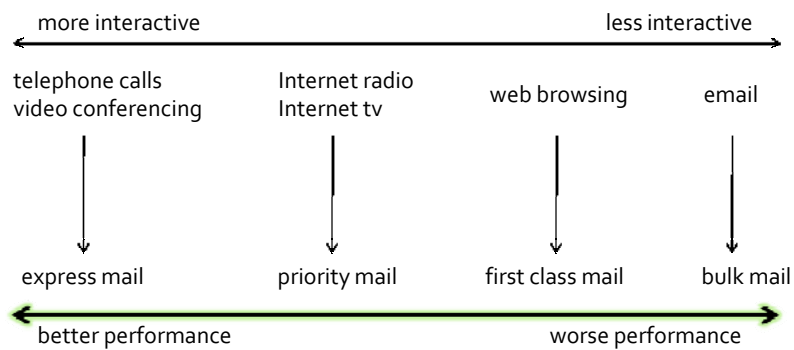


Net Neutrality

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Quality of Service (QoS)



Quality of Service (QoS):

Only two ways to provide QoS:

(1) **Reserve** some bandwidth for selected streams, and **limit** the traffic in this bandwidth segment.

- Example - **toll lane** (when toll depends on congestion to limit traffic)

(2) Give **priority** to some selected streams.

- Example - **priority mail**

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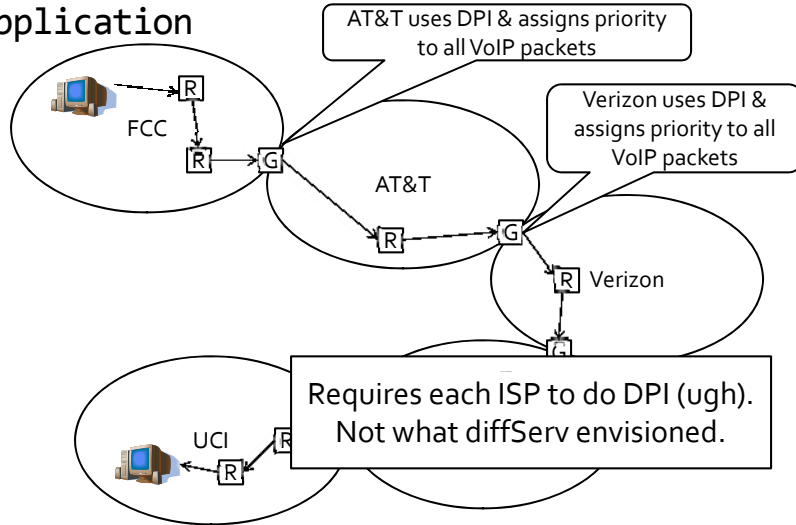
Basis for QoS

- the application, e.g. Cox decides which applications get low priority (in trial)
- the service provider, e.g. Cox VoIP subscribers' packets get high priority
- the source and/or destination, e.g. Comcast terminates selected connections from own subscribers to non-Comcast subscribers (not anymore)
- payment, e.g. ISP gives high priority to all of a subscriber's VoIP packets if that option is purchased

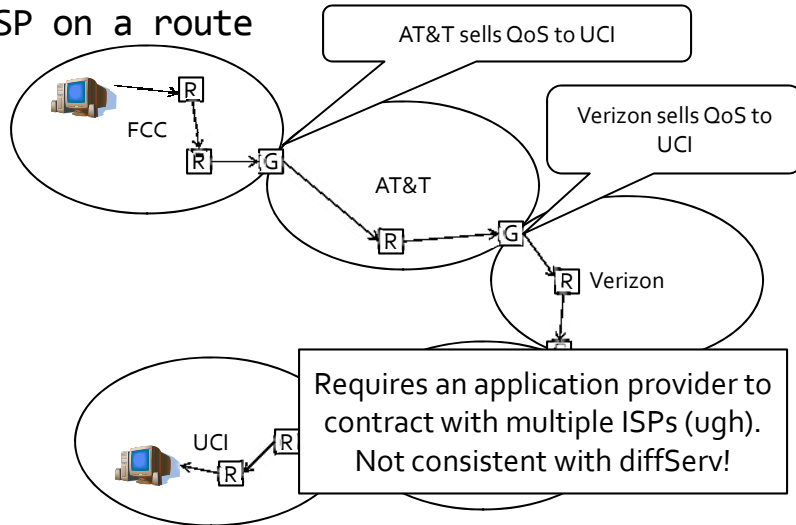
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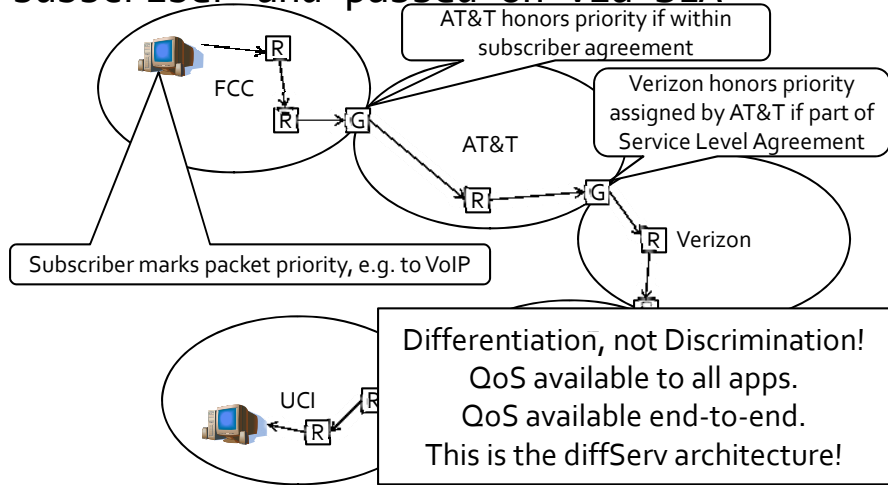
The wrong way: QoS based directly on application



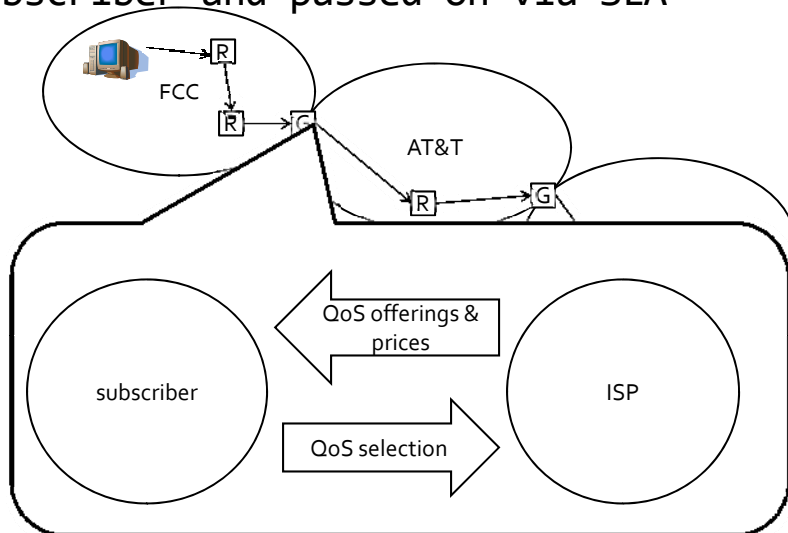
The wrong way: QoS purchased from each ISP on a route



The right way: QoS purchased by subscriber and passed on via SLA



The right way: QoS purchased by subscriber and passed on via SLA



Pro Net Neutrality

Application Providers

- e.g. Google, Amazon, Microsoft, Yahoo, ...
- want to be able to access QoS
 - worried that ISPs will only use QoS for themselves
 - worried that ISPs will offer exclusive QoS deals
 - worried that QoS will not be available end-to-end
- are willing to pay for QoS
 - but only to their own ISP
 - not to terminating ISP

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Pro Net Neutrality

Public Interest Groups

- e.g. Free Press, Public Knowledge, CDT, ...
- want a prohibition on blocking
- want to be able to access QoS
 - some used to be opposed to QoS
 - now want nondiscriminatory access to QoS
- mixed opinions about paying for QoS
 - usually ok with consumers paying
 - usually not ok with application providers paying

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Anti Net Neutrality

Internet Service Providers

- e.g. AT&T, Verizon, Cox, Comcast, Time Warner
- using QoS for their own services
 - aren't yet thinking about selling QoS
 - aren't yet thinking about end-to-end QoS
- opposed to new law/regulation
 - don't want to be forced to offer QoS
 - want exemption for "specialized services"
 - want exemption for "wireless networks"
 - if offer QoS, don't want regulation on exclusiveness or price

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FCC Open Internet Order

- Scope
- Transparency
- Blocking
- Discrimination
- Wireless
- Specialized Services

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Broadband Internet Access Service

- only applies to providers of mass-market retail service to/from substantially all Internet endpoints
 - thus may exclude campus networks
 - but may include the ISPs of universities

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Transparency

- requires disclosure by ISPs of
 - network management practices, performance, terms of service
 - to consumers & to application & device providers
- including congestion control, blocking, device attachment, pricing, privacy, security
- not including detailed spam or security info

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Blocking on Fixed Internet Access

- prohibits blocking of lawful content, applications, or non-harmful devices:
 - blocking based on political speech
 - blocking based on source or destination
 - charging for delivery
- except “reasonable network management”:
 - blocking for network security (e.g. DoS)
 - anything controlled by the end-user, including spam & parental controls

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Discrimination on Fixed Internet Access

- prohibits unreasonable discrimination:
 - application-based congestion control or QoS, if anti-competitive
 - payment for QoS by remote application providers
 - QoS exclusively for an ISP’s own applications (but see “specialized services” later ...)
- except “reasonable network management”:
 - anything controlled by the end-user, including tiering, QoS, usage-based pricing
 - application-agnostic congestion control

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Mobile Internet Access

- prohibits
 - blocking of lawful websites
 - blocking of competing voice/video applications
- does not prohibit
 - blocking of other applications
 - blocking of non-harmful devices
 - unreasonable discrimination

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Specialized Services

- What are they?
 - not “broadband Internet access service”
 - including VoIP, video/IP
 - may include many other IP-based services
- Not regulated
 - but will be “monitored” ...

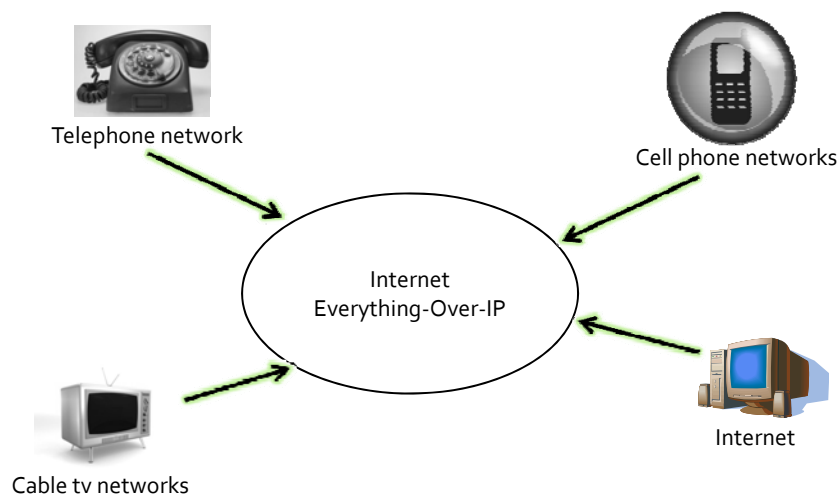
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Current Status

- Courts
 - FCC's legal authority to be litigated
- Congress
 - attempts to blocking implementation
 - attempts to strengthen rules

Convergence



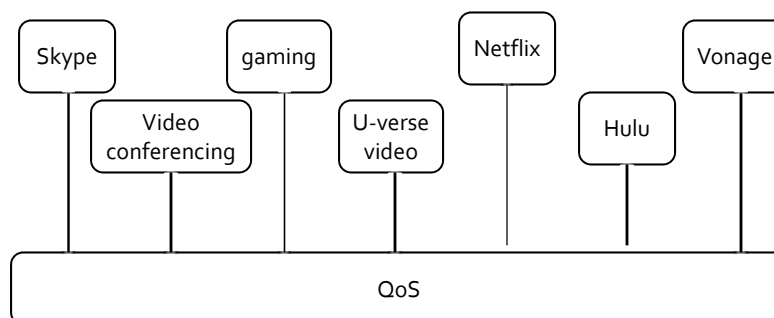
Fixed versus mobile

- Different expectations of blocking and discrimination
 - on smart phone versus desktop computer?
 - on smart phone on 3G versus on Wi-Fi?

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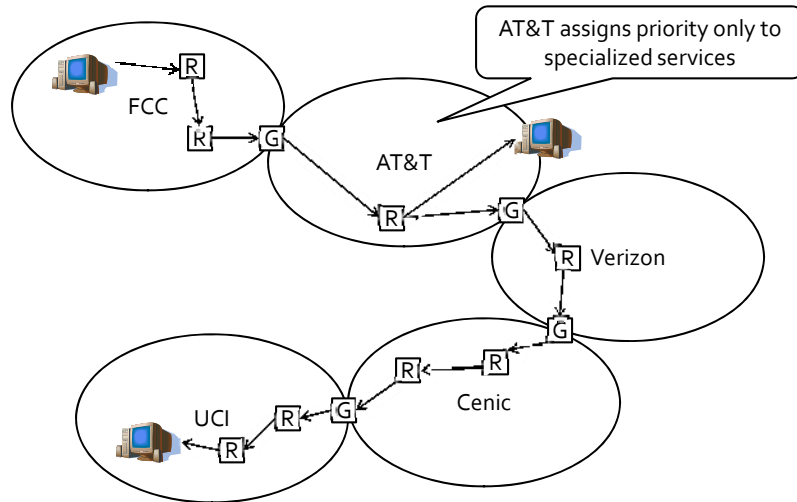
Specialized Services



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End-to-end QoS



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A proposal ...

If an ISP uses QoS for its own applications ...

... then it shall make QoS available without unreasonable discrimination ...

... to subscribers (both residential and business) ...

... and to other ISPs.

- Apply to both fixed & mobile
- Don't define "Specialized Services"

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