

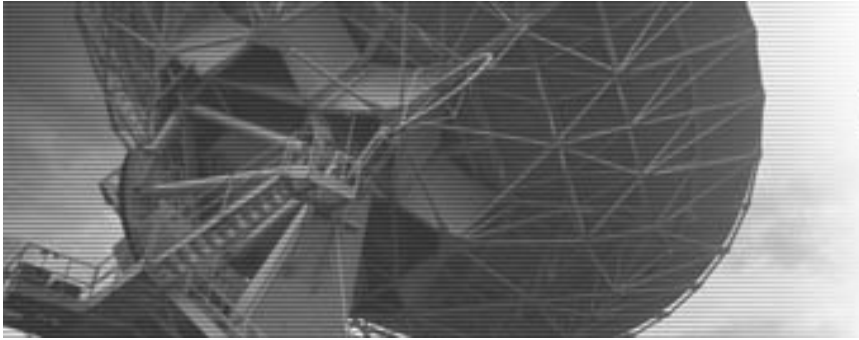
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NET NEUTRALITY-- WHAT IS IT? WHERE IS IT GOING?

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I. WHAT IS “NETWORK NEUTRALITY”?

- A. Introduction -- A vague term that can mean different things to different people.

Generally -- arguments that there should be *legal restrictions* on the ability of *Internet service providers* to engage in various “*unreasonably discriminatory network management practices.*”

Such practices would lead to:

- blockage
- degradation
- anti-competitive prioritization

of specific Internet *content* or *applications*



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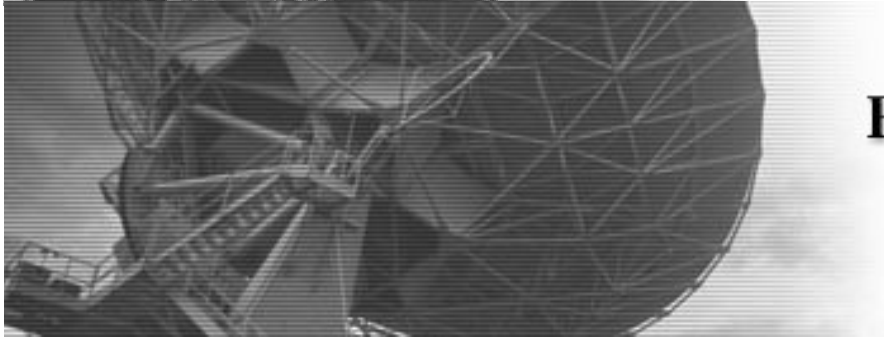
NN supporters:

- content/application providers
- public interest groups (Free Press, Public Knowledge)
- gov't

Critics (ISPs – Verizon, Comcast, etc.):

NN as burdensome intrusion; “a solution in search of a problem”

Even NN supporters believe that there are some “reasonable” network management practices that involve some sort of discrimination



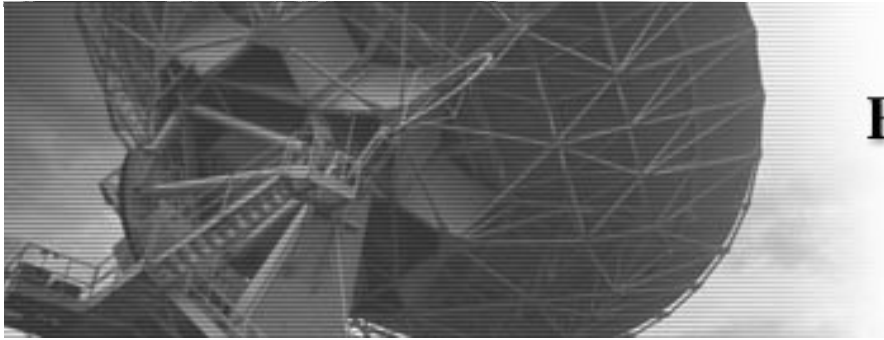
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Today we will discuss:

What practices are the focus of Net Neutrality discussions?

What is reasonable or unreasonable discrimination?

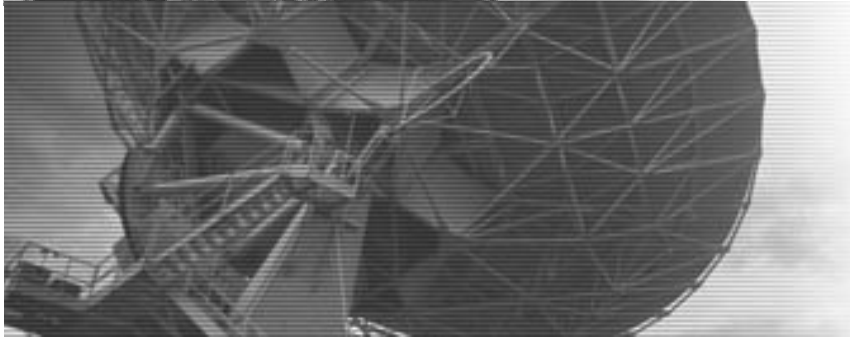
What issues will trigger Net Neutrality debates in the *immediate future*?



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B. Background

- The federal Communications Act is broken into different “Titles” to address different subjects
- *Title II* addresses *common carriers* (historically -- telephone companies)
- *Title II prohibits* carriers from engaging in *unreasonably discriminatory* practices or charges

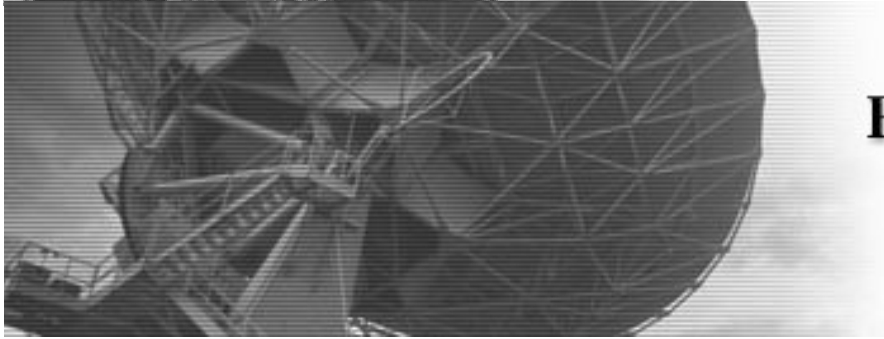


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B. Background (cont'd)

- In its 1976 *Computer II* decision, the FCC *exempted* enhanced service providers (now *information service providers*) from regulation as common carriers.
- Internet Service Providers (*ISPs*) *are exempt* from prohibition against unreasonable discrimination (unclear if this applies to VOIP)
- But founders and early users of the Internet saw it as *uncontrolled medium for free expression*

Never foresaw a *small number of ISPs controlling the majority* of Internet access



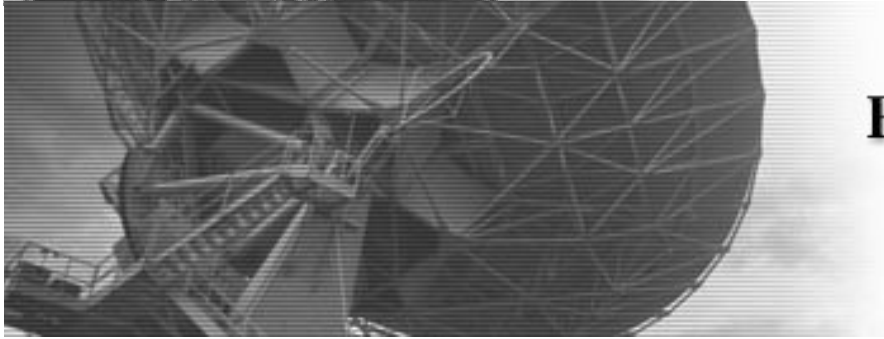
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B. Background (cont'd)

Issues:

Should ISPs be allowed to provide *deliberately better or worse* service to certain end users and/or content providers?

Can this ever be “reasonable” discrimination?

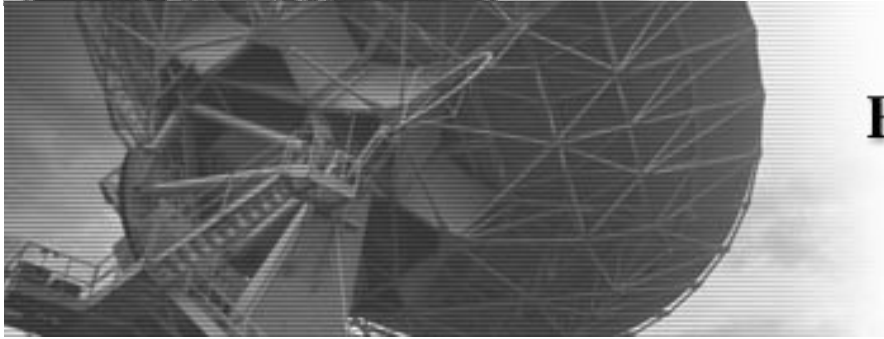


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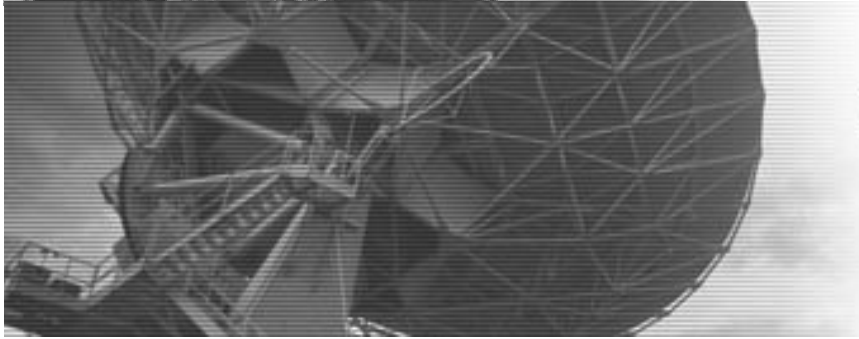
C. The Need for Network Management

History of Internet shows *constant increase in traffic*

Certain newer applications (streaming video, peer-to-peer file sharing-
“P2P”) use much *more bandwidth* than other applications (voice, e-mail,
web browsing)



- C. The Need for Network Management (cont'd)
- Like all networks, Internet has *congestion* problems that can *degrade* customer experience
 - a workable Internet *needs traffic management*
 - Some traffic management protocols may require “*discriminating*” (identifying, prioritizing) between various *users, content, or applications*



D. Network Management Practices That Can Raise Concerns

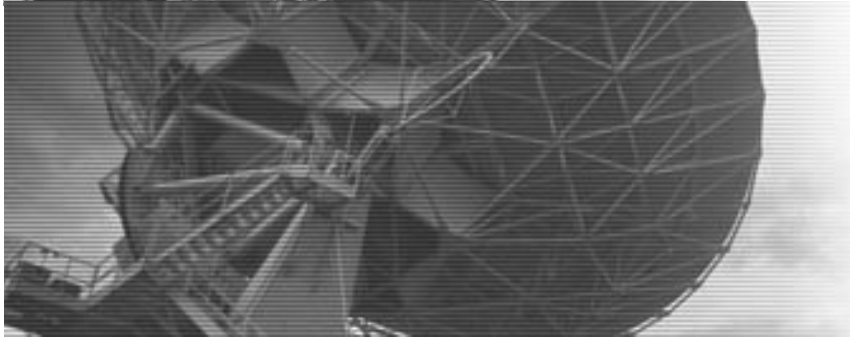
1. Deep packet inspection -- in order to manage packets, this technology can reveal:

source and destination addresses

application

content

Can be used for *legitimate* network security and traffic management, or for *anti-competitive* purposes



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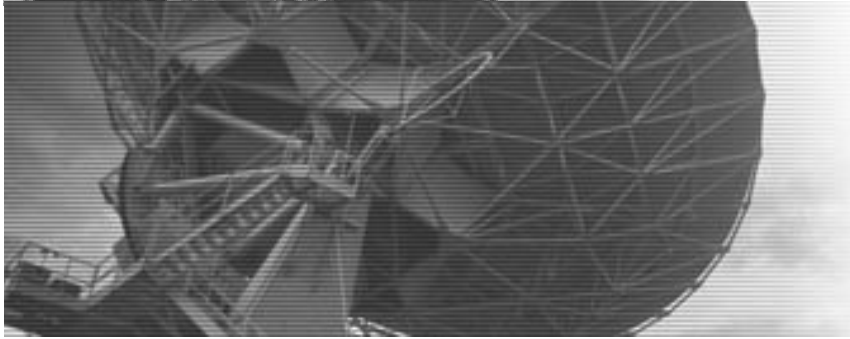
- D. Network Management Practices (cont'd)
2. Data Prioritization -- packets for certain sources, applications or content can be given *priority in transmission*:

promote applications sensitive to *latency* (delay) and *jitter* (signal distortion) – such as VOIP and video streaming

- OR -

actively degrade non-favored traffic or competitors:

Give P2P traffic priority only in
non-peak times

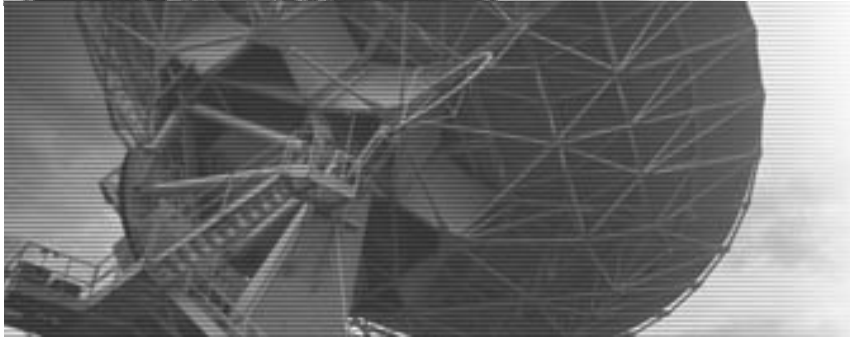


D. Network Management Practices (cont'd)

Could also be used as part of QOS assurance to content/application providers for a *fee* -- a *commercial "Fast Lane"* on the Internet

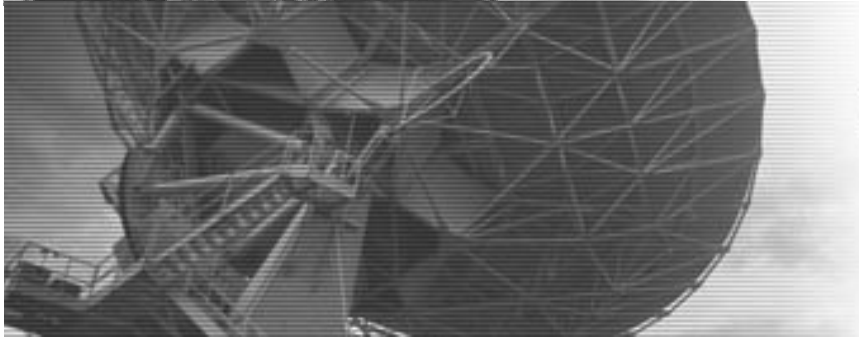
SBC CEO Ed Whitacre caused a firestorm in 2005 when he said:

"There's going to have to be some mechanism for these people who use [SBC's] pipes to pay for the portion that they are using.... for a Google or Yahoo! or Vonage or anybody to expect to use these pipes [for] free is nuts!"

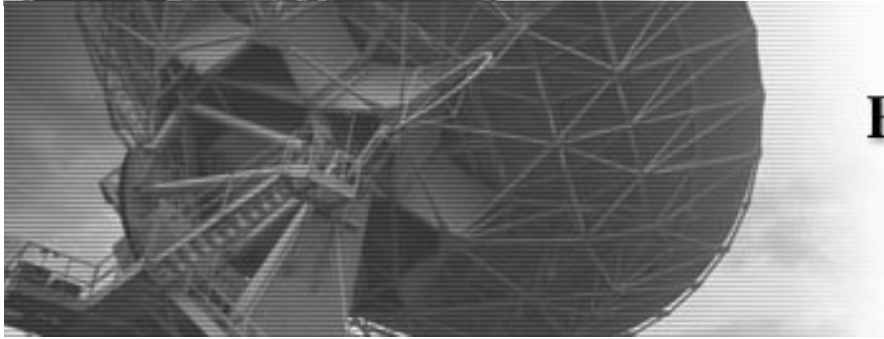


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- D. Network Management Practices (cont'd)
- 3. Separate physical or logical *channels* for *different classes of traffic*
 - Reduced bandwidth for “public” Internet?
- 4. Reserve portion of *last-mile* bandwidth for *proprietary services*
 - (AT&T U-Verse and Verizon FIOS video services)

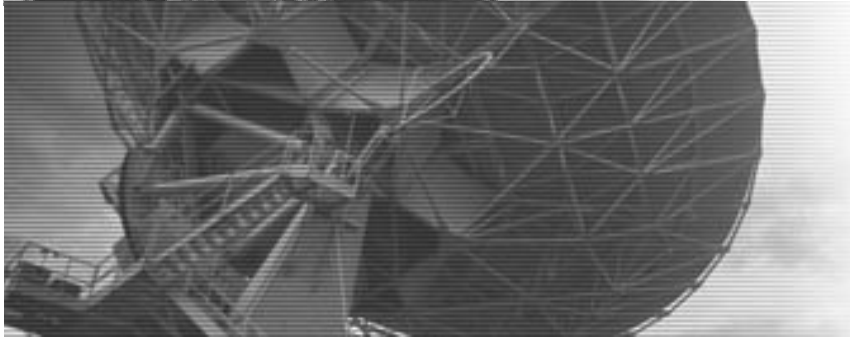


- D. Network Management Practices (cont'd)
5. Different amounts of bandwidth for “*upstream*” vs. “*downstream*” traffic
- ISPs commonly reserve more bandwidth for *downstream*
 - *systematic bias* against upstream-reliant applications? (P2P)
6. Cap or otherwise *limit the amount of bandwidth* available to a particular end user
- charge for additional use



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- E. Elements of Net Neutrality Policy Proposals
 - 1. Limit or eliminate *data prioritization* based on *application, source or content*
 - Limit use of deep packet inspection (“DPI”)



E. Net Neutrality Policy Proposals (cont'd)

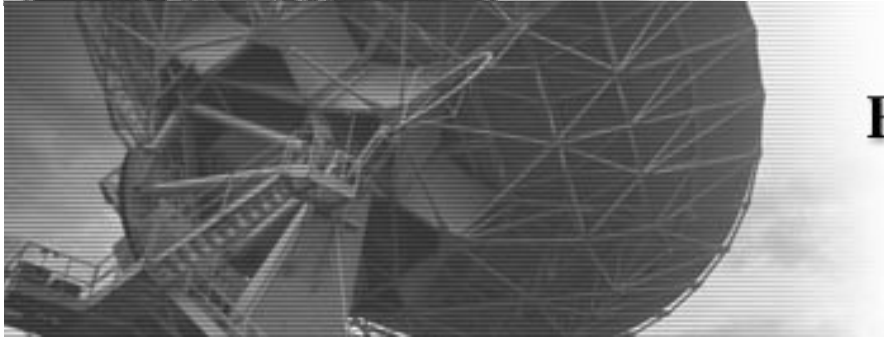
2. Eliminate right of ISPs to *provide priority service* (or enhanced QOS) to content or application providers in return for *payment*

Or, require paid priority to be *available to all* content/app providers

Or, require paid priority to be available on *uniform terms* to all *similarly situated* content/app providers

(NN just for the Amazons and E-Bays?)

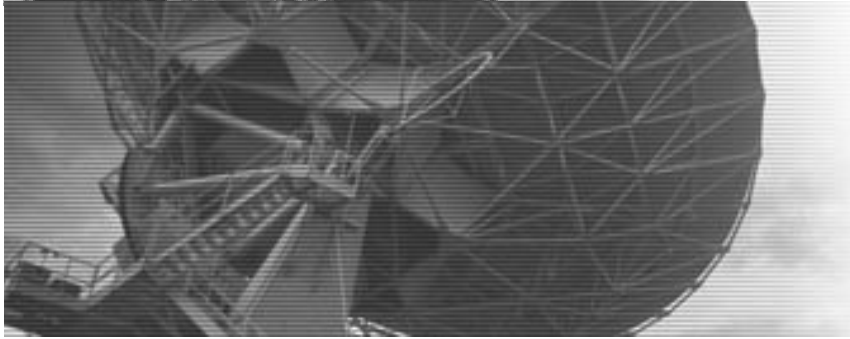
And, require certain *minimum QOS* to all end users or content/app providers for *non-priority* traffic



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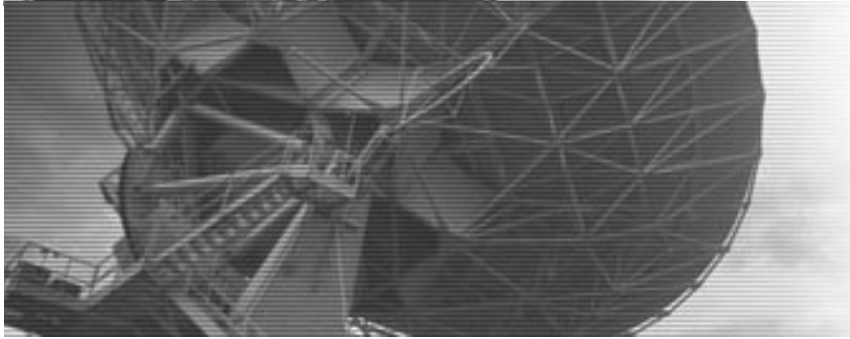
- E. Net Neutrality Policy Proposals (cont'd)
- 3. Limit or eliminate *vertical integration* between ISPs and commercial content/applications
- 4. Limit or eliminate *exclusive deals* between content/application providers and ISPs (fear of “walled gardens”)

Analogy to FCC's Cable TV program
access rules



- E. Net Neutrality Policy Proposals (cont'd)
 - 5. Limit or eliminate ability of ISPs to *inhibit or forbid attachment* of certain end-user equipment (e.g., over-the-top VOIP such as Skype)
 - 6. Require full ISP *disclosure to end users* regarding QOS offered, network management techniques

There is a general recognition of the need of ISPs to address *unlawful content*, and devices or applications that *harm the network*.



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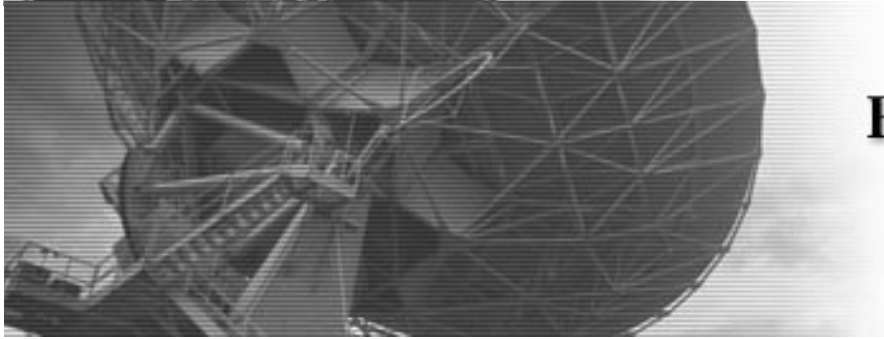
F. FCC Actions

1. *Madison River Communications* (2005)

FCC received complaints that Madison River, an ISP operated by an incumbent LEC, was *blocking ports used for VoIP applications*, thereby degrading customers' ability to use 3rd party VoIP applications (e.g., Vonage) - - blocking competition

Company entered into *Consent Decree* with FCC, agreeing to:

- make “voluntary” contribution of \$15,000 to U.S. and
- *not block ports* used for VoIP applications, or *otherwise prevent* customers from using VoIP applications.



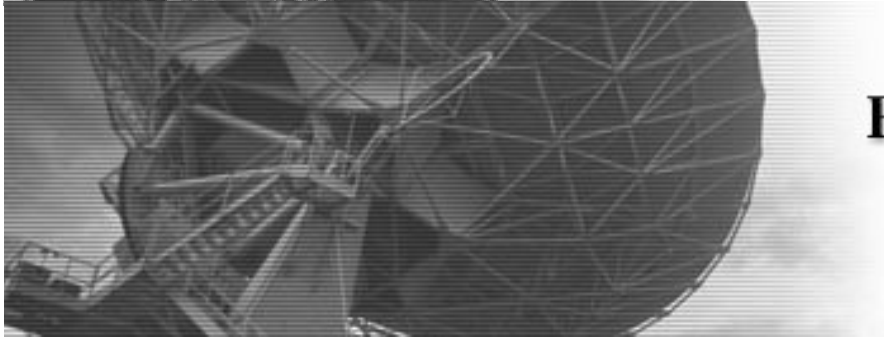
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F. FCC Actions (cont'd)

1. *Madison River Communications* (cont'd)

But FCC acted on *Madison River* under provisions for regulation of “*Common Carriers*”

FCC shortly thereafter declared *B-Band Internet access* to be an “*information service*”, not “*common carriage*”



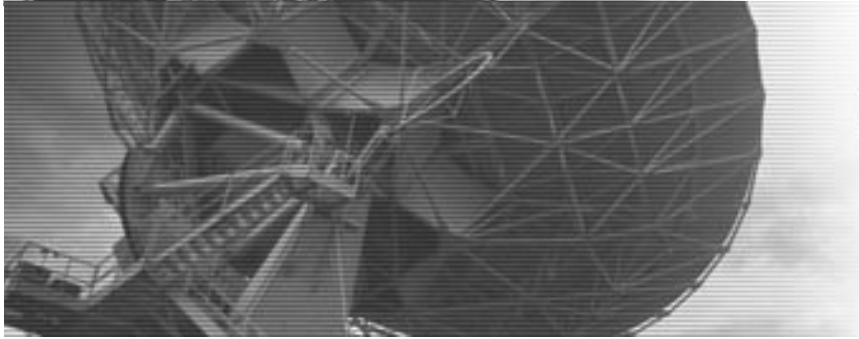
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F. FCC Actions (cont'd)

2. *Internet Policy Statement (2005)*

At same time that FCC declared *Internet access* to be an
“*information service*,”

FCC asserted that it had *jurisdiction* to enact regulations
to ensure that Internet services operated in a “*neutral
manner*.”



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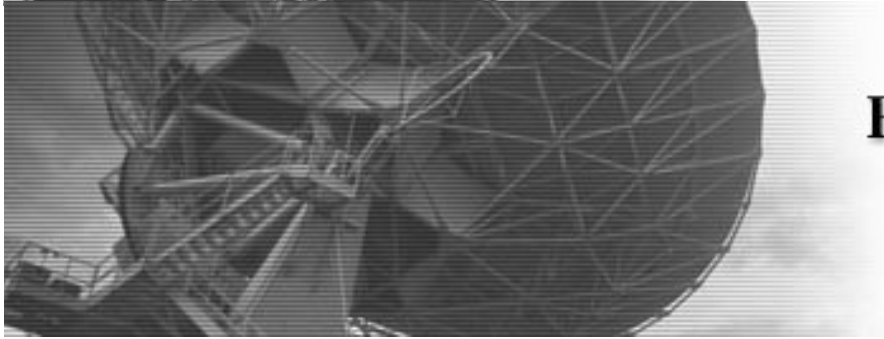
F. FCC Actions (cont'd)

2. *Internet Policy Statement (cont'd)*

Minimum requirements of neutrality?

The FCC stated the following four “principles”:

- Consumers are entitled to *access* the *lawful* Internet content of their choice.
- Consumers are entitled to run *applications* and use *services* of their *choice*, subject to the needs of *law enforcement*.
- Consumers are entitled to *connect* their choice of *legal devices* that do not *harm the network*.
- Consumers are entitled to *competition* among network providers, application and service providers, and content providers.



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F. FCC Actions (cont'd)

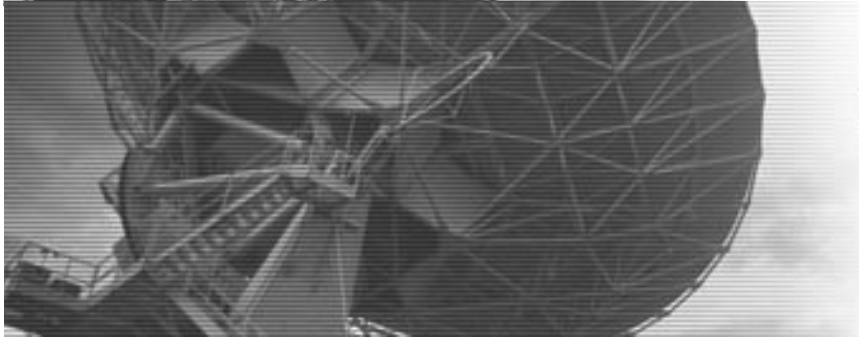
2. *Internet Policy Statement (cont'd)*

FCC stated that it would use 4 principles in “*policymaking* activities.”
FCC did *not* formally adopt the principles as *rules*.

FCC also stated that the principles were “subject to *reasonable network management*.”

Enforceable? What is “reasonable”?

The answers would come 3 years later in a *Comcast* proceeding.



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F. FCC Actions (cont'd)

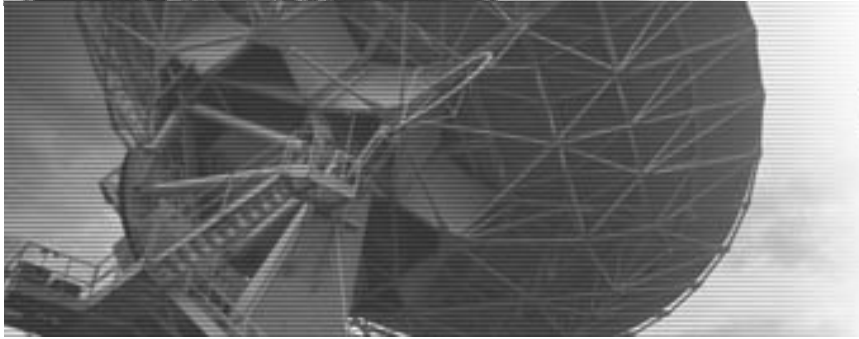
3. *BOC Merger Conditions*

2005 FCC *approval* of 2005 Verizon-MCI and AT&T-SBC *mergers* contained *condition* that merged companies would abide by *IPS 4* principles.

2006 approval of AT&T-BellSouth merger *also required* the BOC:

- to maintain a “*neutral network*” in BBand Internet access, and
- not to provide any B-Band Internet access that “*privileges, degrades or prioritizes any packet ... based on its source, destination or ownership.*”

But, FCC *exempted IPTV* service from NN conditions



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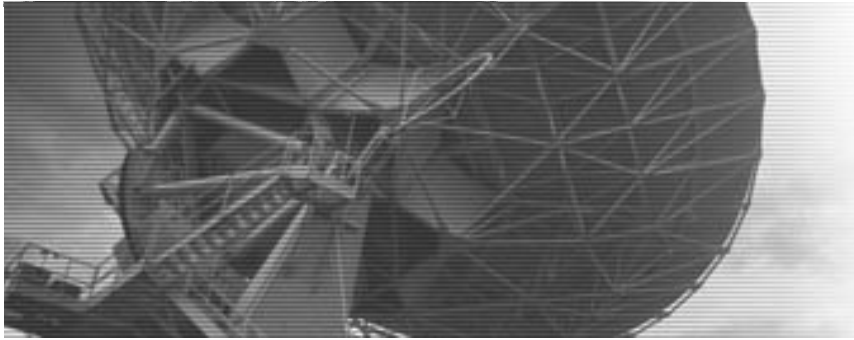
F. FCC Actions (cont'd)

4. *FCC Order – Comcast/BitTorrent (2008)*

In 2007, press begins to report widespread *problems* by Comcast *Internet subscribers* in using BitTorrent and other *peer-to-peer* applications.

a. BitTorrent:

- application that uploads/ downloads content from *multiple* computers at same time
- quick distribution of *large files* (e.g., video)
- used by video distributors who are potential *competitors* to cable operator *VOD* service



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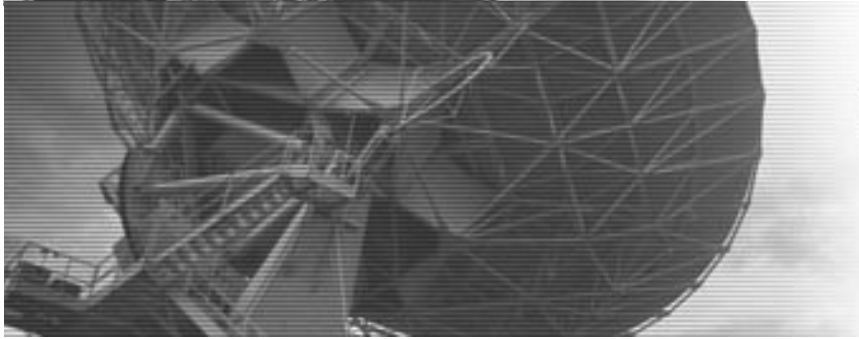
F. FCC Actions (cont'd)

4. *FCC Order – Comcast/BitTorrent (2008)(cont'd)*

b. Comcast Responses:

- *Initially denied any blocking of P2P traffic*
- *Then claimed only done during times of peak network congestion in specific neighborhoods*
- *Lastly admitted that it blocked P2P regardless of level of network congestion (interfering with 10-75% of P2P traffic)*

Getting caught in a lie - - bad strategy!



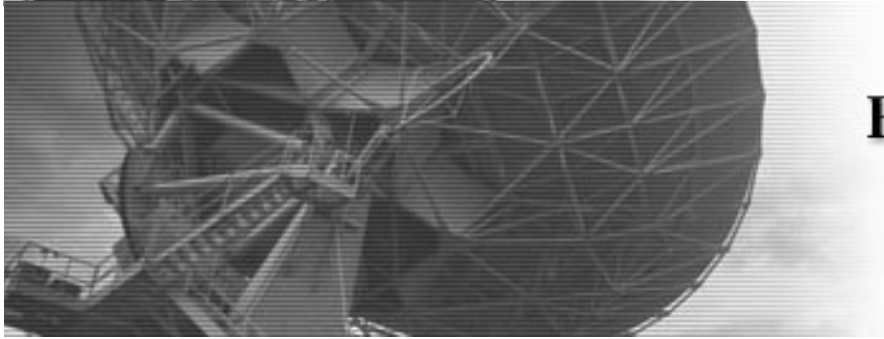
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F. FCC Actions (cont'd)

4. *FCC Order – Comcast/BitTorrent (2008) (cont'd)*

c. Comcast's Prior Management of P2P:

- Used *deep packet inspection* of *upstream* traffic to find use of P2P applications
- When network found use of P2P, Comcast server sent instructions, called "*reset packets*", to P2P connected computers
- These RSTs told the computers to *terminate their connections*, and reestablish a new connection.
- This *slows down or blocks* P2P usage



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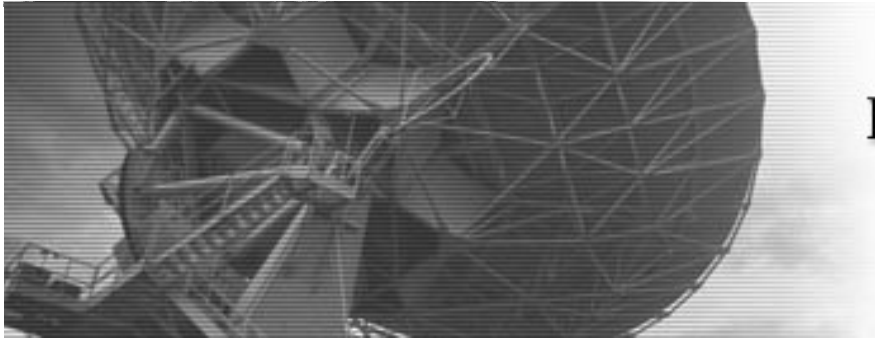
4. *FCC Order -- Comcast/BitTorrent (cont'd)*

d. *FCC's Rulings:*

- *FCC ruled that Comcast practices were a violation of the Internet Policy Statement rights of consumers to*

run applications and services of their choice

access lawful content of their choice



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4. *FCC Order -- Comcast/BitTorrent (cont'd)*

d. FCC's Rulings:

- FCC ruled that Comcast practices were *not reasonable network management*:

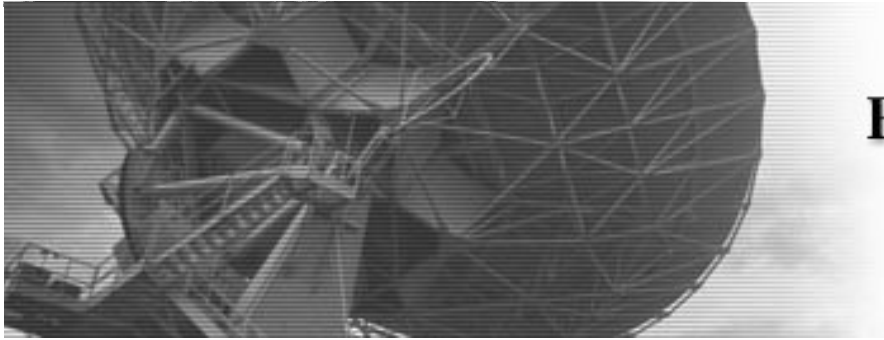
- Use of RSTs *contravenes published Internet protocol standards*

- While management of traffic is a "*critically important interest*," Comcast practices *not reasonably tailored* to meet that interest:

impacted customers who *used little bandwidth* (but used P2P)

practices used even at *times and places* when *little congestion*

practices *not used* against *other* sorts of bandwidth consumption



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4. *FCC Order -- Comcast/BitTorrent (cont' d)*

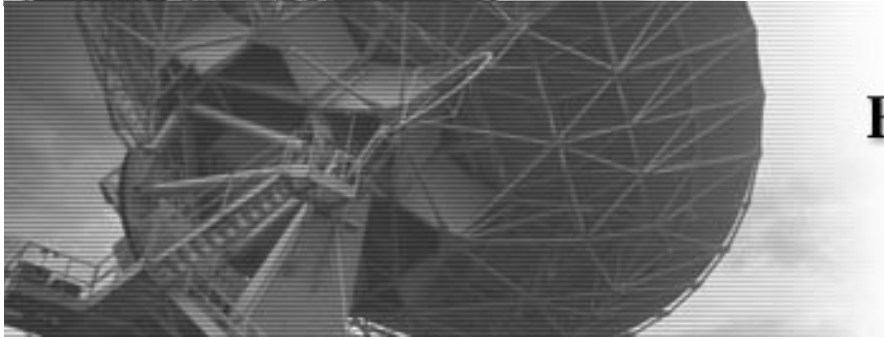
d. *FCC's Rulings:*

- *FCC suggests reasonable network management practices:*

- *cap user's bandwidth and charge for overage -- "metering" or "consumption billing"*

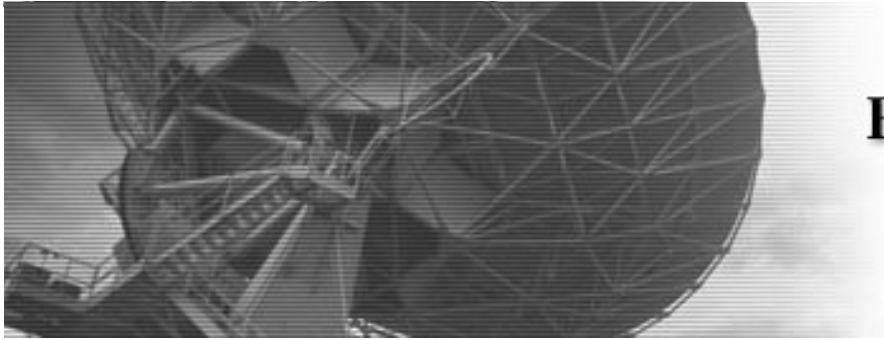
(TW -- multiple GB caps, \$1 for each add'l GB)

- *throttle back connection speeds of all high-capacity users (not just P2P)*
- *clearly disclose management practices to end users*
- *work out solution with application vendors*
- *Comcast Agreement with BitTorrent*



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4. *FCC Order -- Comcast/BitTorrent (cont'd)*
 - d. *FCC's Rulings:*
 - *Comcast required to:*
 - *submit compliance plan for reasonable practices*
 - *fully disclose future practices to end users*
 - *no \$ fine, since this is first ruling by FCC*



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4. *FCC Order -- Comcast/BitTorrent (cont'd)*

d. *FCC's Rulings:*

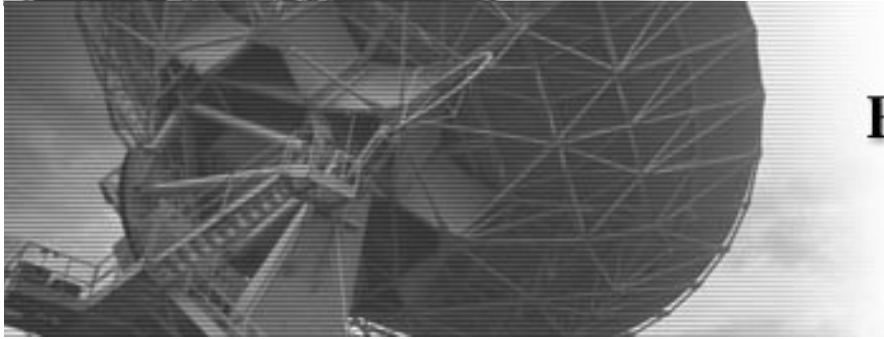
- Order stated that FCC will address future such complaints on a *case-by-case basis* (rather than issuing new rules):

- *Internet traffic management issues are still new*

- *networks are complex and varied*

Would a bright-line/rule approach be better for industry?

- *certainty vs. flexibility*



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4. *FCC Order -- Comcast/BitTorrent (cont'd)*
 - d. *FCC's Rulings:*
 - *FCC explicitly did not decide on whether other practices would violate FCC policy:*
 - *priority to real-time communications (VOIP)*
 - *priority to 3rd party provider per commercial agreement*

(a commercial "fast lane")



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4. *FCC Order -- Comcast/BitTorrent (cont'd)*
 - e. Follow up on *FCC Order*:
 - Comcast submits description of *new* management practices:
 - focus on use of *bandwidth*, not on particular *applications*

“protocol-agnostic”
 - track congestion in segments of network

(*> 70% of upstream b-width or > 80% of downstream b-width*)



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4. *FCC Order -- Comcast/BitTorrent (cont'd)*

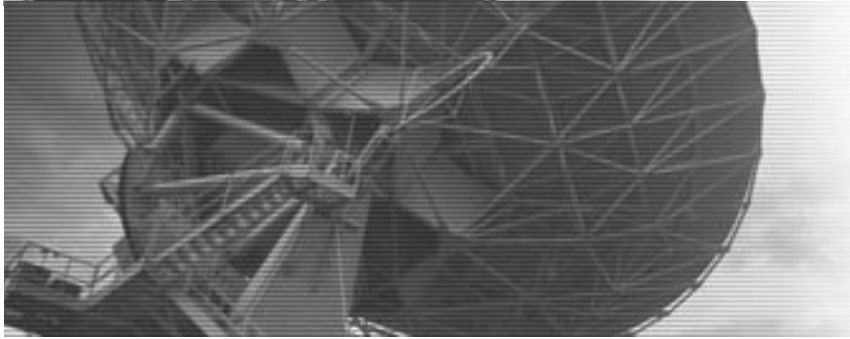
e. *Follow up on FCC Order:*

- *if subscriber uses “disproportionate” share of bandwidth, (> 70% of purchased upstream or downstream b-width over 15 minutes)*

then that sub’s traffic given a lower priority during pendency of traffic congestion

(sluggish web loads, VOIP sounds “choppy”)

- *subscriber’s priority returns to normal if congestion subsides or individual bandwidth goes below threshold*



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4. *FCC Order -- Comcast/BitTorrent (cont'd)*

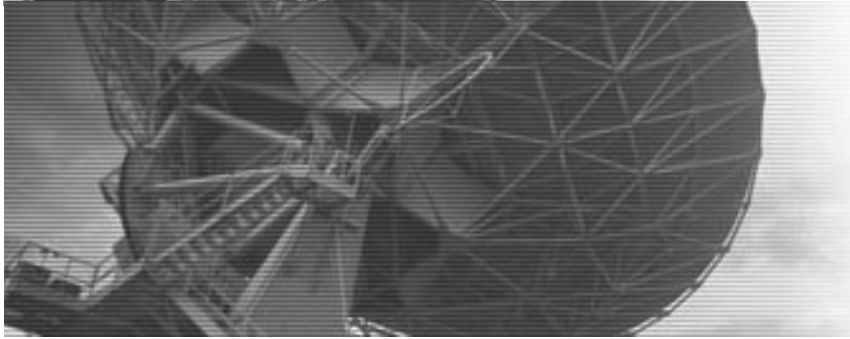
e. Follow up on *FCC Order*:

- January 2009 response letter from the FCC:

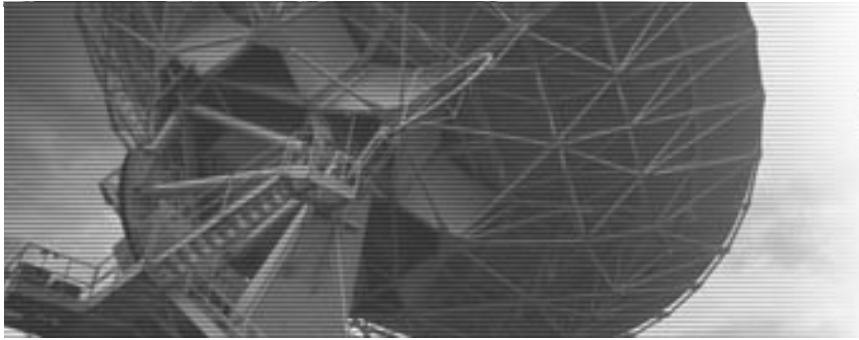
Why would b-band customer subject to lower priority experience choppy service from "over-the-top" 3rd party VOIP provider,

But customers of Comcast *proprietary VOIP service* are *not subjected* to lower priority and resulting degraded service

- Comcast: *proprietary VOIP service* provided over "*managed network*" vs. *public Internet* used for B-band service customers
- Will the New FCC pursue this?
- Comcast has appealed Order (D.C. Circuit)



4. *FCC Order -- Comcast/BitTorrent (cont'd)*
 - f. *Take-Aways From the Comcast Proceeding:*
 - Discrimination based on (legal) *application may not* be a reasonable management practice
 - Management practices must be *close fit* with problem being addressed
 - Operators need to *clearly disclose* management practices to end users
 - FCC is sensitive to *anti-competitive impact* of management practices



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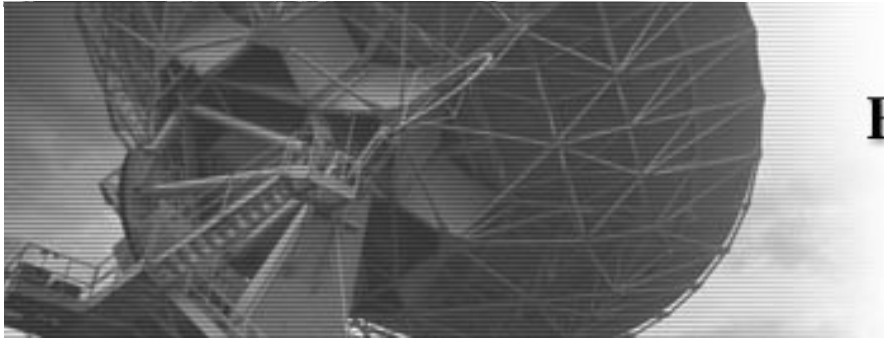
4. *FCC Order -- Comcast/BitTorrent (cont'd)*

BUT, Cox Communications may have a *different* view:

- Jan. 2009 announcement that it will *prioritize*
time sensitive traffic over *non-time-sensitive* traffic (and ignore
“owner or source”)

“Time Sensitive”: VOIP, streaming audio/video, e-mail, gaming

“Non-Time-Sensitive”: P2P(!), file transfer, software updates,
Usenet
- Some Net Neutrality advocates not happy about Cox picking
“winners and losers” among applications

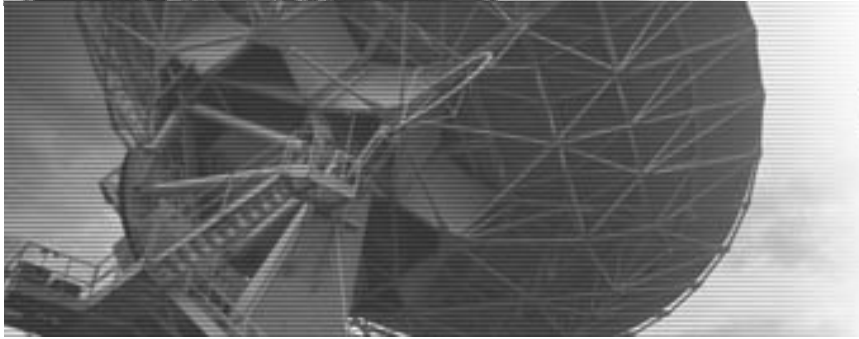


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G. Federal Trade Commission Involvement?

- FTC has mandate to *protect consumers* from *unfair* methods of *competition*
- In 2007, FTC considered and declined to enact NN rules

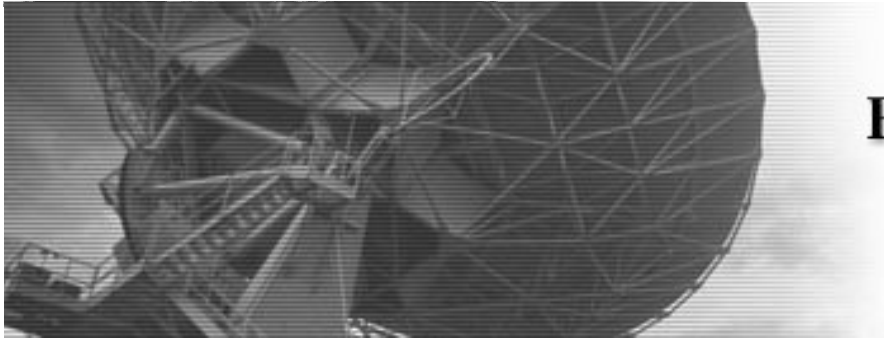
What will the New FTC do?



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H. Prior Congressional Involvement

- Numerous legislative proposals addressing Net Neutrality were *introduced* in the House and Senate in 2005-06, and some came *very close to enactment*.
- Interest on Capitol Hill appeared to decline
- but the *Broadband provisions* of the recent *Stimulus legislation* requires recipients of *grants* to comply with “*non-discrimination obligations*” based at a minimum on the 4 principles of the FCC’s *Internet Policy Statement*.
- NTIA is working with FCC in drafting “*non-discrimination*” provisions



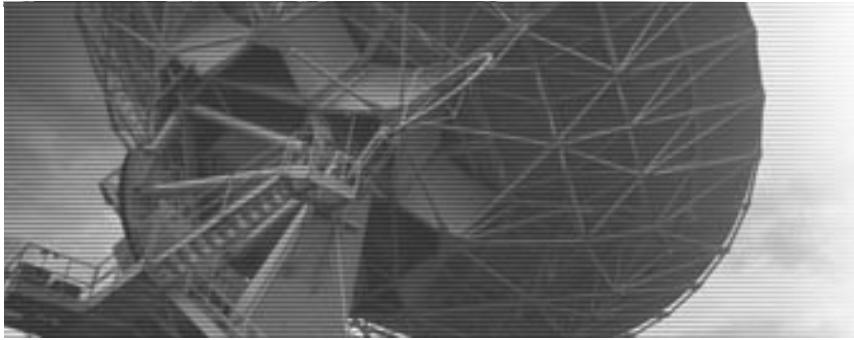
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II. Net Neutrality -- Where is it Going?

A. FCC

President *Obama* is strong supporter of NN, and included NN in his Presidential Technology Policy Agenda

Nominee for FCC Chairman, Julius Genachowski is open advocate of NN.



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II. Net Neutrality -- Where is it Going? (cont'd)

A. FCC (cont'd)

1. FCC may wait to see results of Comcast appeal of *Order* on BitTorrent

- If Court *upholds* FCC:

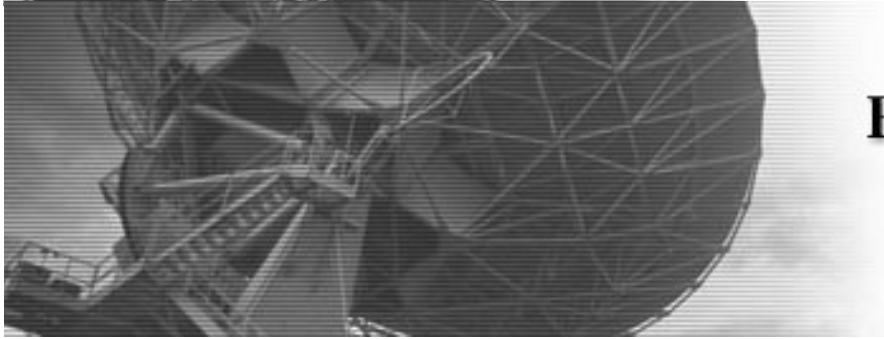
- expect *more case-by-case* enforcement of complaints

*Evolution of "reasonable" network
management?*

- New Chairman might still enact new rules

Talk of "5th" *Policy Statement* principle --
no discrimination

based on source, destination, ownership

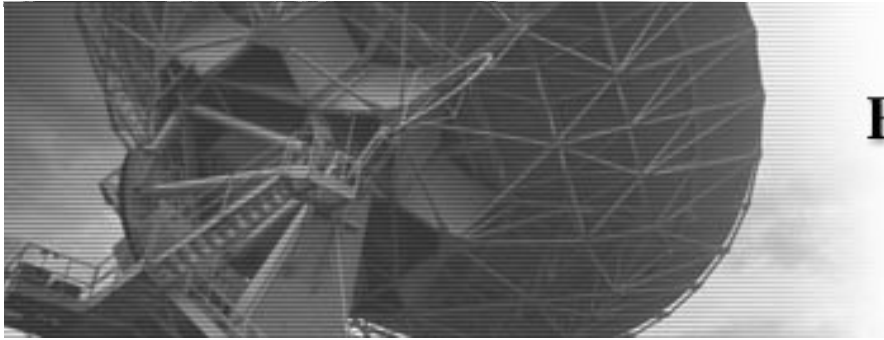


II. Net Neutrality -- Where is it Going? (cont'd)

A. FCC (cont'd)

- If Court *reverses* the FCC:
 - expect FCC to *enact rules* to support or replace case-by-case enforcement (*if* Court agrees that FCC has *jurisdiction*)
 - expect *Congress to enact NN legislation* (*especially* if Court says FCC *lacks jurisdiction*)

2. FCC coordination with NTIA on B-Band stimulus definition of “no discrimination” *may* signal ideas of new FCC.



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II. Net Neutrality -- Where is it Going? (cont'd)

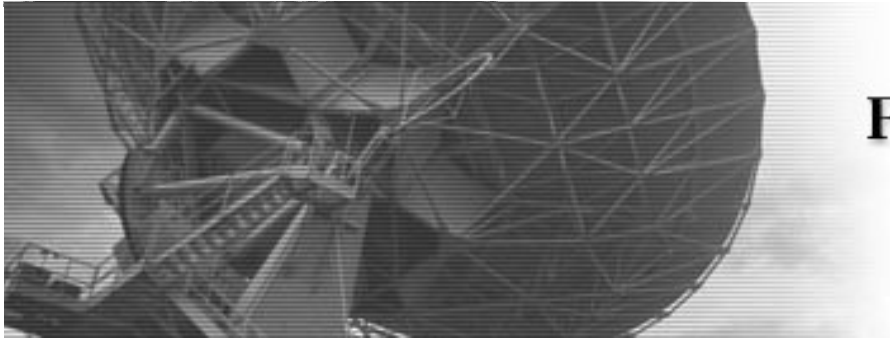
B. Congress

Chair of House Sub-Committee on Telecommunications and the Internet, *Rick Boucher* (D-VA):

- Supports NN
- May be *brokering talks* among industry players
- Recently stated that he *sees no "emergency"* need for NN legislation
- But said he *would push legislation* if FCC's *Comcast Order* is *overturned* on appeal, or if industry talks do not produce *agreement*.

Senate Judiciary Committee *holding hearings* on NN and B-Band competition this year.

Staff saying they are *disinclined to act* as long as no more problems in the market



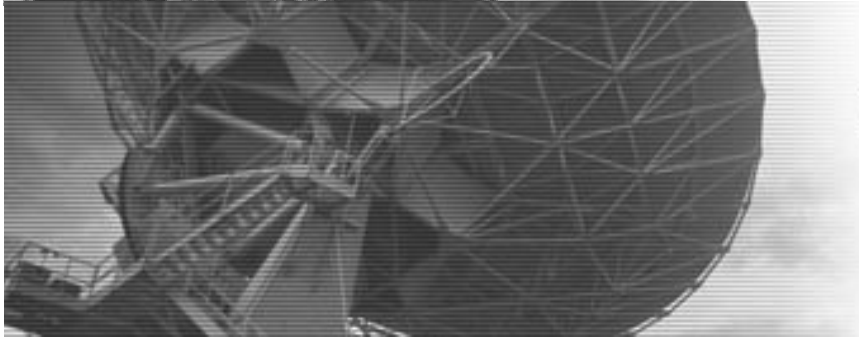
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II. Net Neutrality -- Where is it Going? (cont'd)

C. Possible NN Trigger Issues in Near Future

1. IPTV/Cable

- Will FCC's prior exemption of IPTV from NN (AT&T/BS Merger) remain?
- *Growing potential for conflicts or alliances between IPTV/Cable operators and content providers:*
 - IPTV/cable providers seek to *gain market share for VOD*
 - Cable and IPTV exploring more *Internet-like service* – put more *content online*, and make *cable* experience more *interactive*
 - For operators, programmers are *video allies* and *web competitors*
 - Result: *Potential conflict* with streaming video providers (Netflix, Hulu, Joost), especially *direct-to-TV* (vs. proprietary cable and web-streaming, e.g. Comcast's Fancast)



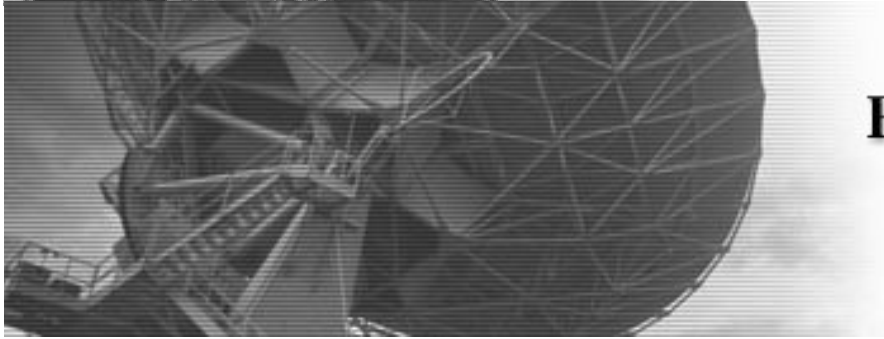
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C. Possible NN Trigger Issues in Near Future (cont'd)

1. IPTV/Cable (cont'd)

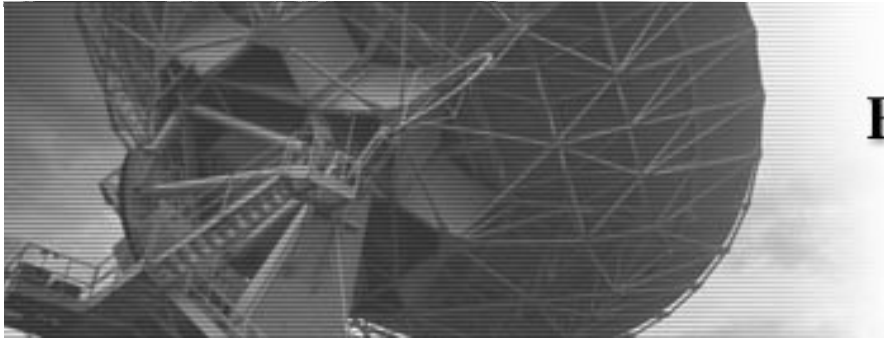
- *Preferences (fast lane) to commercial streaming/content partners?*
- *Middle course: packaging on-line access to video with cable subscription*

ISP block on-line access to content sites for BBand customers who are not cable subs?



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- C. Possible NN Trigger Issues in Near Future (cont'd)
 - 1. IPTV/Cable (cont'd)
 - *If metering/consumption billing, what counts towards caps -- do proprietary services (vs. 3rd parties)?*



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C. Possible NN Trigger Issues in Near Future (cont'd)

2. Wireline VOIP

Will new FCC pursue Comcast on QOS of *proprietary vs. 3rd party VOIP?*



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- C. Possible NN Trigger Issues in Near Future (cont'd)
- 3. Mobile Wireless Video/VOIP

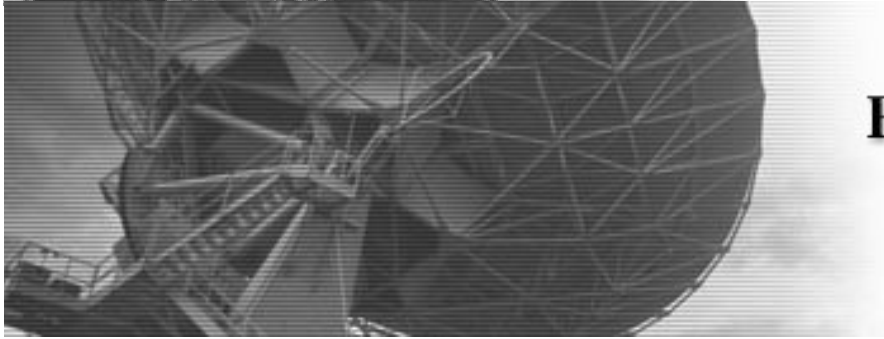
Mobile Video is where the crunch will soon come:

massive growth predicted + limited spectrum = network management

wireless Terms of Service re streaming video:

- conflict between proprietary vs. 3rd party video?

(e.g., AT&T I-Phone temporary banned use of Slingbox)



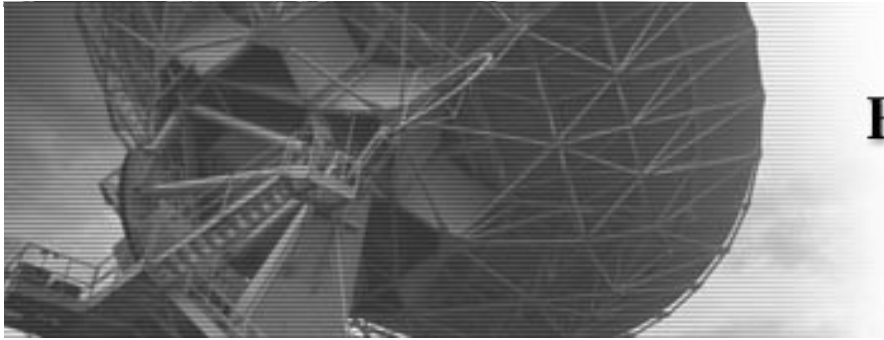
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D. Audience Talks Back!

Where do YOU see NN Issues arising?

QUESTIONS?



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THANKS!

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