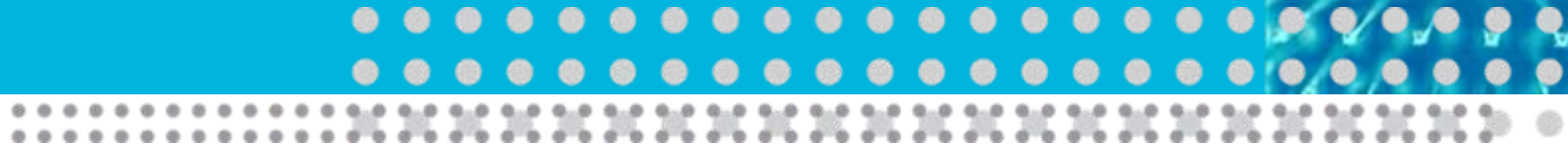
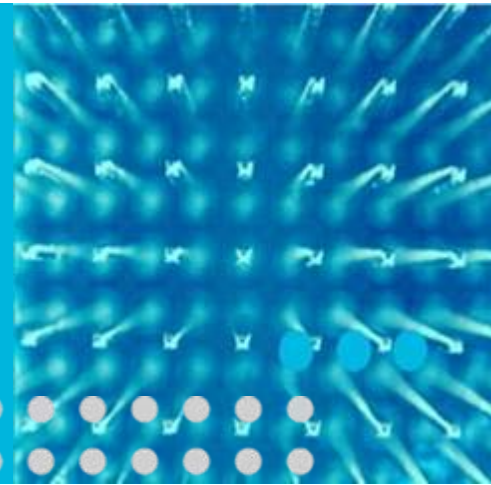


Innovation and Investment in the Internet: Past, present and future



Marcus Weldon

CTO, Alcatel-Lucent

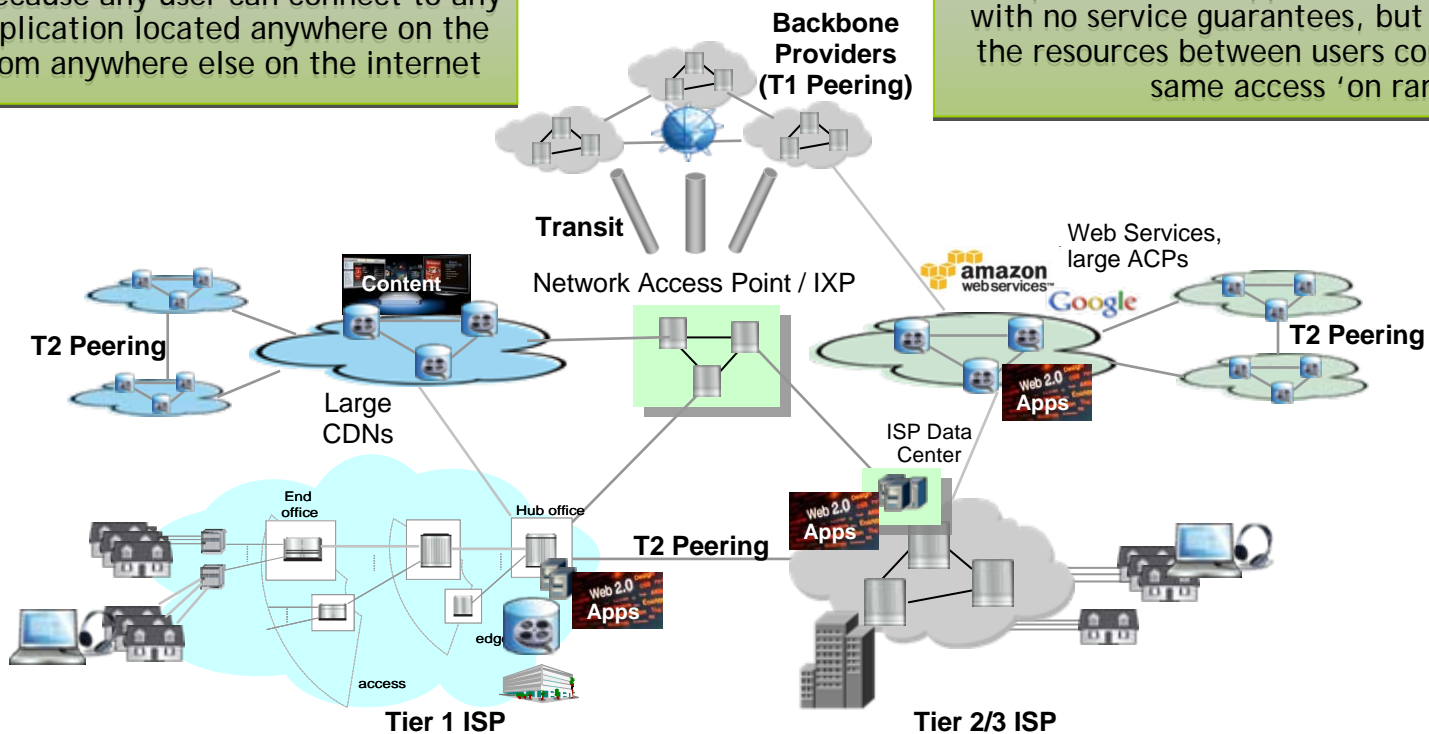
Bell Labs

The Open Internet : What Exactly Is It?

The Internet is a series of interconnected private, managed IP networks and public networks that connect through transit links and peering links

It is Open because any user can connect to any internet application located anywhere on the internet from anywhere else on the internet

The Open Internet supports 'best effort' transport, with no service guarantees, but ~equal usage of the resources between users connected via the same access 'on ramp'



The 'on-ramps' to the Open Internet are primarily provided over managed IP networks, which also support managed services with specific QoS guarantees

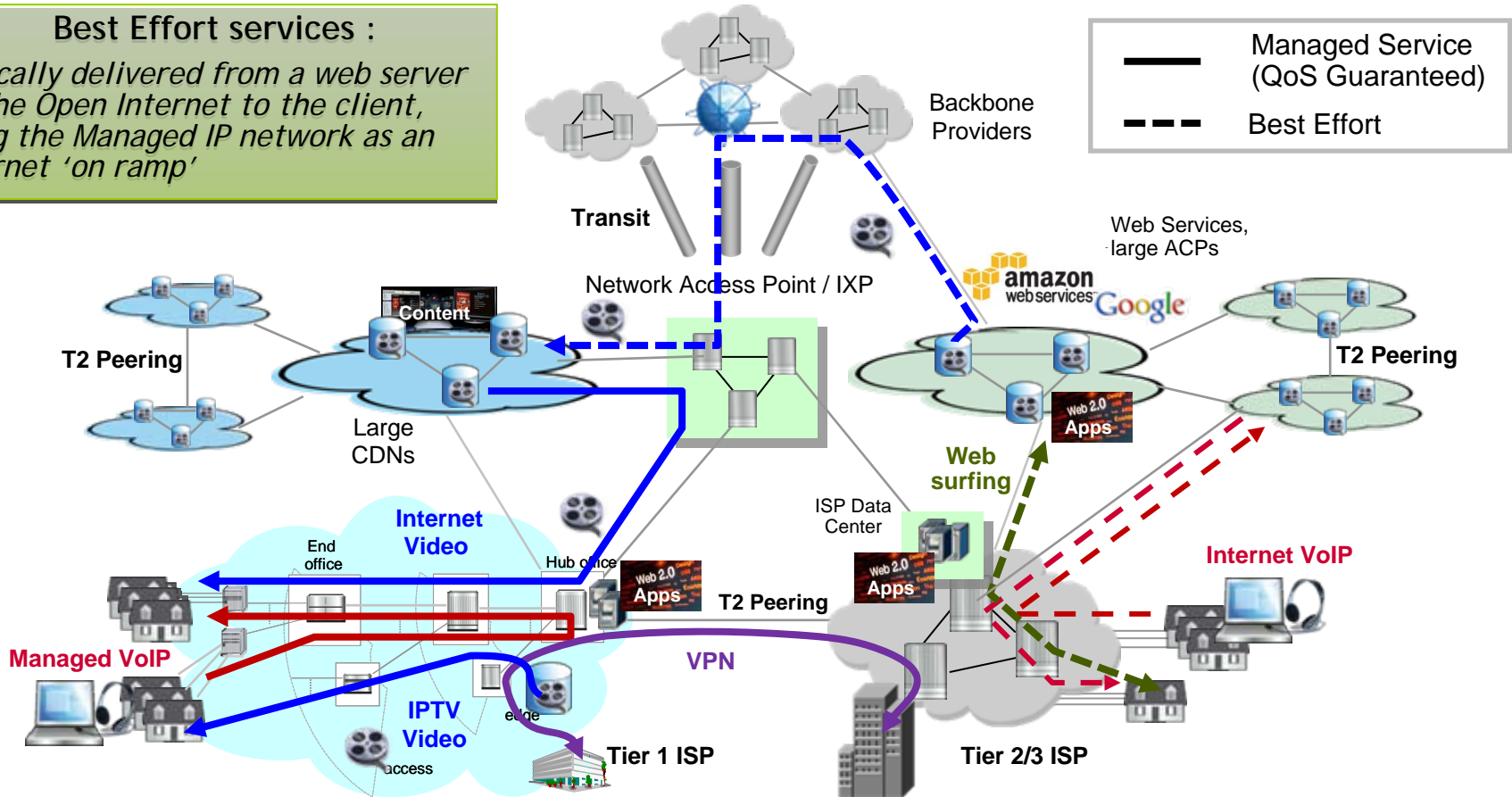
But not all Internet services are equally accessible:

- Content Data Networks (CDNs) enhance delivery of content
- Networks of Data Centers enhance access to applications
- Different service tiers are offered to improve users' access

Best Effort Services and Managed Services : What's the Difference? (View as Build)

Best Effort services :

Typically delivered from a web server on the Open Internet to the client, using the Managed IP network as an Internet 'on ramp'



Managed services :

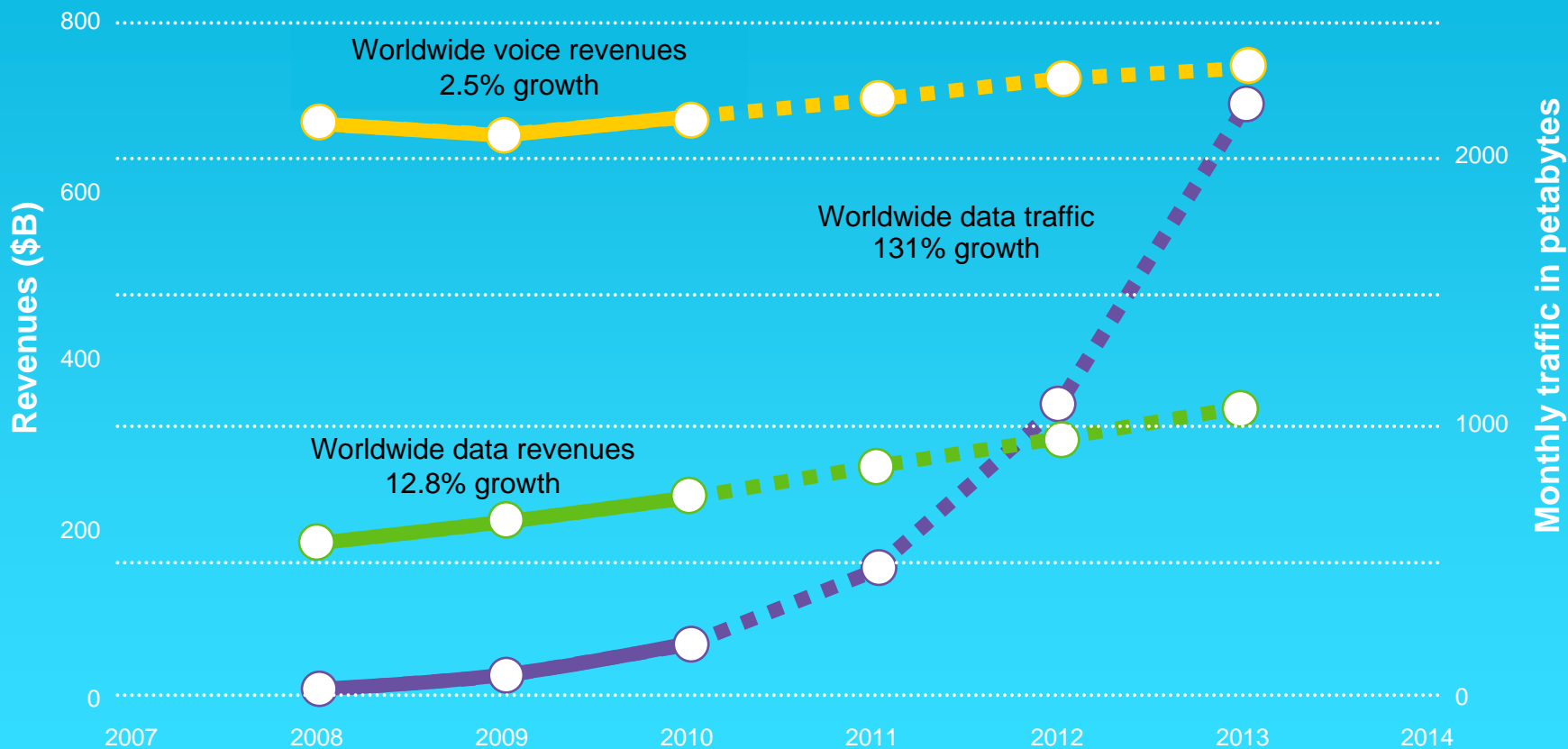
Typically delivered from a web server within the Managed IP network to the client and only traverse the Managed IP network

What exactly led to the success of the Open Internet and what harms it?

Investment in	Was helped by	Was hampered by
Content and Applications	<p>Openness of Internet <i>(anyone can access any app)</i></p> <p>Affordable broadband (fixed + mobile) <i>(it doesn't cost an arm and leg)</i></p> <p>Convergence of Networks (to IP) <i>(one network fits all)</i></p> <p>Simplicity and philosophy of IP <i>(anyone can contribute; 'rough consensus/working code' mentality)</i></p> <p>Proliferation of IP-enabled devices <i>(PCs, Laptops, Netbooks, Smartphones, eBooks, Gaming consoles, STBs)</i></p>	<p>Bandwidth limitations <i>(dial-up doesn't cut it and broadband isn't broad enough)</i></p> <p>Limited accessibility/reach <i>(the utility increases with ubiquity)</i></p> <p>Security and Rights concerns <i>(Protect my data, identity, content)</i></p> <p>Usage of IP-enabled devices <i>(time + money cost of devices and device evolution)</i></p> <p>Poor quality of experience <i>('slow & low' speed and resolution)</i></p>
Network Infrastructure	<p>FTTx-promoting regulation <i>(Open access at Ethernet or IP layer)</i></p> <p>Competition <i>(Cable MSOs vs. Telcos, Fixed vs. Mobile)</i></p> <p>Demand <i>('they came as it was built')</i></p> <p>Network convergence <i>(one network to build, for all services)</i></p> <p>Massive IP/Ethernet technology market <i>(lower cost of devices, networks)</i></p>	<p>FTTx-hampering regulation <i>(infrastructure sharing mandates)</i></p> <p>Geographies and topographies <i>(how far and how hard to reach)</i></p> <p>Cost of networks <i>(capital and cultural cost of IP transformation)</i></p> <p>Lack of competition <i>(high cost of services + access)</i></p>

So what's the problem?

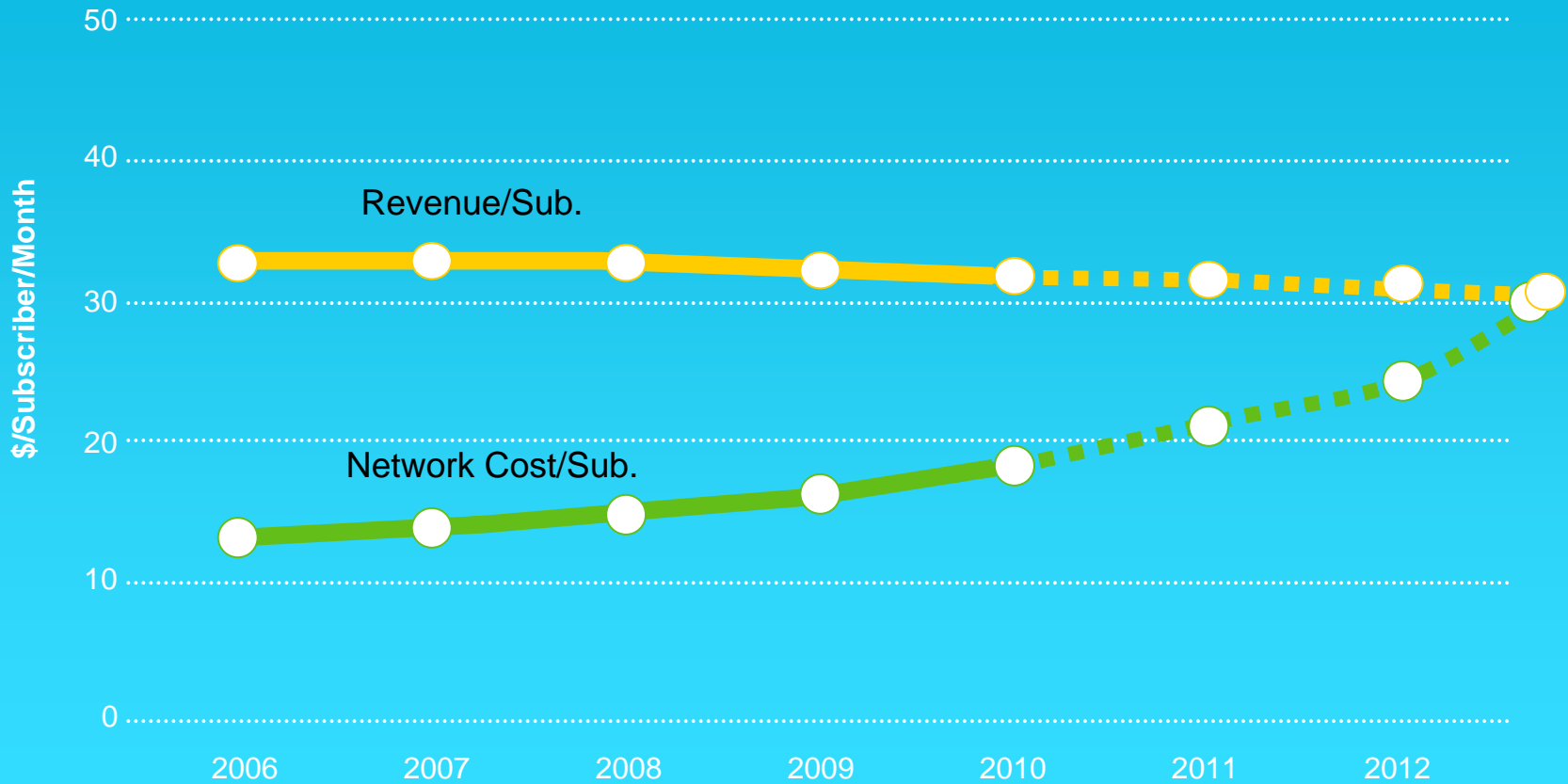
An economic instability as revenues no longer track traffic growth



Source: Pyramid Research/Light Reading

A closer look: Fixed High Speed Internet Revenue and Network Cost

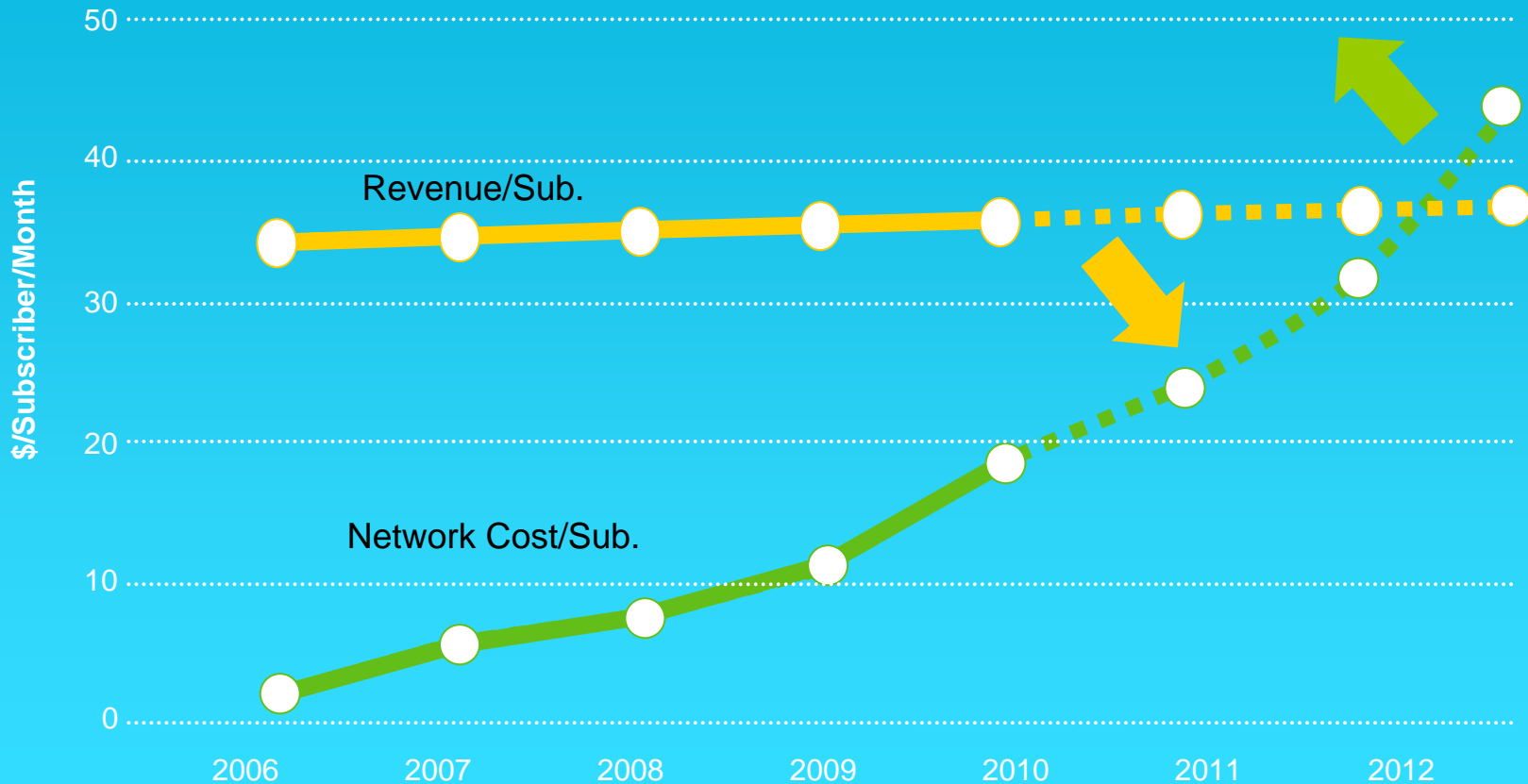
Conservative traffic model assumptions



Source: Bell Labs Modeling and Network Planning

A closer look: Mobile Data Revenue and Network Cost

Conservative traffic model assumptions

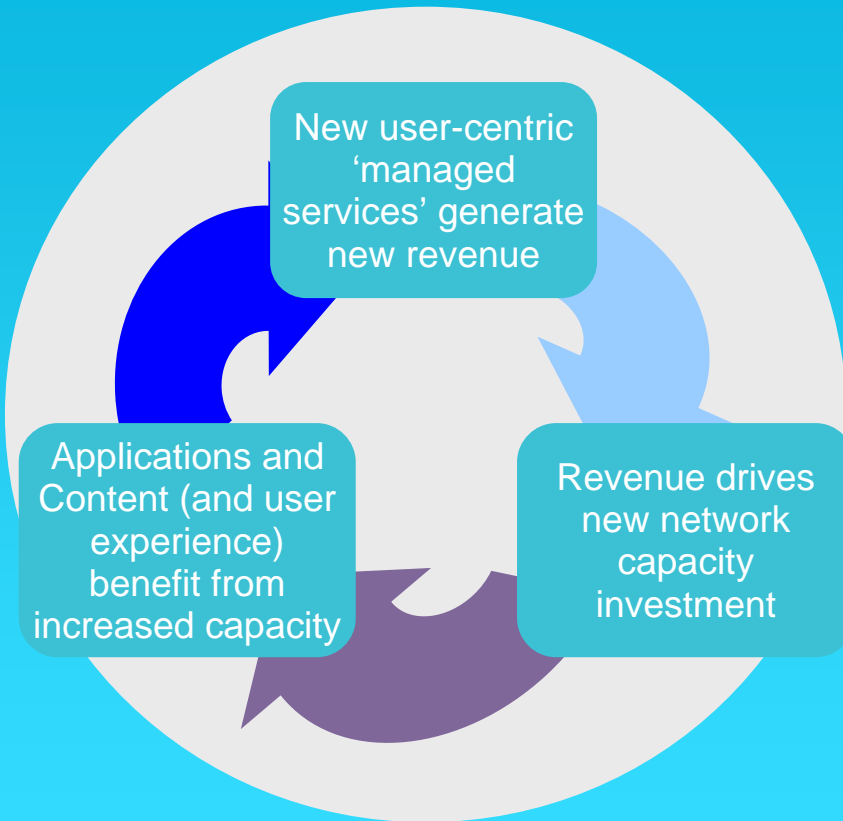


Source: Bell Labs Modeling and Network Planning

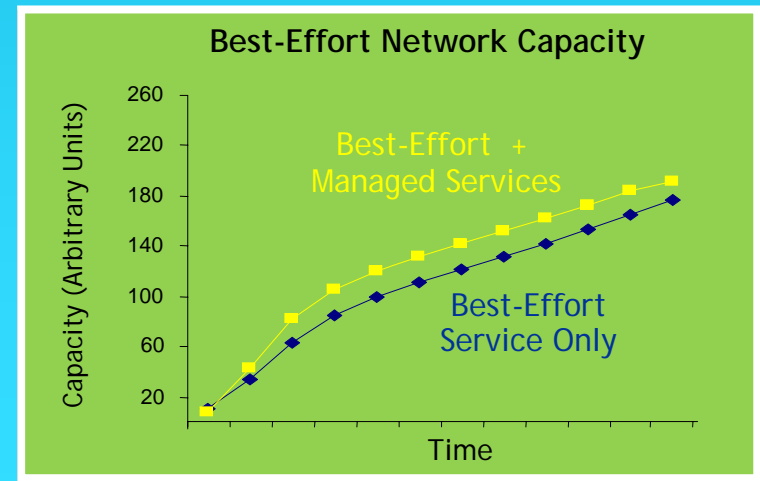
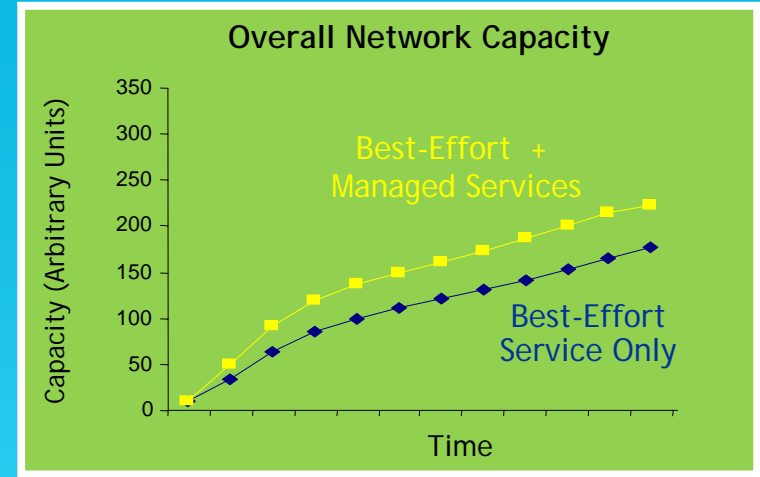
What's the solution?

Managed services for revenue sharing and investment for the good of all

The Proposed Model



The Supporting Analysis



Source: Bell Labs Mathematical Sciences Research