

Smart Data Pricing The Carrier's View

Presented by
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2006 - 2011

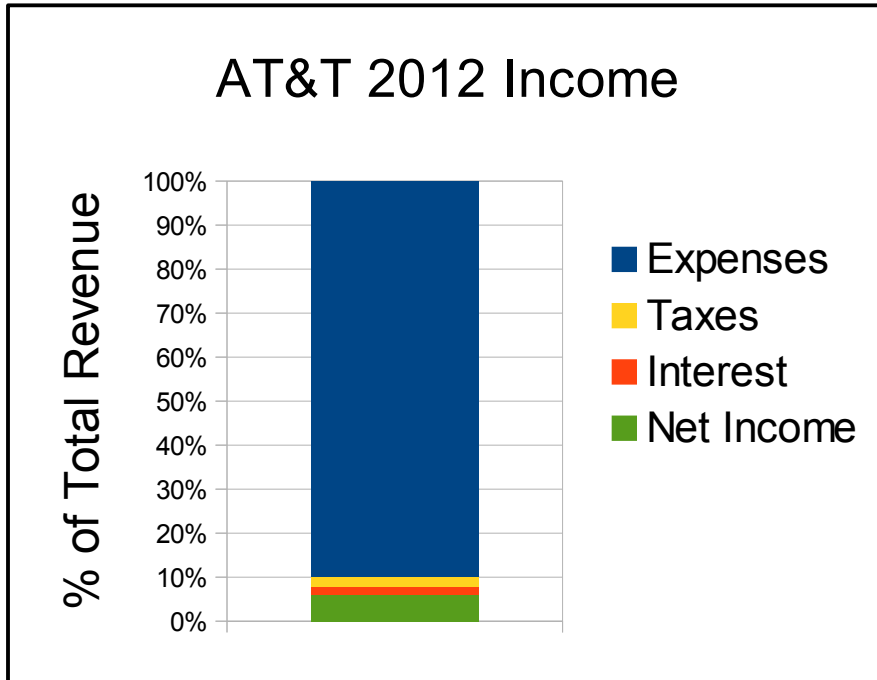
Communication Service Cost and Pricing

- What drives network costs?
- Where is the traffic demand and how is it changing?
- How does network technology evolve?
- What roles do partners, competitors and providers play?
- How does regulatory policy affect pricing?



Key Take Aways

Network Revenues & Costs*



- In 2012 AT&T,
- had revenues of \$127 billion
 - had operating expense of \$114 billion
 - earned \$1.25/share
 - paid a dividend of \$1.77/share
 - invested \$22 billion in the network, that's 15.5% of revenue & \$3.39/share



Network investment cannot be funded from operating income. It must be raised by issuing bonds or issuing equity – selling common or preferred stock. Both place additional pressure on future earnings.

Segment	Revenue	Income	Assets	ROA
Wireless	\$66,763	\$16,594	\$132,556	12.5%
Wireline	\$59,567	\$8,914	\$134,386	6.6%

* all data are taken from AT&T's 2012 annual report

Network Investment & Risks

Project Categories

- +** - **Success Based**, funded when major contracts are won or existing customers expand their footprints. Revenue virtually guaranteed.
- ~** - **Project Funded**, the source of new services and revenues, cost reductions, or required infrastructure upgrades (e.g. Home Security). Revenue depends on service adoption.
- x** - **Business as Usual**, needed to keep network capacity up to set service levels. Increases as traffic grows, harvest as it decreases. Revenue depends on additional charges to existing services.

Cost Categories

- +** - **Variable Cost**, in these projects costs and revenues go together, more cost brings in more revenue immediately.
- x** - **Fixed Cost**, fixed cost projects require substantial investment on day 1 with the promise of future revenues to cover costs.



Risk Assessment

- +** Low Risk
 - ~** Average Risk
 - x** High Risk
- +** **+** **x** = **~**

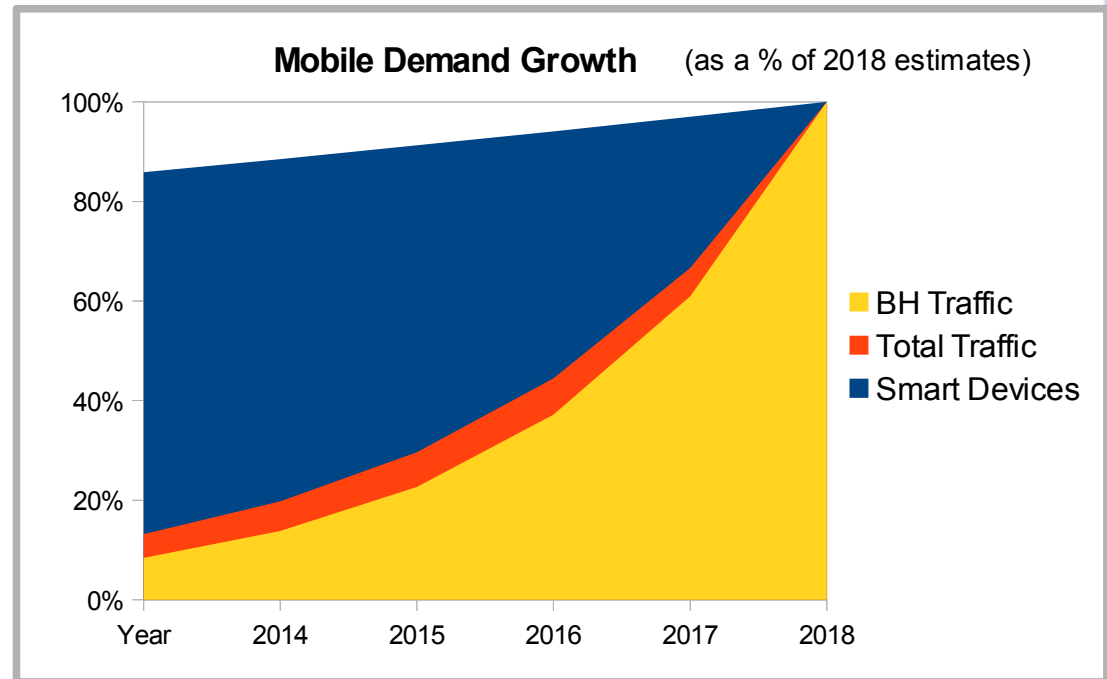
Risk Matrix	Fixed	Variable
Success Based	~	+ +
Project Funded	~ x	~ +
Business as Usual	x x	~

Carriers must find a way to move data driven network growth from fixed BAU to variable SB cost.

US Mobile Market Trends

US Market Facts (2013)

- Mobile subscriptions 110% of population [3]
- Mobile phone penetration* 94% [1]
- Smart phone penetration* 74% [2]
- eTablet penetration* 52% [2]



US Market Forecasts (2013 - 2018)

- Smart device penetration grows to 93% in 2018 [4]
- avg. mobile speeds grow from 2.0 to 4.5 mbps in 2018, a 21% CAGR [4]
- Mobile data traffic will grow by 50% CAGR [4]
- Busy hour traffic will grow by 64% CAGR [4]
- Mobile offload (WiFi) reduces data growth by 4 - 10% [4]
- US operators **profits run out** – **2Q 2014** [3]

* as a percentage of mobile subscribers



Network growth cannot be funded by new subscriptions

US Mobile Market Trends (cont'd)

US Wireline Voice

- About half of US homes use a wireline phone
- Carriers are losing wireline voice customers at 6-8%/year
- There are two busy hours (BH) each day in business districts, 10 am & 2 pm
- There are two busy hours each day in residential areas, 5 pm and 8 pm
- A full day's traffic is generally equal to 10 * the BH traffic
- Network engineering is based on ten high day busy hour blocking
- Today's wireline voice network was sized for a much larger load

US Wireless Data & Voice

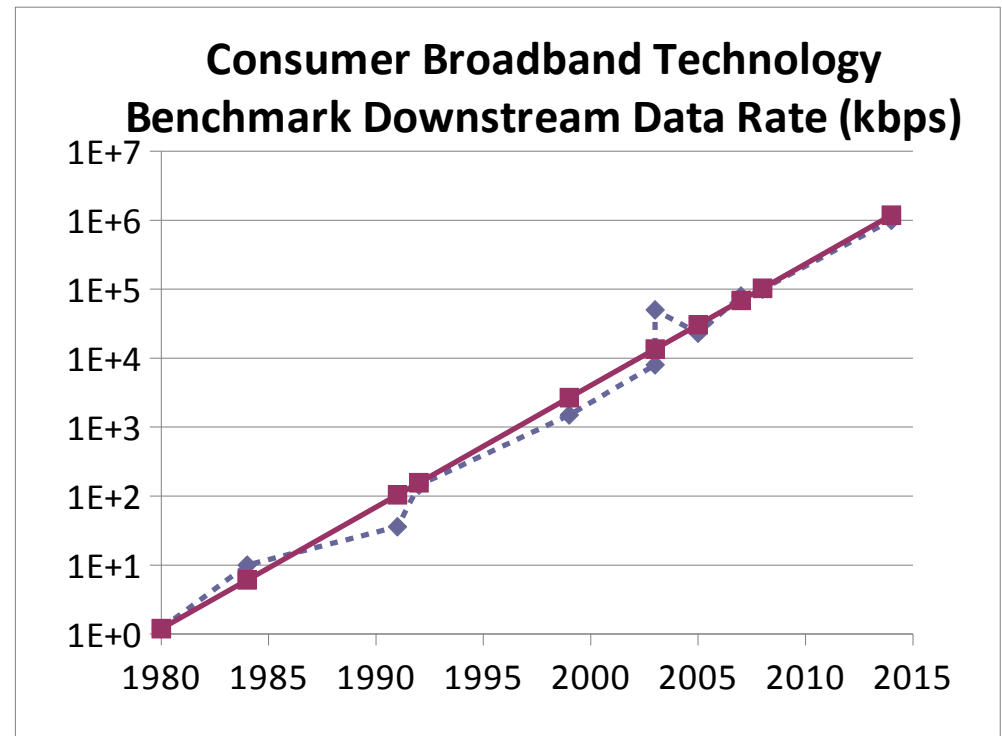
- The US has 5% of the world mobile subscribers and 50% of the LTE traffic
- LTE subscribers will hit 1 billion worldwide in 2016[5]
- LTE subscribers use 168% more data (46 mb/day) than 3G (17 mb/day) users[6]
- A full day's traffic is generally equal to 7 - 10 * the BH traffic
- Approximately 25% of mobile traffic is moving faster than walking speeds
- Video is approximately 55% of BH traffic
- Postpaid ARPU increased ~2.0% in 2013[7]



The US wireless market is nearing saturation; video driven BH data is growing at 64% CAGR and wireless ARPU is growing at 2% per year.

US Wireline Broadband Market Trends

Network Technology	Retail Rates (kbps)
V.22	1.2
V.22bis	10
V.32bis	36
ISDN BRI	144
ADSL 1.5	1,500
ADSL2+	8,000
BPON	50,000
VDSL2	23,000
DOCSIS 3.0	80,000
GPON	100,000
10G-PON	1,000,000

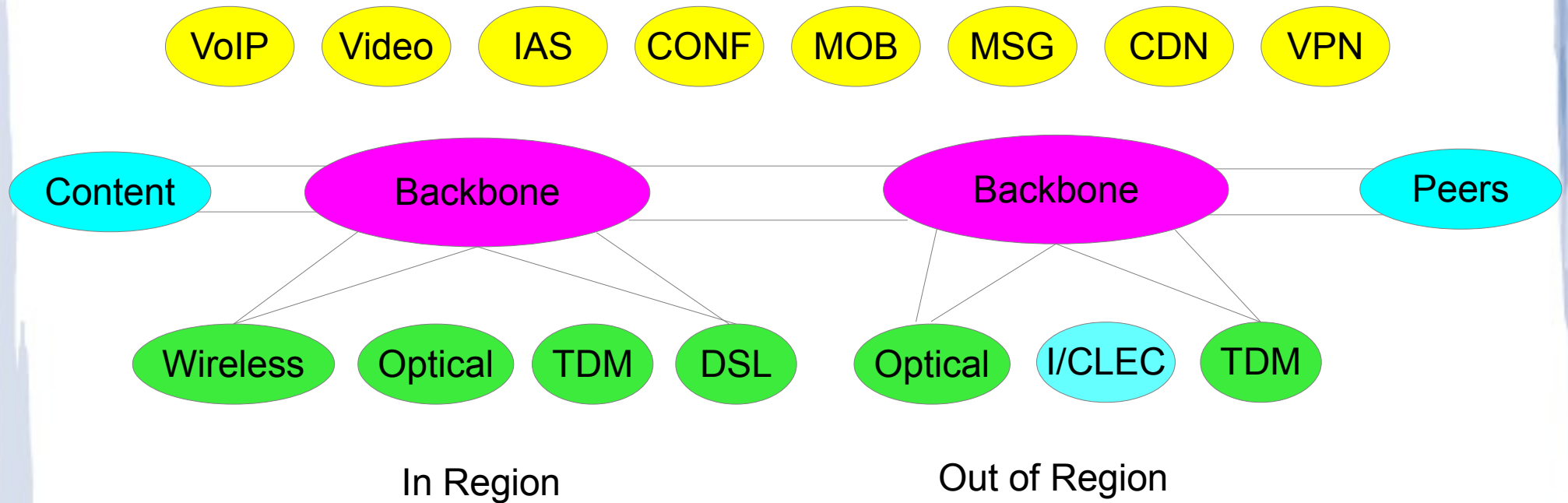


- Consumer benchmark wireline broadband speeds are growing at ~40%/year as predicted by Nielsen's Law.
- New technology is deployed using the benchmark.

---◆--- Retail Rates
 —■— Nielsen's Law

- **Access technology deployment generally means high fixed cost with incremental returns over a long payback period.**
- Consumers expect to pay the same monthly fees, adjusted for inflation.
- **Consumer access rates no longer act as a limit to core network traffic.**

Network



VoIP – Voice over IP
Video – Video Services
IAS – Internet Access Services
CONF – Conference Services

MOB – Mobility & Location Services
MSG – Messaging Services
CDN – Content, Compute Services
VPN – Virtual Private Network Services



Service



Access

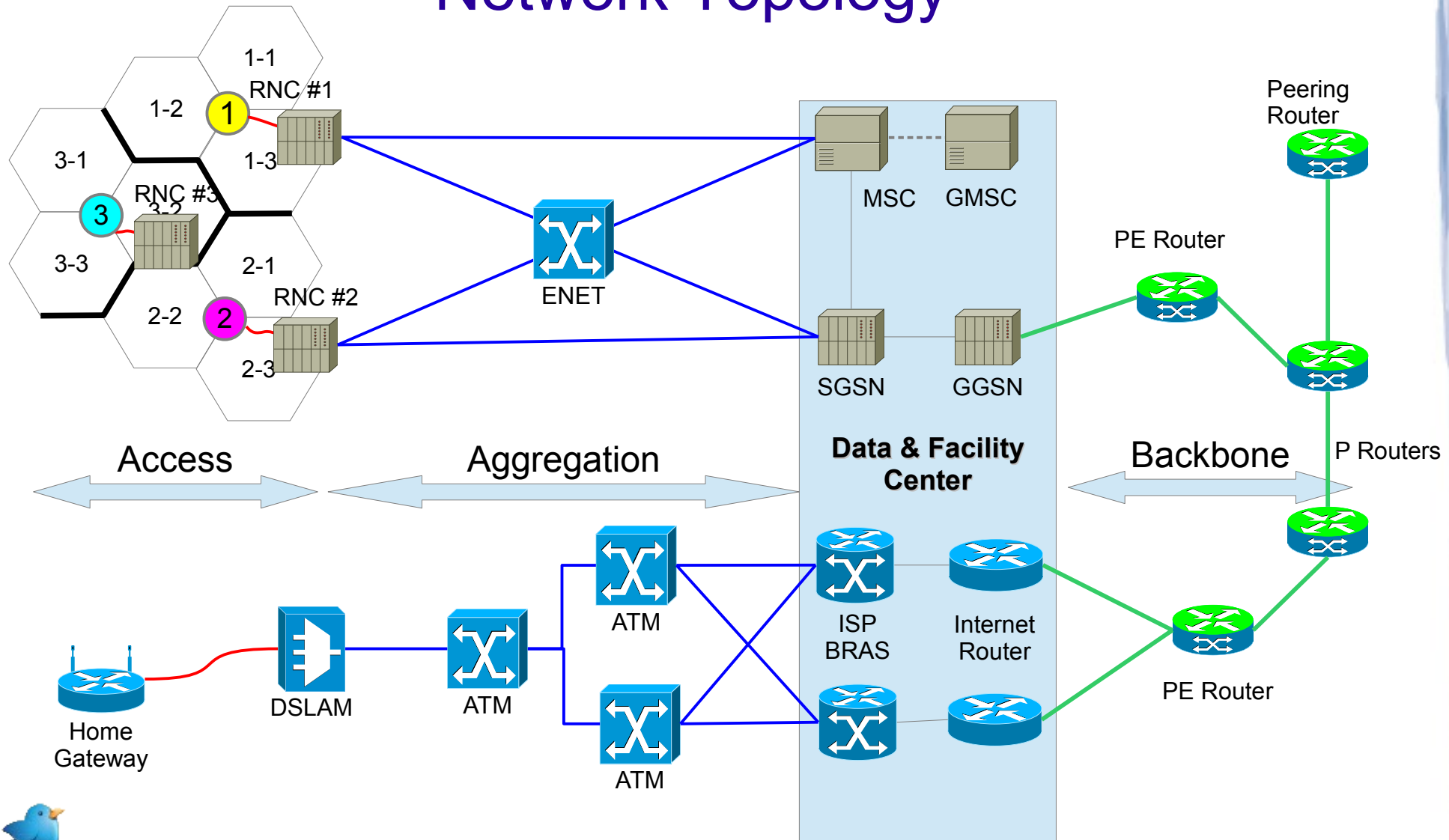


Peers/Providers



Backbone

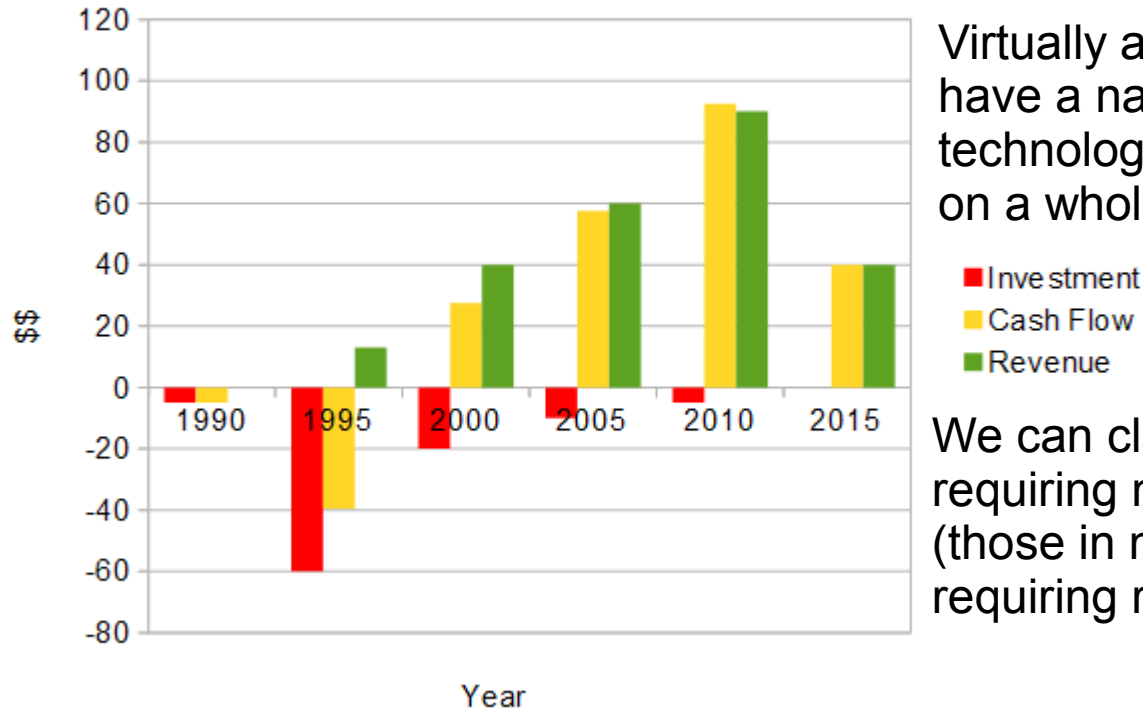
Network Topology



The growth in data traffic affects all parts of the network. Wireless and aggregation networks are the most affected.

Network Technology Economic Lifecycle

ADSL Network Technology
Economic Life Cycle



Virtually all communications technologies have a natural life cycle. Access and aggregation technologies in particular must be replaced on a wholesale basis at end of life.

We can classify technologies as emerging (those requiring massive investment), cash generating (those in mid life) and retiring (those declining and requiring replacement or market abandonment).

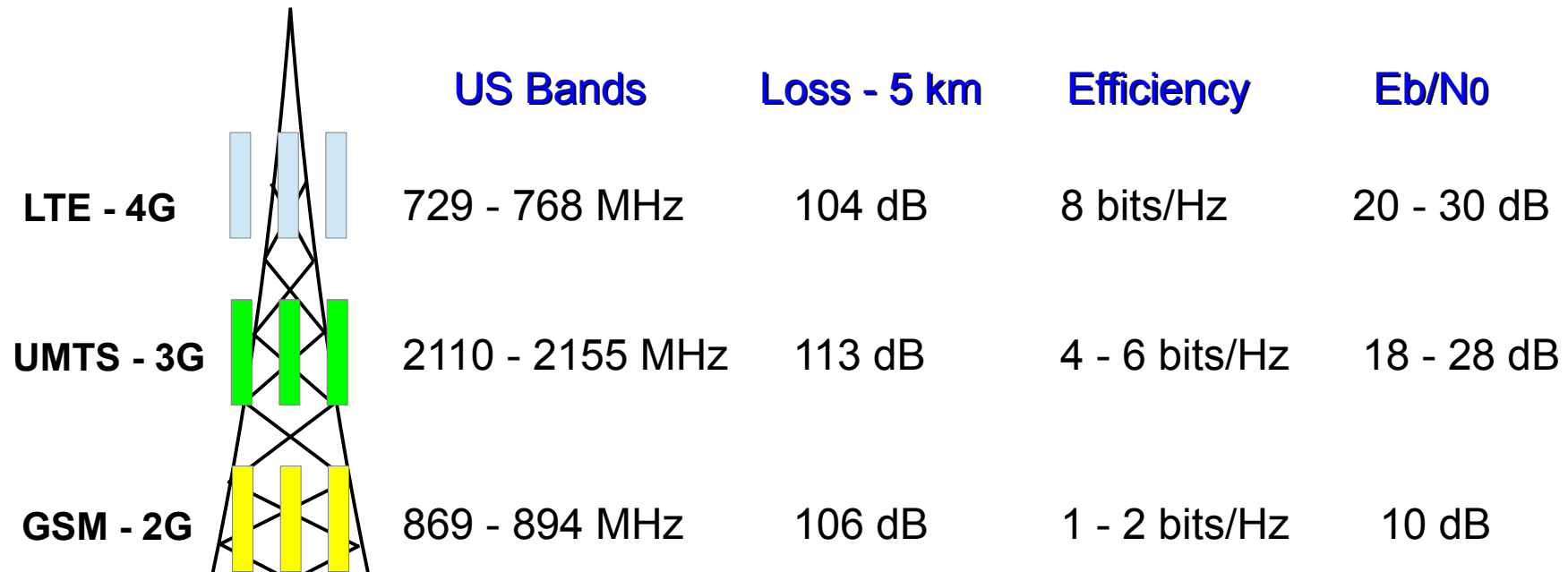
- Retiring technologies include Frame Relay, ATM, wireline TDM voice, GSM/EDGE mobile, SONET optical transport, DS3 and PRI services, ADSL1 and ADSL2.
- Cash generating technologies include VoIP, UMTS/EvDO, VDSL2, DOCSIS 1.0 & 2.0, Gigabit Ethernet and MPLS.
- Emerging technologies include Fiber to the Home (FTTH), DOCSIS 3.0, LTE, cloud services, switched optical wavelength services, SDN, IPv6 and security services.



There are no emerging technologies in sight that can replace the net cash flow of wireless.

Mobile Services Spectrum

(downlink only)



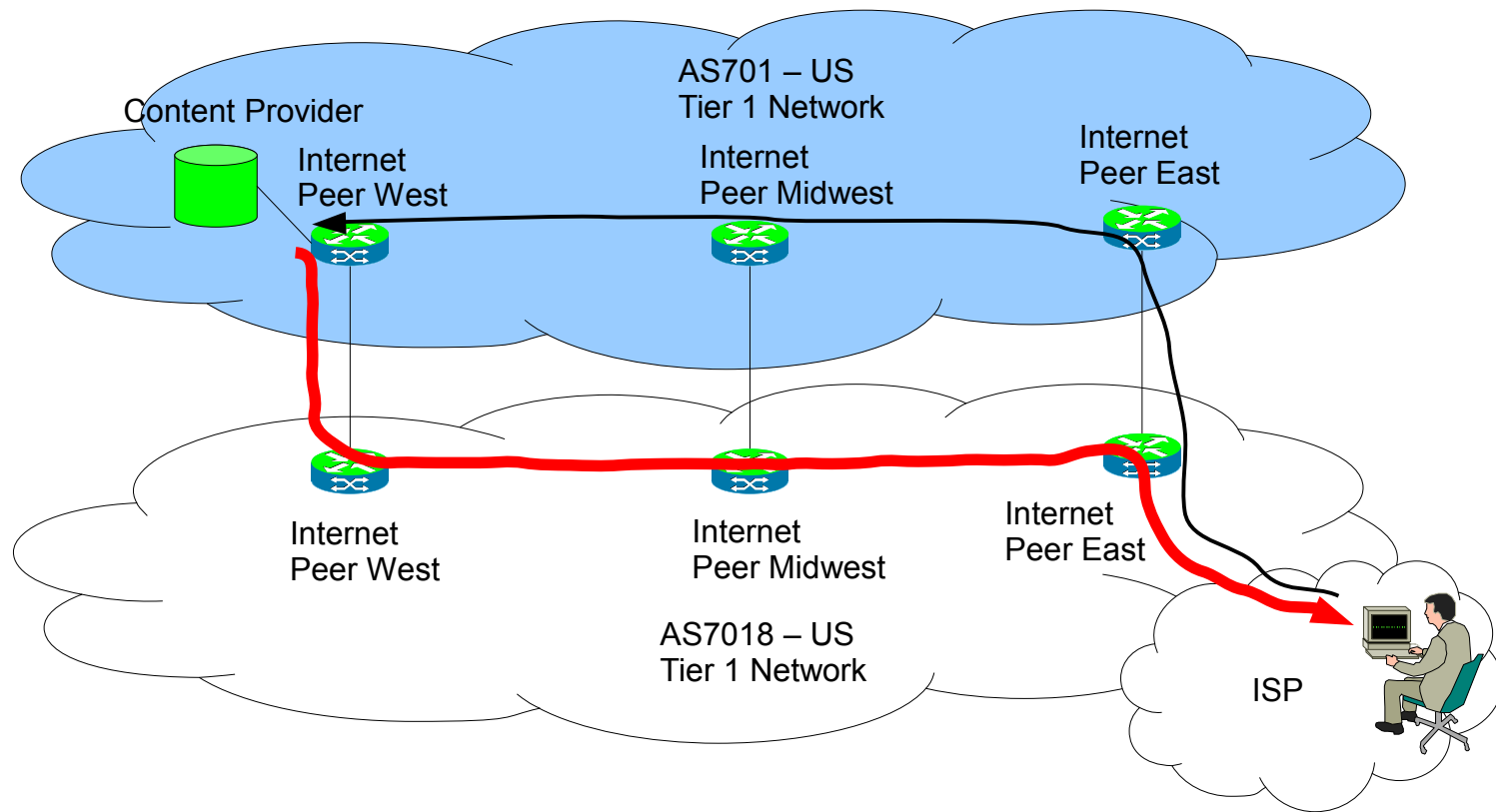
In 2008 AT&T and Verizon spent \$16.3B on LTE licenses in the 700 MHz band. Generally 12 MHz blocks were purchased.

GSM-2G 850 MHz service will be decommissioned by 2017.

Rapid decommissioning and re-use of 2G spectrum is the best path to wireless access relief.



Peering & Content Delivery



Internet interconnection and content delivery are negotiated and managed between network providers. Unlike the wireline voice network, the FCC does not regulate Internet interconnection.

Settlement-free peering is the accepted practice between tier 1 networks. Even then, the peers must maintain a 'balanced traffic ratio' [8].

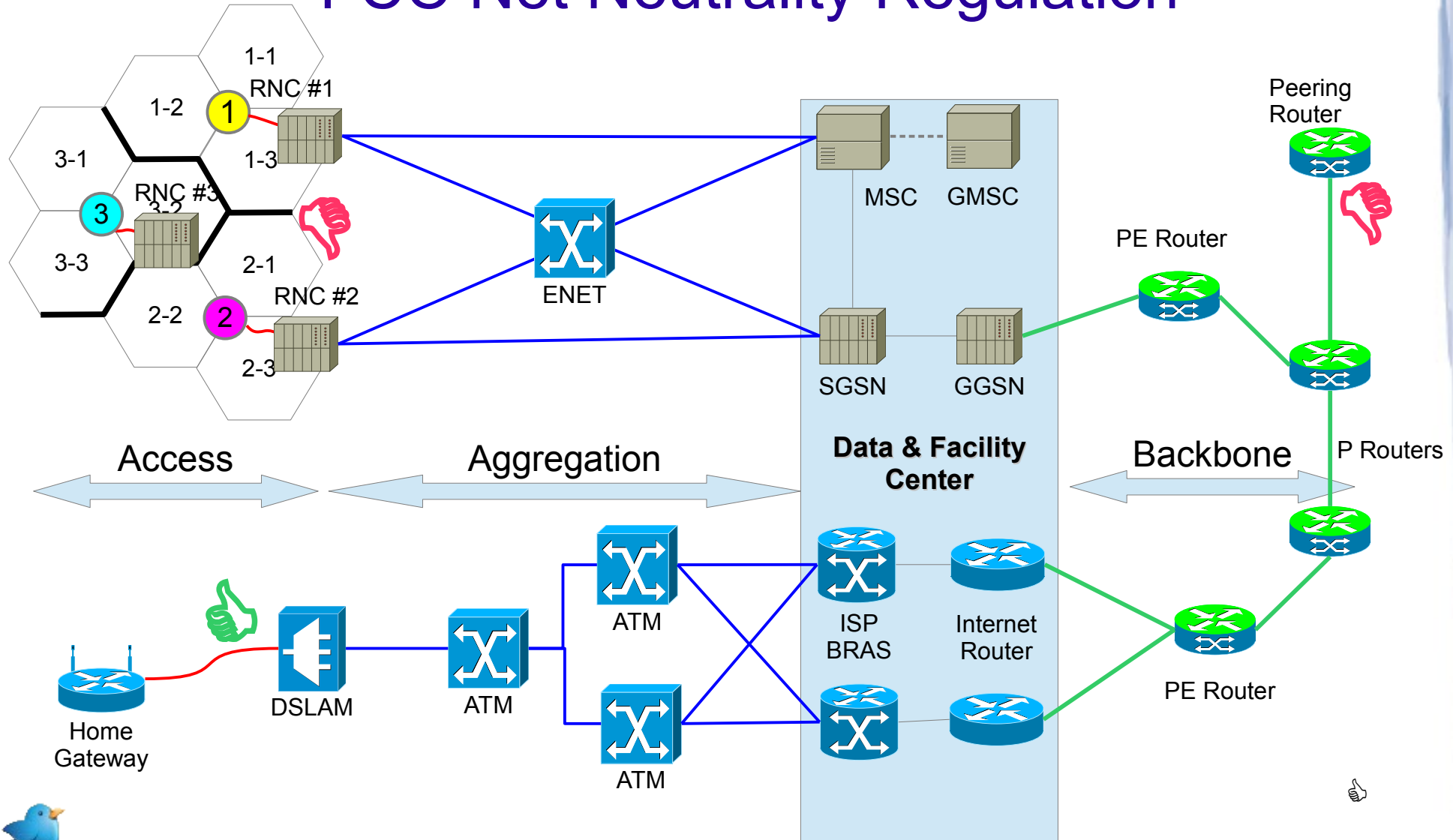
Regulatory Authority & Rulings

- FCC's authority stems from 1934 and 1996 Communications Acts
- Wireline phone carriage and transport are regulated under 'common carriage'
 - * subject to 'equal access and reasonable accommodation'
 - * intra-state regulated by PUCs, inter-state regulated by FCC
 - * interconnection & charges are regulated
- In 2010 the FCC attempted to regulate 'net neutrality' for broadband Internet service: *'A mass-market retail service by wire or radio that provides the capability to transmit data to and receive data from all or substantially all Internet endpoints, including any capabilities that are incidental to and enable the operation of the communications service, but excluding dial-up Internet access service ...'* [FCC order 10-201].
- Three principles were cited:
 - * transparency - disclosure of practices & terms
 - X* no blocking - unfettered access to all sites and content; charging of content providers is not allowed
 - X* no unreasonable discrimination - subscribers can be charged for tiered access, but not sites and content providers



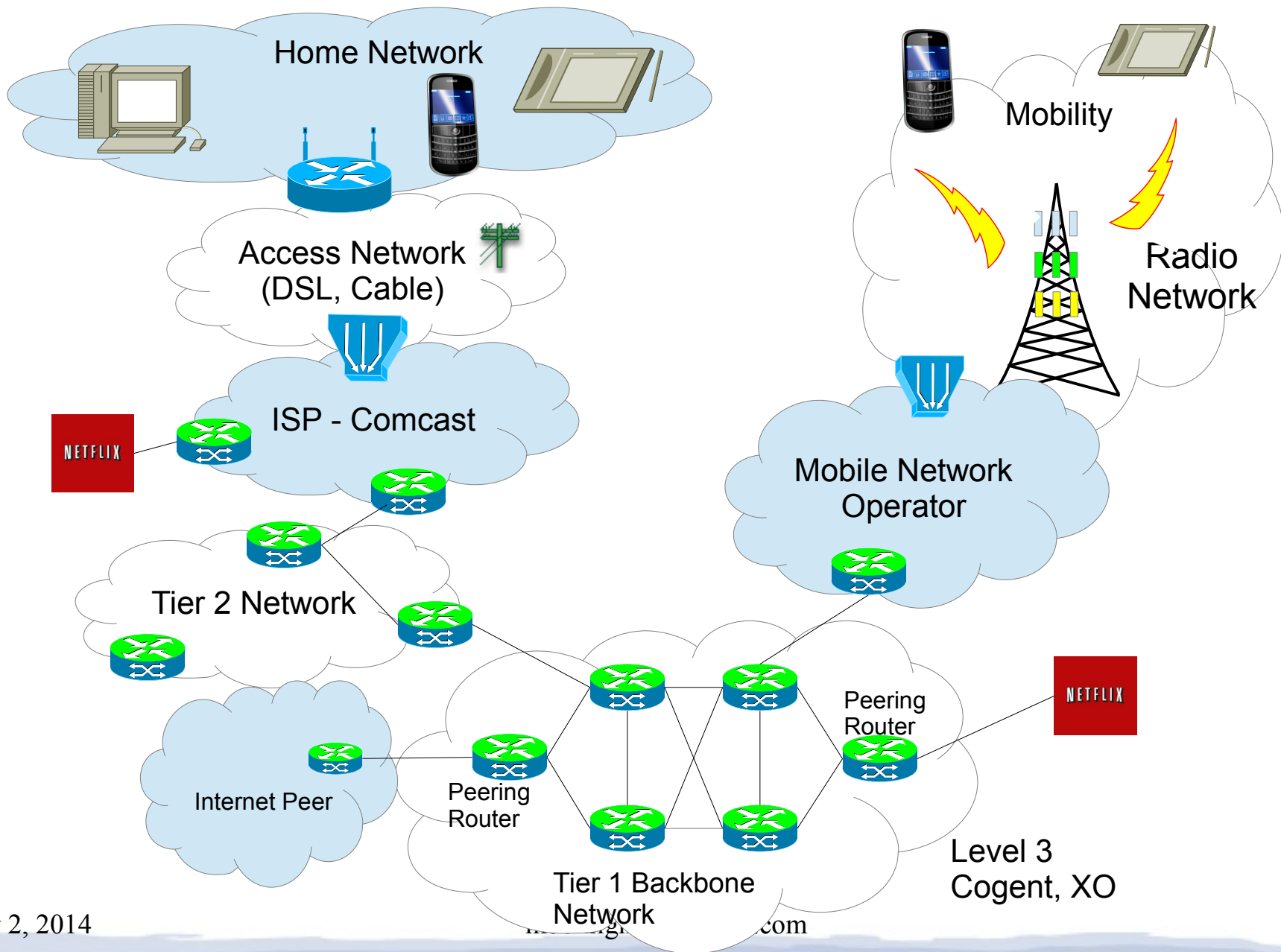
Verizon sued the FCC and in February 2014 the US Court of Appeals, District of Columbia, overturned two of the three principles of the order. The FCC has rewritten those rules to allow for a 'fast lane' that could entail charges to the content providers by the broadband carriers. Public comments open May 15.

FCC Net Neutrality Regulation

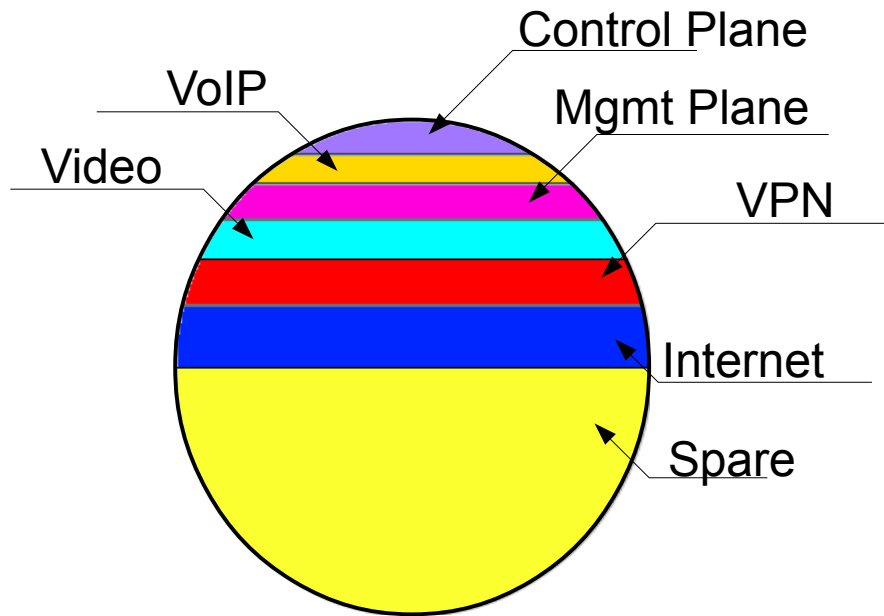


Wireless and peering are not covered by the proposed FCC regulation. Only wireline broadband aggregation and access networks are covered.

Comcast vs. Netflix



Mechanisms for Managing Possible Net Neutrality Outcomes

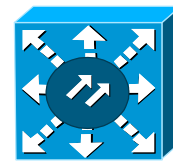


MPLS/IP Service Priorities

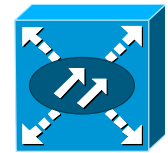
Protocols

- RSVP-TE
- MPLS
- VPLS

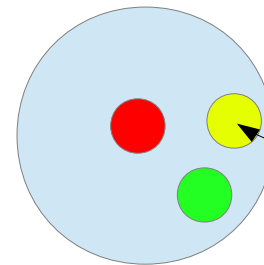
ROADM



Ultra Long Haul WDM

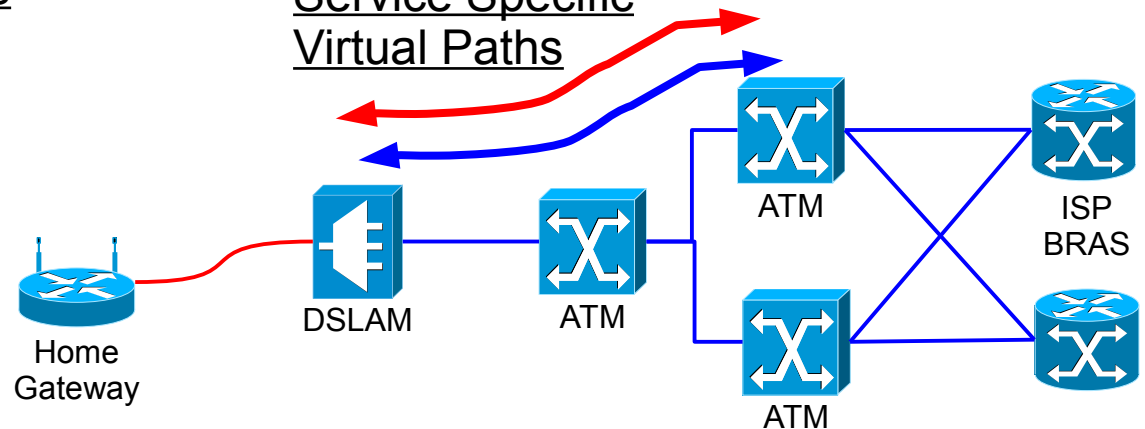


Wavelength Switching



160 λ @ 100 Gbps

Service Specific Virtual Paths



Net Neutrality Winners & Lossers?

Content Creators -

- * Disney (Disney Studios, ESPN, A&E, ABC) 138 B
- * Comcast (NBC, Universal Studios) 133 B
- * News Corporation (20th Century Fox, Fox News, WSJ) 76 B
- * Viacom (Paramount, CBS, MTV, BET) 35 B
- * Sony (Columbia, TriStar, Sony Records) 18 B

Content Bundlers & Distributors -

- * Comcast (cable networks) 133 B
- * Google (YouTube, search) 360 B
- * Netflix 21 B
- * Amazon (Amazon Prime Movies) 150 B
- * Apple (iTunes, Apple TV) 462 B
- * Aereo < 1 B

Carriers -

- * AT&T 185 B
- * Verizon 197 B
- * Comcast 133 B
- * Sprint 35 B
- * T-Mobile 21 B

Public Policy Multiple Choice

- Universal Service
- Affordable Housing
- Business subsidizes the Consumer
- Consumer subsidizes Business
- Predictable Pricing
- Net Neutrality
- Open Internet
- Predatory Lending
- User Choice - pay for what you use

- Policy 1
- Policy 2

Complimentary policies

- Policy 3
- Policy 4

Opposing policies

Summary

- Carriers cannot continue to add Internet bandwidth without additional revenue
- Network BAU costs for bandwidth must become success based
- The US mobile market is nearing saturation & ARPU growth is slowing
- WiFi offload can give limited relief (< 10%) but it moves unregulated traffic to the regulated domain
- The growth of video traffic affects wired and wireless networks
- Repurposing 2G spectrum to LTE is the clearest path to relief
- Large content providers will begin to pay for carriage
- Some form of Net Neutrality will emerge and the carriers will need to find mechanisms to comply with the new rules

References

- [1] – wikipedia - wikipedia.org
- [2] – emarketer.com
- [3] – mobiThinking – www.mobithinking.com
- [4] – Cisco Systems – Visual Network Index
- [5] - HSI iSuppli Reserach - <http://www.cnet.com>
- [6] - The Rapid Road to LTE by Morgan Kurk - <http://www.commscope.com/>
- [7] - AT&T & Verizon annual reports for 2013
- [8] - AT&T's Peering Policy - <http://www.corp.att.com/peering/>