 8, 2015), J. Witmer, Pa. PUC, editor.; Professor Harry Trebing, *Market Power in Public Utilities Industries* NARUC Annual Studies Program: 2000), pp. 3-4.



Economics Case Example #1: Social & Market Pricing For Voice

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Policy Pricing: Traditional Approach

Rural Cost for Voice: \$ 150

Urban Cost for Voice: \$ 10

Cost/Rate Policy Price: $\$ 160/2 = \80 Each

Market Pricing: New Approach

\$150 Cost with \$80 Rate: No Choice; Little BIAS

\$10 Cost with \$80 Rate: Choice; Much BIAS



Economics Case Example #2: Policy & Market Pricing for VDV Broadband

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Network Cost

Rural Cost for VDV Broadband: \$ 300

Urban Cost for VDV Broadband: \$ 100

Policy Pricing: $\$400/2 = \200 .

Market Pricing: \$300 Rural
\$100 Urban

VDV: Access to Voice, Data, Video (VDV).



The Broadband Conflict

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- Ongoing tension between Policy & Market Pricing reflects conflict between Private & Public Legal Duties
- Private Legal Fiduciary Duty: Maximize company margin
- Public Legal Fiduciary Duty: Maximize Public Welfare
- It's a Duties Thing; Duties can be in conflict
- Private providers' refusal to invest or serve reflects duty to maximize margin; they have no public legal duty.



The Broadband Question

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- Similar to voice in the 19th and 20th centuries.
- Remember the transition from Party Lines on cross-bar switches to private lines on analog.
- Broadband everywhere at just rates or just where margin from investment supports service?
- If so, who pays, who sets rates, and how.



A Rural Answer

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- **UNIVERSAL SERVICE.**
- Section 254 of federal law requires “comparable rates for comparable services” in urban and rural America.
- Section 3011 of Chapter 30 addresses universal service



Universal Service: BIAS Support

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- Department of Community & Economic Development (DCED);
- United States Department of Agriculture Rural Utilities Service (USDA RUS);
- Governor's Office of Broadband, Cherie Collins, Director



Universal Service: Broadband Numbers

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- 82% - Nation's telephone network without broadband owned by Verizon, ATT, CenturyLink (formerly Qwest);*
- 93% - Facilities controlled by cable and telco providers;*
- 95% - Nation's wholesale wireless minutes sold by Vz, ATT/Cingular, Sprint*
- 5% - Wireless consumers that can use 95% of spectrum*
- 50B – Cost to build a 10 to 30 Mbps broadband network nationwide*
- 350B – Cost to build a 100 Mbps broadband network nationwide
- \$4.5B – FCC 2014 & 2015 support for high-cost (rural & tribal) BIAS*
- 34M – Pennsylvania's state fund to support voice COLR*
- Other support: USDA, DCED (PA), Governor's Initiative (\$35M) 3/18
- Is Public support adequate to the rural cost? what's out there today?

*Source: *In re: Natl Broadband Plan*, Docket 09-51, FCC Staff Update (9/29/09), slides 38, 44, 47; *In re: IP-Enabled Services*, Docket 04-36, Covad Comments (5/28/4), p. 8 and MCI Comment (5/28/4), p. 13; *In re: Nextel Transfer to Sprint Communications*, Docket 05-36, Bessen Declaration, (2/17/5), p. 19; *In re: Net Neutrality*, Docket 09-191, CTIA Ex Parte on Net Neutrality (9/20/10) and *In re: Open Internet*, Docket No. 14-28, CTIA Ex Parte (9/4/14); *In re: National Broadband Plan*, Docket No. 09-51 FCC Staff Update (9/29/9), slides 38, 44, and 45; *FCC Joint Board Monitoring Report (2015)(2016)*, Table 1.9; HB 1417, House Consumer Affairs Hearing, Chairman Gladys M. Brown Testimony (8/25/15), p. 2



Universal Service: Broadband Burdens

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- Telephone alone has the Carrier of Last Resort (COLR) to serve all*
- Companies getting FCC money must provide voice and BB (COLR).*
- Cable and others (CLECs) provide voice/BB but have no COLR.*
- Broadband is costly to build (Capex) and operate (Opex) in rural areas.*
- FCC gives money to build networks to do voice and, now, broadband.*
- BIAS was Title II telco in 2017 but reclassified as information in 2018.*
- **Deployment** means **Availability** (Got it?) and **Affordability** (Buy it?)*
- **Deployment** stimulates health, education, and economic development.

Source: 66 Pa.C.S. § 3011 et seq. and 47 U.S.C. § 254; *In re: CAF*, Docket 10-90 (11/18/11) aff'd *In re: FCC*, 753 F.3d 1014 (10th Cir. 2014), cert den. Nos. 14-610 (5/4/15); 47 U.S.C.A. §§ 332, 601 et seq. and 701 et seq.; *In re: National Broadband Plan*, Docket 09-51 (FCC Staff Update 9/29/09), slide 44; *In re: CAF*, Docket 10-90 (11/18/11) aff'd *In re: FCC*, 753 F.3d 1014 (10th Cir. 2014), cert den. Nos. 14-610 (5/4/15); *In re: Open Internet*, Docket 14-28 (3/12/15), aff'd *USTA v. FCC*; Docket No. 15-1063 (DCCA 6/14/16); *Restoring Internet Freedom Order*, WC Docket No. 17-108, FCC 17-166 (Released on January 4, 2018), FCC upheld *Mozilla v. FCC*, DCCA: Docket No. 18-1051 (October 1, 2019), Petitions for Rehearing En Banc (December 12, 2019); NARUC Telecommunications Staff Subcommittee, *Rural Universal Service Reform* (November 8, 2015), J. Witmer, Pa. PUC, editor; Hudson & Parker, *Electronic Byways: State Policies for Rural Development Through Telecommunications*, (Westview: Aspen Institute, 1992);



Universal Service: Broadband Platforms

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- Wireline – USF recipients must provide BB at 1/10 Mbps over 5 years; FCC says fiber gives nearly unlimited scalability and performance.*
- Wireless – CTIA states wireless is not equal to wireline; FCC says it is no substitute for wireline in January 2016 and February 2018; needs wireline for backhaul.*
- Cable – relies on Docsis 3.0, mostly present in residential areas due to cable video legacy but expanding into business enterprise markets.*
- Satellite – FCC said broadband is fixed and wireless BIAS, satellite may not meet the 3/25 Mbps standard; has VoIP latency & multiplayer limits; capacity constraints*
- Broadcast – Local content provided over the air with retransmission costs larger for COLR carriers than cable or satellite; concern with ownership concentration*
- Internet Protocol (IP) Networks –Header-Load software manage IP traffic; IP Header gives sender, receiver, content, nature, priority; Netflix a major user.*
- Fixed Wireless – Point to Point or Point to Multipoint broadcast; needs open Line of Sight (LOS); geography & distance limits; Fresnel effect (distortion) with open LOS*

*Sources: *In re: CAF*, Docket 10-90 (12/18/14), para. 4 and *In re: Nat'l Broadband Plan*, Docket 09-51, Staff Update (9/29/9), slide 38; *In re: Open Internet*, Docket 14-28, CTIA Ex Parte (9/4/14) and *FCC Broadband Progress & Section 706 Rpt*, Docket No. 15-191 (1/29/16), para. 17 & Section 706 Report (2018), Docket No. 17-199 (February 2018), para. 18; *FCC Local Competition Report*, (October 2014), Fig. 4-8 and HB 1417, House Consumer Affairs Hearing, Tourje Testimony (8/2/15), pp. 2-3; *In re: Broadband Progress & Section 706 Report* (January 29, 2014), para. 18 and *In re: CAF III Auction*, Docket No. 10-90 (May 26, 2016), para. 30; and Jeff Baumgartner, "New Hughes/EchoStar Satellite to Deliver 100 Mbps-Plus" Multichannel News (8/11/17) <http://www.multichannel.com/news/distribution/new-hughesechostar-satellite-deliver-100-mbps-plus/14552>; *In re: Retransmission*, Docket No. 10-71 and Frontier & CenturyLink Ex Parte (3/24/14) and John Hendel, "How Trump's FCC Aided Sinclair Expansion," Multichannel News (8/6/17) <http://www.pollit.co.com/story/2017/08/06/trump-fcc-sinclair-broadcast-expansion-241337>; Edward Felton, Nuts & Bolts of Network Neutrality (Prof. of CompSci & Public Affairs, Princeton University; 2006) <http://policy.princeton.edu/pub/neutralty.pdf>; *In re: Broadband National Plan*, Dockets 09-51, Pa. PUC Comments (7/15/10), (10/12/10); *In re: Open Internet*, Docket 14-28, Pa. PUC Comment (3/28/14); NARUC Telecommunications Staff Subcommittee, *Federal Universal Service* (November 8, 2015), J. Wiltmer, Pa. PUC, editor and Todd Spangler, Netflix Uses 37% of Bandwidth (Variety Magazine May 28, 2015) on <http://variety.com/2015/digital/news/netflix-bandwidth-usage-internet-traffic-1201507167/>; *In re: Section 706 Report*, Docket No. 17-199 (February 2018), para. 51, n. 148.



New Platforms: DAS

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- Distributed Antenna Systems (DAS)
- Uses femtocell or small cells dispersed on poles or roof
- Subdivides scarce spectrum to send over fiber
- Essential to G5 wireless service
- DAS can serve one carrier or many carriers (Crown Castle for ATT, Verizon, Sprint, T-Mobile)



DAS in PA

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- Pa.PUC certified DAS as a public utility which granted Rights-of-Way access and Eminent Domain power.
- Pa.PUC certified DAS as “wholesale telecommunications” until 2017; no longer certifying.
- Pa.PUC decision is under appeal in the Pa. courts
- Pa. Assembly is considering law for siting; HB1620.
- FCC looking at how “state practices” may impede DAS.



New Hope: Blimps & Satellite

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- Altaeros
- \$7.5M in SoftBank Group funding (owner of Sprint);
- Develops autonomous aerostats
- Proposes reliance on SuperTower, a project that uses Altaeros' tethered balloons (blimps) to bring broadband wireless to rural areas*
- FCC Section 706 Report (February 2018) notes that ViaSat and Hughes may sell 25/3 but constraints can limit the number of consumers able to get it.*

[Altaeros gets SoftBank boost for rural broadband balloons](#) TechCrunch (8/8) ; *Section 706 Report* , Docket No. 17-199 (February 2018), para 51 and n. 148.



New Hope: Fixed Wireless

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- Two : Point-to-Point (PTP) & Point to Multipoint (PMT)*
- Uses broadcast and needs unobstructed Line of Sight (LOS) from tower to receiving point or multipoint to work*
- Can be less expensive than fixed wireline service*
- Technology changing; maybe useful in high-cost areas*
- Limitations: Geography (hills); distance (7 miles) & Fresnel effect (distortion based on physics) w/wo clear LOS*

<https://www.cio.com/article/2440978/wifi/the-last-mile-fixed-wireless.html> (2002 basic science); <https://www.fiercewireless.com/5g/startup-to-expand-its-50-200-mbps-fixed-wireless-service-to-16-major-markets-during-2018>; <https://www.lifewire.com/5g/5g-fixed-wireless-broadband-internet-access-818318>; <https://www.broadcastingcable.com/news/broadband-coalition-proposes-new-fixed-wireless-service-166686>; <http://www.whichvoip.co.za/blogpage/advantages-and-disadvantages-fixed-wireless-connectivity-business>; <http://www.digitalairwireless.com/wireless-blog/recent/fresnel-zones-what-are-they-and-why-are-they-so-important.html>; https://www.researchgate.net/publication/224306981_Ray_Tracing_with_Fresnel_Zone_Theory_for_Fixed_Wireless_Access_Channel_Characterization; <https://blandinonbroadband.org/2018/02/14/wireless-to-the-rescue-the-pros-and-cons-of-fixed-wireless/>; <http://blog.oner10networks.com/explaining-the-pros-and-cons-of-fixed-wireless-internet/>; <https://succeed.net/facts/understanding-line-sight-limitations-fixed-wireless/>



Why New Networks Matter

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- Critical for wireline & wireless backhaul*
- The Future: Demographics of NextGen (ITU Study)*

70% of ages 15 to 24 use the internet;
94% of the 70% are in developed countries

104 nations have 80% or more of 15-24 online

830 million young people of 15-24 are online,
320 million (39%) are in China and India.

80% of fixed, high-speed BB at 10 Mgbps in developing nations are in China; wireless is cheaper.

*Shawn Buckley, "Zayo's Caruso: Sprint, wireless industry's backhaul plans validate fiber's importance," Fierce Telecom (8/16/17), <http://www.fiercetelecom.com/telecom/zayo-s-caruso-sprint-wireless-industry-s-backhaul-plans>;
International Telecommunication Union, ICT Data & Statistics Division, ITU Data Visualisation Tool (July 2017), <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2017.pdf>



Wireline and Wireless: The FCC's 2016 View

Joseph K. Witmer
Pa. PUC 2016

[w]e find that consumers have advanced telecommunications capability only to the extent that they have access to both fixed and mobile broadband service. As they currently exist, fixed and mobile broadband services are not functional substitutes for one another, as some commenters have suggested.

FCC Section 706 Report, Docket No. 15-191 (January 29, 2016), paragraph 17.



Wireline and Wireless: The FCC's 2018 View

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Pa. PUC 2018

At the same time, we disagree with those that argue that mobile services are currently full substitutes for fixed service. Both fixed and mobile services can enable access to “information, entertainment, [and] employment options,” but there are salient differences between the two technologies.

FCC Section 706 Report, Docket 17-199, (February 19, 2018), Paragraph 18



CTIA Explanation

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Pa. PUC 2018

- Fixed networks have significantly higher capacity and predictability of resource requirements, whereas mobile networks are far more capacity constrained, with constantly changing user requirements and operating environments. Fixed networks involve channels that are relatively clean with signal regeneration, while mobile channels are impaired with interference, multipath and blockage, varying by location and from one millisecond to the next.

In re: Open Internet & Net Neutrality, CTIA Ex Parte, Docket 14-28 (9/4/14).



Broadband Economics: US and PA

Joseph K. Witmer
Pa. PUC 2018

- FCC fund spent \$8.5B on four programs in 2015, i.e., high cost, low-income, (lifeline), schools & libraries (e-rate), and rural health.*
- \$4.5B of \$8.5B supports COLR carriers in rural and tribal high-cost areas.*
- \$50B for a nationwide 10-39 Mbps network; \$350B for 100 Mpbs.*
- PA paid \$169M more into the FCC fund in 2015 than PA got after deducting support for high cost areas, lifeline, e-rate, and rural health.*
- At 4.9M households with 2.5 per household and \$169M to USF, annual cost is about \$34.48 per year or \$2.87 per household per month.*
- The statewide average does not separate households served by carriers who got more than they paid (rural carriers) from households served by carriers who paid more then they got (Verizon).

Source: FCC Universal Service Monitoring Report (2016), Table 1.9; *In re: Broadband National Plan*, Docket No. 09-51, FCC Staff Update (9/29/9), slides 38, 44, and 47; Census Facts U.S. Census Bureau, <http://www.census.gov/quickfacts/table/PST045215/42>



Broadband in Pennsylvania: Chapter 30

Joseph K. Witmer
Pa. PUC 2018

- 100% broadband at speeds of 128 kpbs up/1.5 Mpbs down;
- 3014(b)(5): broadband availability 10 days of request;
- Section 3014(g): technical support to political subdivisions;
- Section 3015(h): LEC right of first refusal; local broadband;
- 3015(a)(2): PUC oversight.
- \$969.01M in rate increases since 2005;* all were not collected (mostly smaller); rates can increase in the future.*
- Some legislators are interested in revising Chapter 30 and state universal service support.

Source: In re: CAF II Auction Process, Docket No. 01-92, Pa. PUC Comments, (July 21, 2016), p. 6; *But see* In re: Intercarrier Compensation, Docket No. 01-92 (Missoula Plan), Pa. PUC Reply Comments 12/22/8), Appendix D (\$1.2B through 2008 including state USF distributions); 66 Pa. C.S. § 2015(a)(2).



Fixed Rural Broadband Today: PA > US But Still Challenged

Joseph K. Wiltmer
Pa. PUC 2018

	2016 Report Section 706*		2018 Report Section 706*	
	Urban	Rural	Urban	Rural
PA	271K	532K	178K	472K
w/o %	3%	20%	1.8%	17.3%
US	10.5M	23.4M	5.4M	9.3M
w/o %	4%	39%	2.1%	30.7%

Source: Section 706 Report, Docket No. 15-191 (January 2016), Appendix D; Section 706 Report, Docket No. 17-199 (February 2018), Appendix D1. CAVEAT: rural definition reflects 2010 census block classification, presumes census block is served if one location is served, relied on advertised speeds, concedes that data may overstate service; recognizes satellite may serve but capacity constrains may limit the number of consumers getting service, concludes that wireline and wireless service are not the same. Section 706 Report, Docket No. 17-199 (February 2018), App. C, p. 18, n. 128, para. 43, p. 19, n. 133, p. 128, n. 62, App D-1, p. 62; *In re: CAF*, Docket 10-90 USCS EX Parte (2/25/16)



Mobile Rural Broadband Today: PA > US But Still Challenged

Joseph K. Witmer
Pa. PUC 2018

	2018 Report 5 Mbps/1Mbps*		2018 Report 10 Mbps/3Mbps*	
	Urban	Rural	Urban	Rural
PA (with)	10.05M	2.703M	11.6M	2.0M
without %	0%	.08%	4.5%	12.9%
	(12.774M counted)		(12.178M counted/ 596K not)	
US (with)	259M	62.9M	229M	33M
Without %	0%	1.3%	9.5%	29.9%
	(all 322M counted)		(300.03M counted; 19M not)	

CAVEATS: 5/1 is standard for areas getting MF II support and 10/1 is standard MF II recipient must build; Reflects centroid service area, Does not mean service is actually offered, Uses advertised speeds of carriers and Ookla speed test, Counties with less than 300 measurements are excluded (7% of American counties) for 10/3 mobile speed. Source: In re: MF II, Docket No. 10-208, FCC Order (8/4/17), para. 15-17, FCC Order (2/28/18), para. 10, FCC Section 706 Report, Docket No. 15-191 (January 29, 2016), Para. 46, n. 133 and 135, Para. 48, n. 141 and n. 142, n. 152, Table 3b, n. 154, and Table D1.



Voice: PA > US

Joseph K. Witmer
Pa. PUC 2018

By Numbers:

- US: 96.4% of Americans have voice service
- PA: 98.8% of Pennsylvanians have voice service*

By Income:

- 10K: 98.8% for PA versus 96.0% for US or 2.8% difference
- 30K: 99.1% for PA versus 97.7% for US or 1.4% difference
- 40K: 99.5% for PA versus 98.1% for US or 1.4% difference

By Impact

- With 4.9M households, 1% means 49,000 more Pennsylvania households have service compared to the national average.
- With 4.9M households, 2% means 98,000 more Pennsylvania households have service compared to the national average.
- Impact likely larger in rural areas given their overall lower incomes.



Why?

Joseph K. Witmer
Pa. PUC 2016

- Others lack a state USF
- Others completely deregulated all retail voice services rates and QOS.
- Others lack regulatory policy aimed at preserving universal service
- Others did not rely on consumer rate increases alone to fund broadband.

BUT

Let not the Perfect or Preferred be the Enemy of the Possible.



10 Point Summary

Joseph K. Witmer
Pa. PUC 2016

- Two “last mile” network owners serve most with 25 Mbps
- RBOCS had most areas without broadband; FCC reforms reduced rural carriers’ support to support the RBOCS; today’s speed is 25/3 with mobile.
- Broadband costs increase with speed; 50B to 350B.
- Broadband rates increase with speed.
- Federal fund is tiny given the cost; PA fund is very small.
- Wireless is no substitute for wireline; both are needed
- Consumers choice is mostly cable and/or telco BIAS.
- Consumers want speed and mobility; FCC sees that.
- BIAS went from Title II telco to information in one year.
- FCC supports BIAS networks and low-income voice & BIAS.



Questions

Joseph K. Wiltmer
Pa. PUC 2018



Appendix B

Filings of the Commission on BIAS at the FCC.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of

Framework for Broadband Internet Service

GN Docket No. 10-127

A National Broadband Plan for Our Future

GN Docket No. 09-51

COMMENTS OF
THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

The Pennsylvania Public Utility Commission (PaPUC) hereby submits these Comments in response to the Federal Communication Commission's (FCC) Public Notice of Inquiry issued on June 17, 2010 (the *Title II Reclassification NOI*). The FCC set deadlines of July 15, 2010, and August 12, 2010, for filing Comments and Reply Comments, respectively.

The PaPUC appreciates the opportunity to file Comments. As an initial matter, the PaPUC Comments should not be construed as binding on the PaPUC in any proceeding before the PaPUC. Moreover, these Comments could change in response to subsequent events. This includes a later review of other filed Comments and legal or regulatory developments at the federal or state level.

The *Title II Reclassification NOI* asks a very basic, and critically important, question about the regulatory classification of the "internet connectivity service" component of "broadband internet service" under state and federal law. The FCC's resolution of this legal issue, particularly after the federal court's decision in *Comcast v. FCC*, 600 F.3d 642 (DC Cir. 2010) (*Comcast*) effectively voided the FCC's reliance on

Title I ancillary authority, is critical to pending consideration of the National Broadband Plan and, equally important, deployment and delivery of advanced telecommunications and information services to all Americans.

Before *Comcast*, the FCC relied on Title I ancillary authority to impose “telecommunications like” obligations on Voice over Internet Protocol (VoIP) providers (such as Local Number Portability, Universal Service support, and Telecommunications Relay Service). Moreover, the FCC also relied on the statutory provisions governing Communications Assistance for Law Enforcement Agencies (CALEA) in determining, in part, that VoIP was a “successor technology” to traditional telecommunications.

The FCC now asks if: (1) this current “information service” classification remains adequate to support effective performance of the FCC’s responsibilities; (2) classifying the “internet connectivity service” component of broadband service as a “telecommunications” service and applying *all* the requirement of Title II is appropriate; and (3) a “third way” is appropriate in which the FCC would classify the “internet connectivity service” as “telecommunications” *but* forbear from applying *all* provisions of Title II except for those needed to implement universal service, competition and small business opportunity, and consumer protections.¹

The PaPUC applauds, and supports, the FCC’s willingness to address this controversial, but fundamental, legal question.

The PaPUC supports a modified common carriage approach, albeit one that does not preempt state law or forbear from state responsibilities for ensuring telecommunications or telecommunications service to the extent that this “internet

¹ *In re: Framework for Broadband Internet Service*, Docket No. 10-127 (June 17, 2010), para. 2.

connectivity service” is intertwined with legitimate state concerns. This is consistent with the PaPUC’s prior filings.²

The FCC is fully aware that the PaPUC’s refrain on universal service has been that Early Adopter states must not be penalized for undertaking efforts at promoting competition; ensuring open access, and reforming local rates, lowering access rates, and creating state universal service funds before other states or the FCC. The FCC can accomplish all of the professed goals in the *Title II Reclassification NOI* in a manner that preserves, and does not undermine or harm, state law.

The PaPUC has consistently stated that a primary way to achieve these goals is by preserving the common carriage approach.³ Common carriage provides legal certainty, ensures joint jurisdiction, and allows state commissions to address local concerns in a cost effective manner compared to relegating all telecommunications matters to the FCC.

Of course, the PaPUC recognizes that the traditional panoply of pricing and tariffing in place under the current common carriage approach may not be appropriate.⁴ The PaPUC, however, maintains that modified common carriage is necessary so that all providers seeking to deliver services to customers over the PSTN, albeit a Public Switched Transportation Network or a Packet Sending Transmission Network, will be shouldering an appropriate portion of the total FUSF and, now, network access.⁵

The PaPUC suggested then, and repeats today, that a modified form of common carriage might well be the most effective, if not the only, way of providing open access to all facilities and ensuring support for whatever programs the FCC decides to support

² *In re: High-Cost Universal Service Support and Federal-State Joint Board*, Docket Nos. 05-337 and 96-45 (April 17, 2008) (hereinafter PaPUC Comments).

³ PaPUC Comments, p. 22.

⁴ PaPUC Comments, pp. 22-23.

⁵ PaPUC Comments, p. 22.

from the FUSF.⁶ This may well come to include broadband deployment and/or support for broadband services under the National Broadband Plan or its successors.

The PaPUC's support for a modified common carriage is not without limits. For one thing, the diversification in the current communications market may prevent the imposition of mandatory minimums on every device or service while, at the same time, the imposition of federal maximums could discourage investment. Consequently, the FCC may have to limit the scope of any "internet interconnectivity" classification.

For another thing, the PaPUC notes that the *Title II Reclassification NOI* lists several provisions of federal law governing universal service, public safety, access by persons with disabilities, privacy, homeland security, and harmful internet practices i.e., unreasonable disruption practices or secret interruptions.⁷ However, the FCC's NOI is significant in its silence on whether any state authority, as an historic joint regulator of "telecommunications" under state and federal law, will continue to apply to this proposed "broadband interconnectivity" service.

The PaPUC is gravely concerned, and could not support, a result in which the FCC preempts the states or reaches a forbearance decision that leaves the states with no viable role. An FCC decision that reclassifies the "broadband interconnectivity service" as "telecommunications" or "telecommunications service" must respect state law.

Several reasons support this approach. First, the PaPUC recognizes that traditional Title II regulation may be unworkable in today's technological market and possibly contravene existing state law if authority retained by the states is overturned by the FCC.⁸ Also, the PaPUC doubts that even the FCC's expansive authority under Title

⁶ *PaPUC Comments*, pp. 22-23

⁷ *In re: Broadband Internet Service*, Docket No. 10-127 (June 17, 2010), para. 32, 39, 40, 41, 42.

⁸ *VoIP Freedom Act*, 73 Pa.C.S. § 2251.1.

II and preemption or forbearance can include servers or routers connected to the United States network through nodes located in Europe, Asia, or Latin America. Moreover, states have restricted rate regulation and consumer protection for Internet Protocol (IP) or VoIP retail services. Consequently, any FCC action must be cognizant of these realities and avoid preemption or forbearance that overrides state law or prevents a state commission from participating in federal efforts.

However, the FCC's proposal for a "modified common carriage" is consistent with the federal definition for "information service" and the exception to the exclusion for "information service" under federal law. The definition holds that a change in protocol related to the management, control, or operation of a telecommunications system or the management of a telecommunications service is not "information service" but, instead, becomes telecommunications under federal law.⁹

The FCC's decisions interpreting Pennsylvania law view Pennsylvania law as consistent with federal law.¹⁰ In turn, the PaPUC relied on FCC interpretations of federal law to avoid preemption or forbearance for decisions made under state law.¹¹

Consequently, the FCC and the state commissions would be within the confines of this "exception to the exclusion of information service" if a provider is changing protocol to facilitate communications over the PSTN, albeit a traditional or modernized PSTN. This same provision preserves the "joint jurisdictional" approach that has been a hallmark

⁹ *Title II Reclassification NOI*, para. 59, n. 170.

¹⁰ *Fiber Technologies v. North Pittsburgh*, File No. EB-05-MD-014 (February 23, 2007) (*Fiber Technologies*).

¹¹ *Palmerton Telephone Company v. GNAPs*, Docket No. C-2009-2093336 (March 16, 2010); Application of *Sprint Communications Company L.P. For Approval of the Right to Offer, Render, Furnish or Supply Telecommunications Services as a Competitive Local Exchange Carrier to the Public in the Service Territories of Alltel Pennsylvania, Inc., Commonwealth Telephone Company and Palmerton Telephone Company*, Docket No. A-310183F0002AMA, A-310183F0002AMB, A-310183F0002AMB (December 1, 2006).

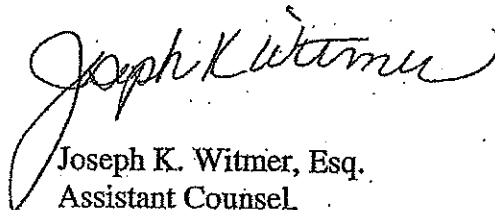
of regulatory oversight for network facilities, "telecommunications," and "telecommunications service" under state and federal law.¹²

Finally, a modified common carriage approach that retains state authority better reconciles the FCC's preservation of federal authority to ensure open access with state jurisdiction. Of necessity, moreover, a federal solution that preserves state authority must address the difficult questions of consumer protections and federal support for state work on federal goals, particularly the difficult issue of authorizing the states to impose a modest assessment on interstate revenues in support of federal efforts.¹³

The PaPUC appreciates the opportunity to file these Comments. The PaPUC reiterates that the positions taken in these initial Comments are general and may change, particularly following review of the other filed Comments.

Respectfully submitted,

Pennsylvania Public Utility Commission



Joseph K. Witmer, Esq.
Assistant Counsel,
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street
Harrisburg, PA 17120
(717) 787-3663
Email:joswitmer@state.pa.us

Dated: July 15, 2010

¹² *Fiber Technologies*, para. 12 and 15.

¹³ PaPUC Comments, pp. 16-17.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of Framework for
Broadband Internet Service

GN Docket No. 10-127

A National Broadband Plan for Our Future

GN Docket No. 09-51

Issues in the Open Internet Proceeding

WC Docket No. 07-52

**FURTHER COMMENTS OF
THE PENNSYLVANIA PUBLIC UTILITY COMMISSION**

The Pennsylvania Public Utility Commission (PaPUC) files these Comments to the FCC's Notice of Inquiry issued on September 1, 2010 (the *Further NOI*). The *Further NOI* set deadlines of October 12, 2010, and November 4, 2010, for filing Comments and Reply Comments, respectively. These PaPUC Comments should not be construed as binding on the PaPUC in any matter before the PaPUC. Moreover, the Comments could change in response to subsequent events, including review of other filed Comments and legal or regulatory developments at the state or federal level.

The PaPUC's prior comments in the *Title II Reclassification NOI (Initial NOI)* broadly supported a modified common carrier Title II approach for "Internet connectivity service" or "broadband Internet access service" under state and federal law. These PaPUC Further Comments reiterate that a modified common carrier approach, so long as it does not preempt the states and properly reflects changes in technology and service platforms, is appropriate for "managed," "specialized," or "other" services, including wireless Internet connectivity service. These comments reflect, and incorporate, PaPUC comments that have been filed in other FCC proceedings such as the *Universal Service* at Docket 96-45, *Intercarrier Compensation* at Docket No. 01-92, *Separations* at Docket 80-286, and the *Broadband National Plan* at Docket No. 09-51 given their complex interrelationship. A copy of these Further Comments will be filed there as well.

General Issues in the Notice of Inquiry

A Modified Common Carrier Framework Is the Preferred Approach.

The *Further NOI* seeks comment on the regulatory treatment of “managed” or “specialized” service when those services are provided over the last-mile wireline facilities. These classifications would exclude “managed” or “specialized” services from that modified common carriage classification.

The FCC then asks if the open Internet rules applicable to “Internet connectivity service” as a Title II common carrier service should apply to “mobile wireless Internet access service” as well. This proposal may exempt “wireless” providers of “Internet connectivity service” from any Title II modified common carrier rules imposed on “Internet connectivity service” provided over wireline facilities. This apparently reflects the limitations in spectrum-based wireless “Internet connectivity service” when delivering wireless “Internet connectivity service” that is used to provide Internet broadband service.¹ This *Further NOI* also seems to reflect the recent legislative proposal of Verizon Communications, Inc. (Verizon) and Google announced on or about August 9, 2010.²

In the *Initial NOI*, the FCC asked if the “Internet connectivity service” physical connection used to provide “broadband Internet service” should be classified as “telecommunications” under Title II. The *Initial NOI* addressed an earlier federal appellate court decision in *Comcast v. FCC*, 600 F.3d 642 (DC Cir. 2010) (*Comcast*), a decision that restricted the FCC’s reliance on Title I ancillary authority to adequately address an broadband Internet Access Service under federal law.

¹ See, for example, Ex Parte *CTIA Presentation on Net Neutrality* to FCC Commissioner Meredith Atwell Baker (September 20, 2010), p. 2 (“wireless is limited by spectrum availability and the physical limits of its capacity”), *emphasis added* and p. 4 (“as few as 5% of users can monopolize cell capacity” and “the use of BitTorrent, unknown to the consumer, almost brought an entire cell site down”), *emphasis supplied*.

² *Verizon, Google Unveil Legislative Proposal for Open Internet Principles, FCC Authority*, TR Daily (August 9, 2010). *Verizon-Google Legislative Framework Proposal*, August 10, 2010. Internet http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/googleblogs/pdfs/verizon_google_legislative_framework_proposal_081010.pdf, accessed September 1, 2010 (Verizon-Google proposal).

The PaPUC supports a modified common carriage approach that preserves joint jurisdiction and the mandate of non-discrimination for broadband access to telecommunications and communications facilities and services. The FCC must not preempt state law or impose forbearance results that prevent state commissions from resolving real “on the ground” issues. This includes intercarrier compensation, interconnection between competing carriers, and protection of consumer interests including adequate quality of and non-discriminatory access to various services that are provided over broadband access facilities.

Pennsylvania law gives the PaPUC limited authority over retail end-user “rates” or “consumer protections” for certain Voice over the Internet Protocol (VoIP) retail services. 73 P.S. § 2251.4. That same law preserves PaPUC authority in many critical areas. These include arbitrating interconnection disputes and ensuring that carriers who own facilities are properly compensated, or compensated at all, for common carrier services that are rendered on their networks. The PaPUC has authority in “public policy” areas, like support for 911, universal service, Telecommunications Relay Service (TRS), and “protected” intrastate services that continue to be provided under tariffs.³

The PaPUC positions have consistently attempted to mesh federal and state law with federal and state concerns.⁴ Today’s comments examine modified common carriage with Internet Protocol (IP) and legitimate network management of IP, particularly given the evolving market for transmission of “broadband internet service” using IP technology.

³ These include basic local exchange, touch-tone, switched and special access, and ordering, installation, restoration and disconnection of these services. See 73 P.S. § 2251.6 and 66 Pa. C.S. § 3012.

⁴ See, *In re: USF and Joint Board*, Docket Nos. 96-45 and 03-109 (July 30, 2010) (*PaPUC 2010 Joint Board Comments*); *Framework for Broadband Internet Service*, Docket Nos. 10-127 and 09-51 (July 15, 2010) (July 2010 PaPUC Comments); *In re: Section 706 Inquiry*, Docket No. 09-137 (December 21, 2009) (December 2009 PaPUC Comments); *In re: High-Cost Universal Service Support and Federal-State Joint Board*, Docket Nos. 05-337 and 96-45 (PaPUC Comments: April 17, 2008) (PaPUC April 2008 Comments).

Modified Common Carriage, IP Technology, and Interconnection.

The PaPUC does not believe that the introduction of IP “packet technology” over fiber or available spectrum has so dramatically altered “telecommunications” or “communications” compared to earlier copper networks and analog technology that a new regulatory classification is necessary. The copper-analog technology was subject to Title II common carriage and Joint Jurisdiction between the FCC and the states. The current fiber-digital technology should be classified as Title II modified common carriage. While the technology differs, the underlying principles remain the same. Importantly, joint FCC and state authority must be preserved.

With both technologies, citizens communicate with each other. The major difference is that with fiber-digital technology there are more applications, more providers, and more platforms that generate revenues from providing IP-based communications. The new applications and technology allows citizens to separate, or combine, their voice communication (including texting) with data or video. Previously, there was little integration and no texting on copper-analog networks confined to voice.

The new IP packet technology used to provide these communications is not the result of a purely “free market” innovation funded by investors and private venture capital. IP was created for the publicly-funded DARPA-Net.⁵ In turn, DARPA-Net was a network funded by the U.S. Department of Defense Advanced Research Projects Agency (DARPA) so that nuclear researchers at university and defense institutions could communicate over a national security network not otherwise available for commercial use. When the ban on commercial use of DARPA-Net was removed in the 1990s, the newly-privatized network became the Internet. It now delivers voice, data, and video using IP technology.

⁵ <http://www.inetdaemon.com/tutorials/internet/history.shtml>

IP technology relies on “packets” with three components. These are headers (which identify the origin, nature, destination, and speed of a communication), load (the communication), and footers (information at the end of a load). IP technology relies on standard protocols and bursts of light to send packets at the speed of light through routers and services on networks. Invariably, the transmission of IP-based traffic with and through the traditional public switched telephone network (PSTN) still relies on conversions and re-conversions of IP-based traffic to Time Division Multiplexing (TDM) protocols.

The wireline physical facilities used to deliver IP “packet technology” in this interconnected manner are mainly within the province of two groups of facility owners and operators that may also provide their own content such as video and various information services, i.e., the cable and telecommunications companies.⁶ On the other hand, approximately 95% of the nation’s wireless wholesale minutes are provided by three carriers all of whom are substantially unregulated affiliates of incumbent local exchange carrier⁷ (ILEC) holding companies. These ILEC holding companies still have a considerable market presence and a significant degree of reliance on the TDM transmission protocol of their more traditional PSTN facilities that nevertheless includes significant capital investment in both retail and wholesale broadband facilities.

Above these Internet-TDM connections and protocol conversions, IP networks use “peering” between Tier 1 network owners and Tier 2 providers.⁸ There, Tier 1 network owners exchange traffic on a “bill and keep” basis whereas Tier 2 providers and others below that Tier 2 pay proprietary rates to Tier 1 owners for transmission. Importantly,

⁶ *In re: IP-Enabled Services*, Docket 04-36, MCI Comment, (May 28, 2004), pp. 13-20; *In re: IP-Enabled Services*, Covad Comment (May 28, 2004), pp. 7-17. Their comments endorsed “information service” for services and “telecommunications” for the facilities consistent with Pennsylvania and federal law. *Fiber Technologies v. DOE*, Docket EB-05-MD-014 (February 27, 2007); *In re: Time Warner*, WC Docket 06-55 (March 1, 2007).

⁷ *In re: Applications for Consent to the Transfer of Control from Nextel Communications, Inc. to Sprint Corporation*, WT Docket No. 05-63, Joint Declaration of Stanley M. Besen, et al. (February 8, 2005), para. 51, p. 9.

⁸ See generally http://en.wikipedia.org/wiki/Tier_1_network and <http://www.bing.com/search?q=peering&src=IE-Address>.

the majority of the current Tier 1 backbone connection providers are themselves associated with large incumbent carriers, either nationally or internationally.

Given these considerations, the PaPUC broadly supports classifying the “internet connectivity service” used to provide broadband Internet service under a Title II modified common carriage framework that maintains an appropriate role for state regulatory agencies. Moreover, the service provided over that Title II connection is the Internet, a network now providing voice, data, and video content.

State utility commissions have increasingly utilized Title II common carrier principles and state laws consistent with applicable federal law in order to resolve intercarrier compensation disputes that involve the wholesale telecommunications transmission function of IP-based traffic such as VoIP.⁹ The FCC and the states are within the law to classify “managed service” or “wireless” as Title II modified common carriage given the public interest in “Internet connectivity service” on telecommunication network facilities and Pennsylvania law is consistent with federal law in this respect.¹⁰

Modified Common Carriage and Packet Management.

While IP technology is used to provide voice, data, and video service, all IP-packets are not alike.¹¹ Voice packets require “real time” priority to prevent jitter, latency, and dropped conversations. Data packets can be disassembled and rearranged without a noticeable decline in service quality. Video relies on “buffer” memory to store, and resend, transmission without a noticeable decline in quality.

⁹ Compare 73 Pa.C.S. § 2251.1 et seq. (Pennsylvania’s “VoIP Freedom” law); *Palmerton Tel. Co. v. GNAPs*, (Pa. Docket No. C-2009-2093336 (Pa. PUC March 16, 2010)); *Rural Telephone Company Coalition v. PaPUC*, 941 A.2d 751 (Pa. Cmwlth. 2008) with *Fiber Technologies v. North Pittsburgh*, File No. EB-05-MD-014 (February 23, 2007) (*Fiber Technologies*) and *In re: Time Warner*, Docket No. 06-55 (2007).

¹⁰ Compare 73 Pa.C.S. § 2251.1 et seq. (the “VoIP Freedom” law); *In re: GNAPs*, Docket No. C-2009-2093336; *Rural Telephone Company Coalition v. PaPUC*, 941 A.2d 751 (Pa. Cmwlth. 2008) with *Fiber Technologies v. North Pittsburgh*, File No. EB-05-MD-014 (February 23, 2007) (*Fiber Technologies*) and *In re: Time Warner*, Docket No. 06-55 (2007).

¹¹ Edward W. Felton, “Nuts and Bolts of Network Neutrality,” 24th Annual Institute on Telecommunications Policy and Regulation, 223-334 (Practicing Law Institute: 2006), pp. 223-334.

These packet differences necessitate network management in definitions adopted as a component of modified common carriage. Current federal law contains a definition of "telecommunications" that generally excludes "information service" from telecommunications subject to Title II. However, the "information service" definition contains an exception for network management. In that case, the network management "exception to the exclusion of information service" puts network management within Title II. The network management exception applies here.

Based on that, the PaPUC urges the FCC to recognize these differing packet needs and develop the appropriate classes for "packets" as part of the modified Title II reclassification of "managed service" and "wireless" service. These could be "packet management" and "packet discrimination" in general rules.

The "packet management" classification, if adopted as a component of modified common carriage, could recognize the legitimate and differing needs of voice, data, and video packets. This requires management of networks to ensure that voice packets get the "real time" priority needed to prevent jitter and latency. In addition, there may be instances where public health (telemedicine), public safety (homeland security or 911 calls), public access (at schools and libraries), or discrete types of communications (e.g., various forms of telecommunications relay service or TRS) could warrant "real time" prioritization based on the public interest. Federal law and consistent state laws and regulatory practices already and largely address these areas.

The "packet discrimination" classification, if adopted as a component of modified common carriage, could prohibit network management practices in which a network facility owner competing to provide content with other content providers prioritizes their "data" or "video" packets over competitor packets and voice or public interest packets. This would include any network owner attempts to wrongfully block access to lawful content, access to websites, allocating preference to affiliated packets over unaffiliated

packets, or using technology like deep packet inspection¹² (DPI) to engage in “packet discrimination” in the guise of “packet management” of a network. A Title II modified common carriage approach would recognize, and address, prioritization of voice and public interest packets in general rules. The PaPUC believes that those general rules will provide network owners, content providers, and end-users with predictability and flexibility that are better than uncertain case-by-case adjudications.

Modified Common Carriage and the Proposed Exclusions for Some Wireline Service.

The *Further NOI* seeks comment on the treatment of “specialized” or “managed” or “other” services provided over a wireline network that is providing voice or Internet connectivity service. Several considerations support a modified common carriage approach equally applicable to shared or single purpose networks.

A network owner faces a fiduciary responsibility to maximize benefit for shareholders and generate the profits needed to attract private investment. The failure to do otherwise may constitute a violation of state and federal law. A network owner that is also a content provider cannot be expected to voluntarily accept a modified common carriage mandate that potentially limits their ability to maximize shareholder benefit by marketing higher-priced, and unregulated, “managed” or “specialized” service to unaffiliated content providers.

The FCC and the states must address the public interest arising when a network owner with a scarce resource, such as control over “last mile” wireline facilities, seeks to allocate those scarce resources to the highest bidder using “paid prioritization” for “managed” or specialized” service. Of necessity, the owner or provider’s fiduciary duties

¹² <https://www.dpacket.org>; <http://www.deeppacketinspection.ca>;
http://www.ranum.com/security/computer_security/editorials/deepinspect

may and can encourage “packet discrimination” that would most likely favor affiliated or highest-bidder packets over unaffiliated or lower-priced voice or public interest packets.

A modified common carrier approach is necessary and appropriate given these competing fiduciary duties i.e., one to the private sector and the other to the public sphere. Public oversight is needed to balance a revenue maximization duty with the public interest duty that is broadly based on historic and well founded non-discriminatory common carriage principles.

In addition, modified common carriage is a tried and true approach, not least because it allocates joint jurisdiction between the FCC and the states. It provides network owners and content providers multiple forums for dispute resolution. Some matters are far more local or national than others. A single forum – namely the FCC – focused on doing all disputes will face various timely enforcement difficulties and administrative burdens.

On the other hand, states continue to possess and develop the required legal and technical expertise to address the same issues with better knowledge of local market conditions and a much better focus on consumer protection whether the consumer is an end-user or wholesale customer of broadband interconnectivity access services.

In sharp contrast, the Verizon-Google Proposal would concentrate the requisite regulatory authority and case-by-case enforcement at the FCC while delegating the necessary fact-finding to “non-governmental dispute resolution processes established by independent, widely-recognized Internet community governance initiatives,” with the FCC giving “appropriate deference to decisions or advisory opinions of such groups.”¹³ The Verizon-Google Proposal goes on to state that its “proposed framework would not affect rights or obligations under *existing* Federal or State laws that generally apply to

¹³ Verizon-Google Proposal at 2.

businesses, and would not create any new private right of action.”¹⁴ However, this framework does not adequately explain *how* it will interact with existing federal (e.g., TA-96) and state laws, particularly those that affect the rights of end-user consumers who purchase broadband connectivity services and may have certain legally founded expectations of reliability, adequacy and privacy.

Modified common carriage also ensures an appropriate alignment of network costs with network revenues using an “interstate and intrastate” revenue allocator similar to that under consideration in the *Separations* docket at Docket No. 80-286.

A modified common carriage approach also avoids the regulatory problems created by the *Vonage Order* with its limited preemption, interpreted by some courts to apply only to “nomadic” VoIP and not “fixed” VoIP. This approach also avoids the *pulver.com* exclusion of “information service” that is free and does not touch the public network from “interconnected VoIP” or other undefined “information service” as well.

A modified form of common carrier classification further avoids the need to differentiate “information service” for voice service under the FCC and state authority in the Communications Act from “information service” under the Law Enforcement Agencies (CALEA) statute which exempts “information service” from compliance with the CALEA mandates. The FCC ultimately parsed the legal definitions of “information service” in both statutes to support the inclusion of “interconnected” VoIP within CALEA notwithstanding *Vonage* and *pulver.com*.¹⁵ The parsing illustrates the long-term consequences of agency decisions that are “result driven” or use “case by case” adjudications as contrasted to the utilization of rules with general applicability.¹⁶

¹⁴ Verizon Google Proposal at 2 (emphasis supplied).

¹⁵ *In re: CALEA*, Docket No. ET 04-295 (August 9, 2004).

¹⁶ See *In re: Review of Data Collection Practices of the Wireless and Wireline Competition Bureaus*, Docket Nos. 10-131 and 10-132, Comments of Professor Frieden (State College: Penn State University). The long-term problem of unpredictability and result-driven analysis undermines the general rule of law, an emerging phenomenon. Jonathan Turley, “Do Laws Even Matter Today”, *USA Today* (June 14, 2010).

Moreover, any exclusion for “managed service” from any “Internet connectivity service” subject to a modified common carrier classification will likely swallow the general rule. That will probably occur because higher-priced, and unregulated, “managed service” or “specialized” or “other service” will be providing the functional equivalent of Internet connectivity service albeit at the higher price some content providers may be able and willing to pay. This ability to leverage these exceptions and undermine the general rule will be compounded if the excluded services are removed from the states’ current authority to resolve interconnection or intercarrier compensation disputes for those services under state law and/or Section 251 of federal law, 47 U.S.C. § 251.

The PaPUC does not support case-by-case adjudications compared to the promulgation of general rules because individual adjudications are more costly than the development of general rules. Adjudications also increase the likelihood of unpredictable “result driven” decisions compared to general rules that provide more predictability. General rules also have the benefit of providing consistency to network owners, content providers, and retail and wholesale end-user consumers of broadband connectivity services. General rules must be broad enough to address most situations yet detailed enough to prevent “packet discrimination” practices.

The *Further NOI* also seeks comment on the advisability of allowing the “bypass” of Title II Internet connectivity service for “other” specialized service. For the reasons set out in these Further Comments, the PaPUC does not support that approach.

Modified Common Carriage and the Proposed Exemption for Wireless Internet Connectivity Service.

The PaPUC does not support any exemption for wireless Internet connectivity service. The proposed exemption is not competitively neutral compared to modified common carriage for wireline service. An exemption would favor wireless service, despite its clear spectrum and capacity constraints, by permitting network owners to

potentially engage in “packet discrimination” to enhance revenues from higher-paying packets. Meanwhile, wireline networks could be held to a modified common carriage mandate, including an obligation to prioritize lower-priced voice or public interest packets.

The PaPUC recognizes that changes in technology for mobile Internet service may be the only way to eliminate current spectrum and capacity constraints. This change, however, does not eliminate the appeal of “packet discrimination” practices if that enhances revenues. Wireless network owners could still market “paid prioritization” for higher-paying packets over lower-paying voice or public interest packets without any accountability because that service is not common carriage. In that case, certain types of mobile services and wireless broadband connectivity may be confined largely to higher income consumers.

Modified common carriage practices should be applied to wireless Internet connectivity service given the capacity and spectrum constraints in the wireless markets.¹⁷ Otherwise, the exclusion from modified common carriage will combine with this volume and capacity service. The end result will likely be more, not less, packet discrimination. That likelihood is even more likely given the absence of regulatory parity in the wireless and wireline markets, most evident in the failure to address the “handset exclusivity” practices allowed for wireless service but prohibited for wireline service.¹⁸

Modified common carriage, on the other hand, gives the FCC and the states regulatory authority to ensure the appropriate “packet prioritization” for voice or public interest packets over other packets. This also ensures that unaffiliated content providers have equal access. Modified common carriage is better than a regulatory exemption that

¹⁷ The AT&T-LEAP proposal to deliver wireless Internet connectivity service priced by volume and capacity appears to allow measured service for IP packet transmission similar to that already provided by measured local service or long-distance calling on a per minute basis in the wireline industry. The major difference is that there is no modified common carriage component in the AT&T-LEAP proposal.

¹⁸ *Petition for Rulemaking Regarding Handset Exclusivity Arrangements*, RM-11479 (RCA Ex Parte Letter of Rebecca Murphy Thompson, August 18, 2010).

will potentially mask "packet discrimination" behind walled gardens in the guise of "network management" of spectrum and capacity constraints.

The adoption of the proposed exemption for wireless Internet connectivity service is inadvisable given the current spectrum and capacity constraints. Moreover, the FCC can no longer rely on its Title I ancillary authority to prohibit packet discrimination for wireless Internet connectivity service given the *Comcast* decision.

Specific Issues in the Notice of Further Inquiry

The Five Principles.

The *Further NOI* identifies five principles in this proceeding. These are:

1. Broadband providers should not prevent users from sending and receiving the lawful content of their choice, using the lawful applications and services of their choice, and connecting the non-harmful devices of their choice to the network, at least on fixed or wireline broadband platforms.
2. Broadband providers should be transparent regarding their network management practices.
3. With respect to the handling of lawful traffic, some form of anti-discrimination protection is appropriate, at least on fixed or wireline broadband platforms.
4. Broadband providers must be able to reasonably manage their networks, including through appropriate and tailored mechanisms that reduce the effects of congestion or address traffic that is unwanted by users or harmful to the network.
5. In light of rapid technological and market change, enforcing high-level rules of the road through case-by-case adjudication, informed by engineering expertise, is a better policy approach than promulgating detailed, prescriptive rules that may have consequences that are difficult to foresee.

The PaPUC notes several problems with these principles. First, the FCC has to define "lawful" content from other content. A major question is the definition of what constitutes "lawful" when applying "what" law is controlling. Second, there must be a better degree of clarity and guidance that delineates the concepts of reasonable network management and reliability with undue discrimination. Under existing federal and state law, the majority of the states adjudicate interconnection disputes under the federal Tele-

communications Act of 1996 (TA-96) where wholesale broadband interconnectivity issues among competing wireline and wireless carriers are often implicated. Finally, the FCC must clearly delineate the roles of the states in the adjudications of various disputes and the contemplated role of outside engineering expertise consistent with applicable federal and state procedural rules.

The FCC proposal segregating “wireless” Internet connectivity service from “wireline” Internet connectivity service is not competitively neutral. The CTIA’s presentation on the limitations of spectrum and capacity underscores the necessity of a modified Title II common carrier approach. Title II provides transparency and forums to resolve disputes. Given these CTIA-identified limits, the exclusion of wireless Internet connectivity service compared to wireline Internet connectivity service has the potential of encouraging wireless “packet discrimination” to maximize revenues for video or data packets compared to Title II “packet management” for voice or public interest packets.

The proposed exemption for wireless Internet connectivity service fails to address how the public and regulators can ensure the “packet management” for voice and public interest packets that is needed if those packets are competing with more lucrative packets for priority on various privately owned broadband access networks. And even if it did, there is no effective enforcement mechanism that would ensure competitive neutrality. A case-by-case adjudication provides less predictability than general Title II rules.

The Six General Policy Issues

The *Further NOI* seeks comment on six general policy goals for this NOI. These are (1) definitional clarity, (2) classification of “specialized” services compared to Title II Internet connectivity service; (3) disclosure of terms and conditions; (4) the advisability of non-exclusivity in packet practices; (5) appropriate limits on any “specialized” service exempted from Title II; and (6) delivery of guaranteed capacity of packet transmission.

Definitional Clarity. The PaPUC proposes some definitional classes. The first is “packet management” for network management given the differing packet needs of voice, data, and video. The second is undue or unlawful “packet discrimination” which would be prohibited.

Specialized Service. The PaPUC supports a modified common carriage approach for any wireline “managed service” or wireless service to the extent they are “specialized” service.

Modified common carriage provides joint jurisdiction and forums to resolve interconnection and intercarrier compensation disputes. Modified common carriage ensures that voice and public interest packets will get the “packet prioritization” they need as well. Finally, modified common carriage reconciles the fiduciary obligation to generate revenues that network owners have with the equally compelling fiduciary duty to preserve open access so that content providers can compete to deliver voice, data, and video content to citizens.

Disclosure. The PaPUC also supports the development of appropriate disclosure mandates as well. A Title II modified common carriage approach necessitates the development of federal disclosures sufficient to prevent “packet discrimination” or misleading retail and wholesale end-users of broadband connectivity services. A federal minimum disclosure mandate, which allows the states to impose supplemental requirements, is better than “case by case” adjudications on “information service” decided at the FCC. The FCC should not rely on Title I ancillary authority to impose “Title II Light” mandates given the recent *Comcast* decision.

This modified common carriage is more defensible so long as state authority is preserved as well. This joint jurisdictional approach provides network owners, content providers (affiliated or otherwise), and end-users with equal access to broadband

connectivity services. This also provides an enforcement vehicle to ensure delivery of packets and prevent fraud as well.

Exclusivity and Limits on Specialized Service. The PaPUC supports a modified common carrier “non-exclusivity” approach to packet transmission service over shared or sole purpose facilities. This reconciles universal access and legitimate packet management needs on networks with the interest that content providers and network owners have in providing a “specialized” or “managed” service. The only difference is that managed service would be a transparently priced and available common carrier service and not a service excluded or exempted from modified common carriage.

Delivery Speeds. Modified common carriage allows the FCC and the states to address guaranteed delivery of purchased transmission speeds to packetized providers of voice, video, or data. The FCC and the states can also use modified common carriage to ensure delivery of the transmission speed purchased by end-user consumers. Finally, the FCC could delegate federal minimums to the states. Those states with authority to enforce minimums could do so to the extent they are consistent with federal law.

Summary

The PaPUC supports a modified common carriage so that all providers seeking to deliver services to customers over the PSTN, albeit a Public Switched Transportation Network or a Packet Sending Transmission Network, have access and pay rates that reflect the need to finance broadband deployment and the delivery of voice, data, and video packetized services. Modified common carriage is the most effective, if not the only, way of reconciling open access, packet management, access to facilities, and support for whatever programs the FCC supports from the FUSF.¹⁹

¹⁹ *In re: High-Cost Universal Service Support and Federal State Joint Board*, Docket Nos. 05-337 and 96-45 (PaPUC Comments April 17, 2008), pp. 22-23; *In re: Framework for Broadband Internet Service and A National Broadband Plan for Our Future*, Docket Nos. 10-127 and 09-51, (PaPUC Comments December 21, 2009, pp. 2-3 and July 15, 2010, pp. 2-6

The PaPUC is gravely concerned, and could not support, a result in which the FCC preempts the states or reaches a forbearance decision that leaves the states with no viable role while excluding “managed service” and “wireless Internet connectivity service” from a modified Title II regulatory framework. An FCC decision that reclassifies the “broadband interconnectivity service” as “telecommunications” or “telecommunications service” is appropriate based on the considerations set out above. It is also consistent with current state and federal law.

The PaPUC appreciates the opportunity to file these Comments. The PaPUC reiterates that the positions taken in these initial Comments are general and may change, particularly following review of the other filed Comments.

Respectfully Submitted On Behalf Of,

The Pennsylvania Public Utility Commission



Joseph K. Witmer, Esq., Assistant Counsel,
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street
Harrisburg, PA 17120
(717) 787-3663
Email: joswitmer@state.pa.us

Dated: October 12, 2010

Appendix C

Federal Caselaw on the Classification of BIAS

Legal Issue: Legal Classification of BIAS

Joseph K. Wilmer
Pa. PUC 2018

- **Madison River:** Local phone company fined for blocking internet content under FCC's "ancillary" power in Title I.
- **Comcast :** Comcast fined for blocking Bit-Torrent internet content & Comcast appeals; court reverses FCC because Title I "ancillary power" has no power to fine
- **Verizon:** FCC issues rules on internet content blocking under Section 706; court reverses because the FCC said earlier 706 gives no power; FCC can change their mind.
- **Open Internet Order:** FCC rules Basic Internet Access Service (BIAS) is Title II telecommunications and that 706 also gives it power to regulate; FCC upheld on authority to treat BIAS as federal Title II telco for fixed and mobile BIAS, decision affirmed by DC Circuit 6/14/16.
- **Restoring Internet:** FCC rules that BIAS is information service; FCC upheld *Mozilla v. FCC*, DCCA: Docket No. 18-1051 (October 1, 2019), Petitions for Rehearing En Banc (December 12, 2019).*

Sources: *Madison River Communications*, File No. EB-05-IH-0110, 20 FCC Rcd 4295 (Enforcement Bur. 2005); *Comcast Corp. v. FCC*, 600 F.3d 642 (D.C. Cir. 2010); *Verizon v. FCC*, 740 F.3d 623 (D.C. Cir. 2014); In re: Open Internet, 14-28 (3/12/15) appealed in *USTA v. FCC*, Docket No.15-1063 (June 14, 2016); *Restoring Internet Freedom*, Declaratory Ruling, Report and Order (*Restoring Internet Freedom Order*), WC Docket No. 17-108, FCC 17-166 (Released on January 4, 2018), FCC upheld *Mozilla v. FCC*, DCCA: Docket No. 18-1051 (October 1, 2019), Petitions for Rehearing En Banc (December 12, 2019).

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued February 25, 2013

Decided May 28, 2013

No. 12-1337

COMCAST CABLE COMMUNICATIONS, LLC,
PETITIONER

v.

FEDERAL COMMUNICATIONS COMMISSION AND UNITED
STATES OF AMERICA,
RESPONDENTS

THE TENNIS CHANNEL, INC.,
INTERVENOR

On Petition for Review of an Order
of the Federal Communications Commission

Miguel A. Estrada argued the cause for petitioners. With him on the briefs were *Erik R. Zimmerman* and *Lynn R. Charytan*.

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued September 9, 2013

Decided January 14, 2014

No. 11-1355

VERIZON,
APPELLANT

v.

FEDERAL COMMUNICATIONS COMMISSION,
APPELLEE

INDEPENDENT TELEPHONE & TELECOMMUNICATIONS
ALLIANCE, ET AL.,
INTERVENORS

Consolidated with 11-1356

On Petition For Review and Notice of Appeal
of an Order of the Federal Communications Commission

Helgi C. Walker argued the cause for appellant/petitioner Verizon. With her on the briefs were *Eve Klindera Reed*, *William S. Consovoy*, *Brett A. Shumate*, *Walter E. Dellinger*, *Anton Metlitsky*, *Samir C. Jain*, *Carl W. Northrup*, *Michael Lazarus*, *Andrew Morentz*, *Michael E. Glover*, *William H. Johnson*, *Stephen B. Kinnaird*, and *Mark A. Stachiw*. *John T. Scott III* and *Edward Shakin* entered appearances.

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued December 4, 2015

Decided June 14, 2016

No. 15-1063

UNITED STATES TELECOM ASSOCIATION, ET AL.,
PETITIONERS

v.

FEDERAL COMMUNICATIONS COMMISSION AND UNITED
STATES OF AMERICA,
RESPONDENTS

INDEPENDENT TELEPHONE & TELECOMMUNICATIONS
ALLIANCE, ET AL.,
INTERVENORS

Consolidated with 15-1078, 15-1086, 15-1090, 15-1091,
15-1092, 15-1095, 15-1099, 15-1117, 15-1128, 15-1151,
15-1164

On Petitions for Review of an Order of
the Federal Communications Commission

Peter D. Keisler argued the cause for petitioners United States Telecom Association, et al. With him on the joint briefs were *Michael K. Kellogg*, *Scott H. Angstreich*, *Miguel A. Estrada*, *Theodore B. Olson*, *Jonathan C. Bond*, *Stephen E.*

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued February 1, 2019

Decided October 1, 2019

No. 18-1051.

MOZILLA CORPORATION,
PETITIONER

v.

FEDERAL COMMUNICATIONS COMMISSION AND UNITED
STATES OF AMERICA,
RESPONDENTS

CITY AND COUNTY OF SAN FRANCISCO, ET AL.,
INTERVENORS

Consolidated with 18-1052, 18-1053, 18-1054, 18-1055,
18-1056, 18-1061, 18-1062, 18-1064, 18-1065, 18-1066,
18-1067, 18-1068, 18-1088, 18-1089, 18-1105

On Petitions for Review of an Order of
the Federal Communications Commission

Pantelis Michalopoulos and Kevin Kendrick Russell
argued the causes for non-government petitioners. With them
on the joint briefs were *Cynthia L. Taub, Markham C.*
Erickson, Michael A. Cheah, Brian M. Willen, Donald J.
Evans, Sarah J. Morris, Matthew F. Wood, Colleen Boothby,
James N. Horwood, Tillman L. Lay, Jeffrey M. Bayne,

Appendix D

Other State Laws & the NRRI Study

The NRRI paper on “State Responses to Net Neutrality” reviews legislation in each state and addresses the interplay of net neutrality, paid prioritization and other issues.

<https://pubs.naruc.org/pub/45ACE3A2-AAEA-417D-2416-B6862C9D4435>