RITE

Reducing Internet Transport Latency

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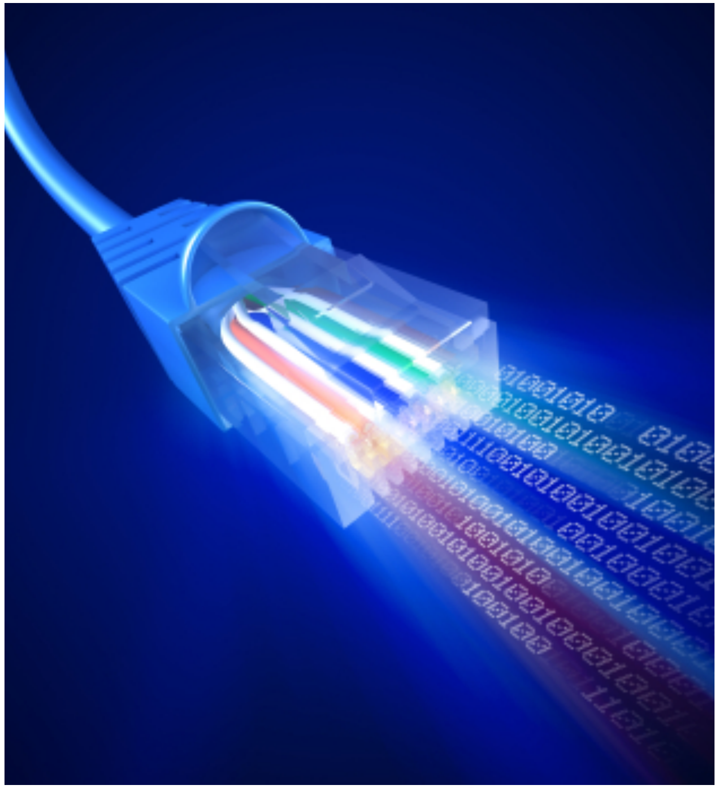

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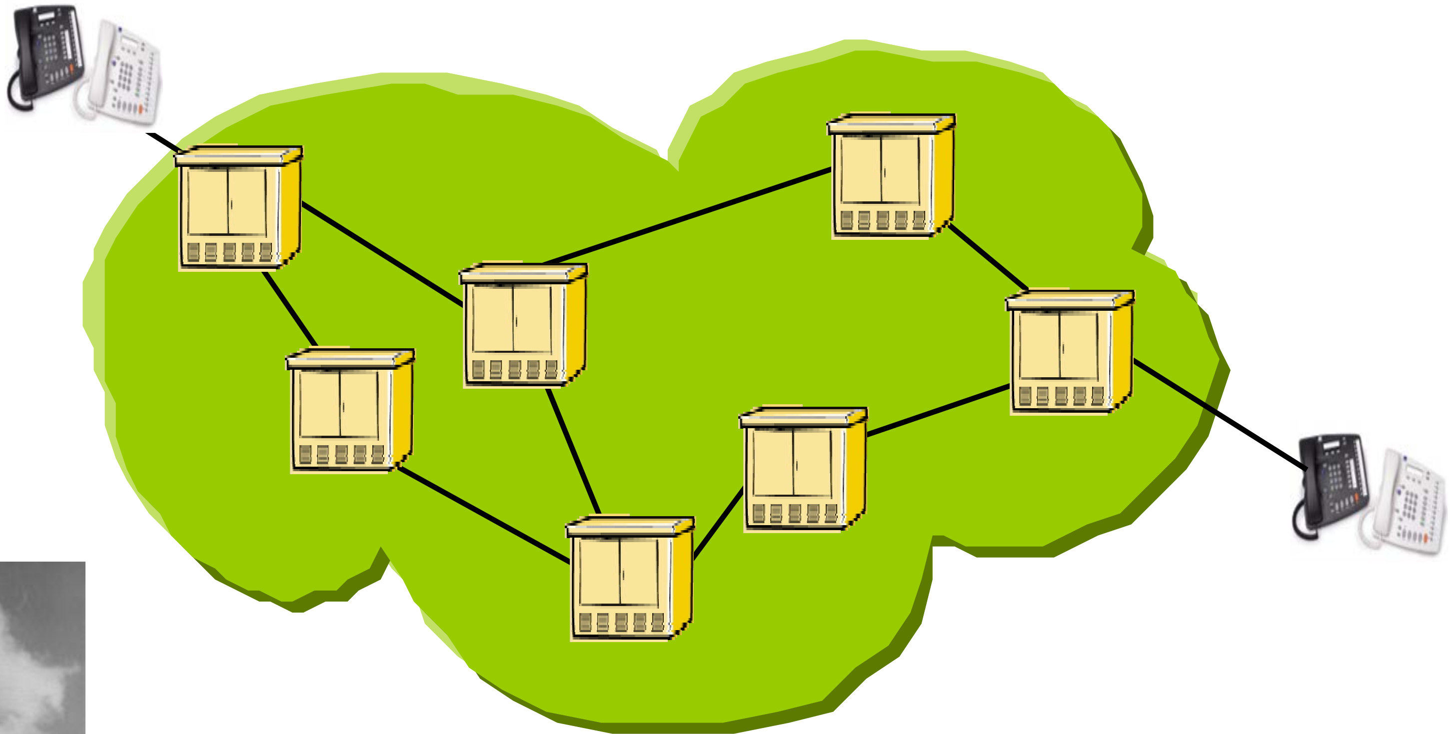
Presented at Scottish Networking Event, SCONE, 8th Feb 2013

Before the Internet was “invented”

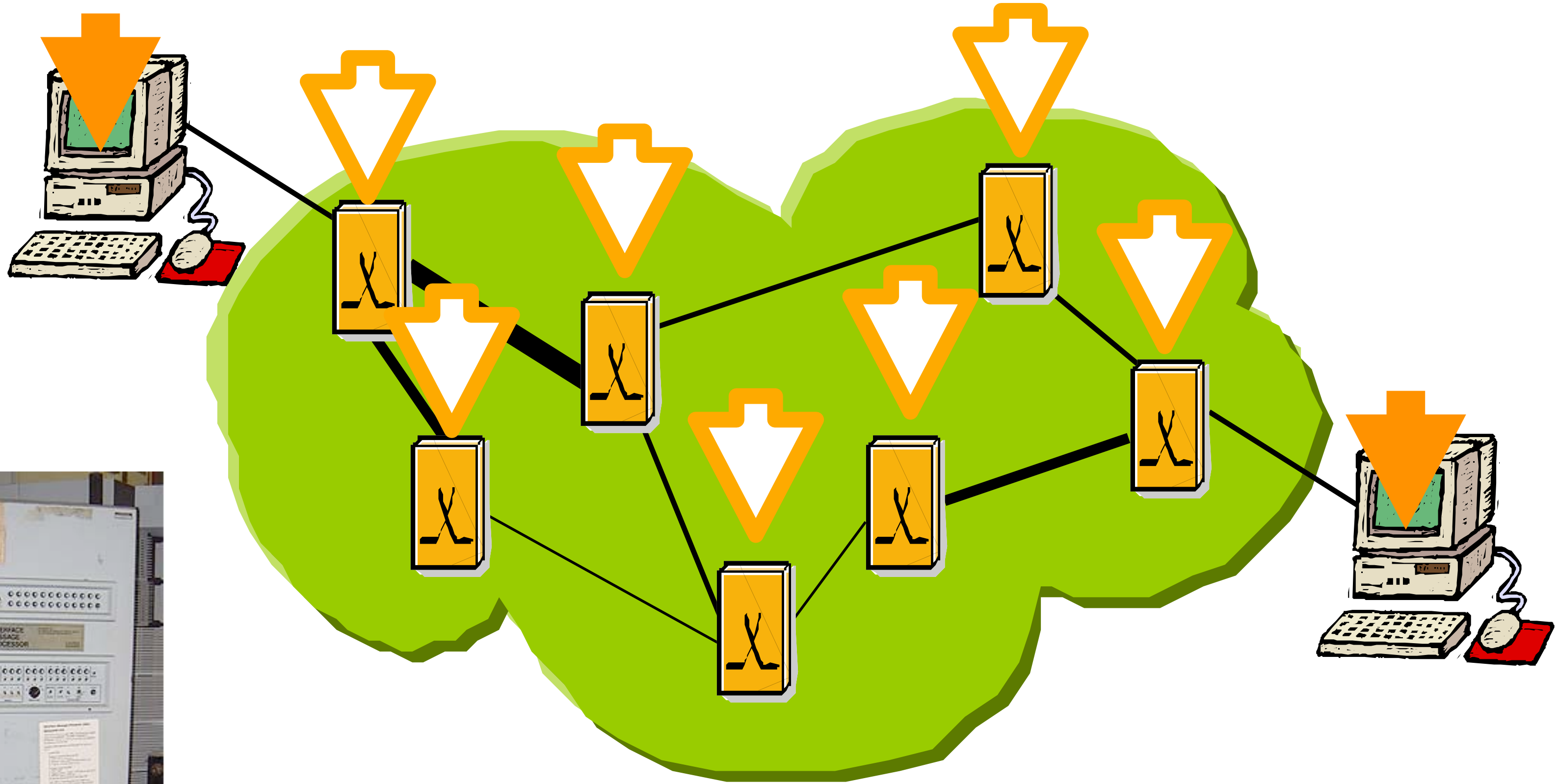
Gorry Fairhurst (c) 2013, http://www.erg.abdn.ac.uk/users/gorry



Users directly connected

Low delay, guaranteed capacity

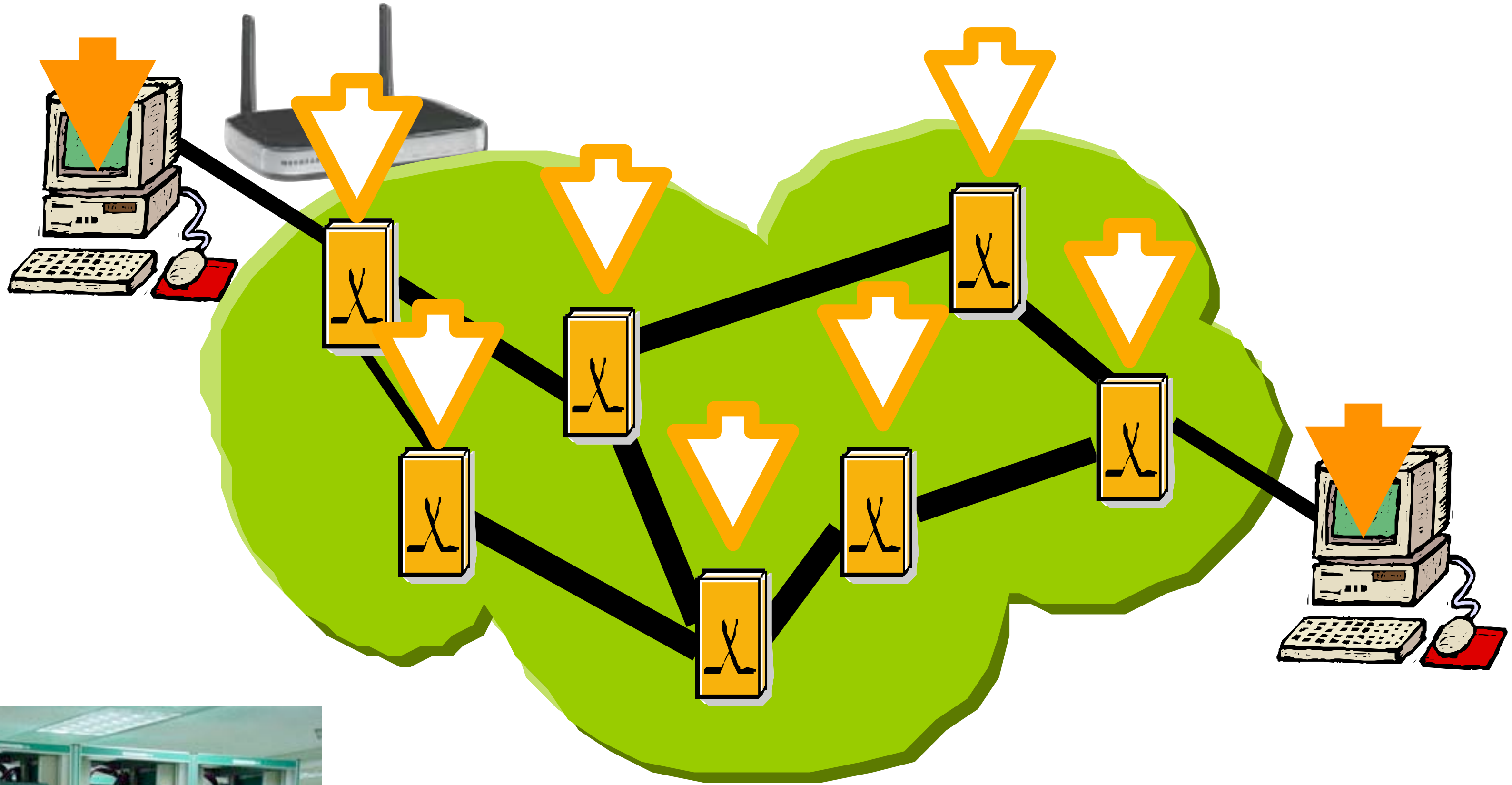
After the Internet was “invented”



Shared capacity, but limited capacity

Router buffers

Today's Internet

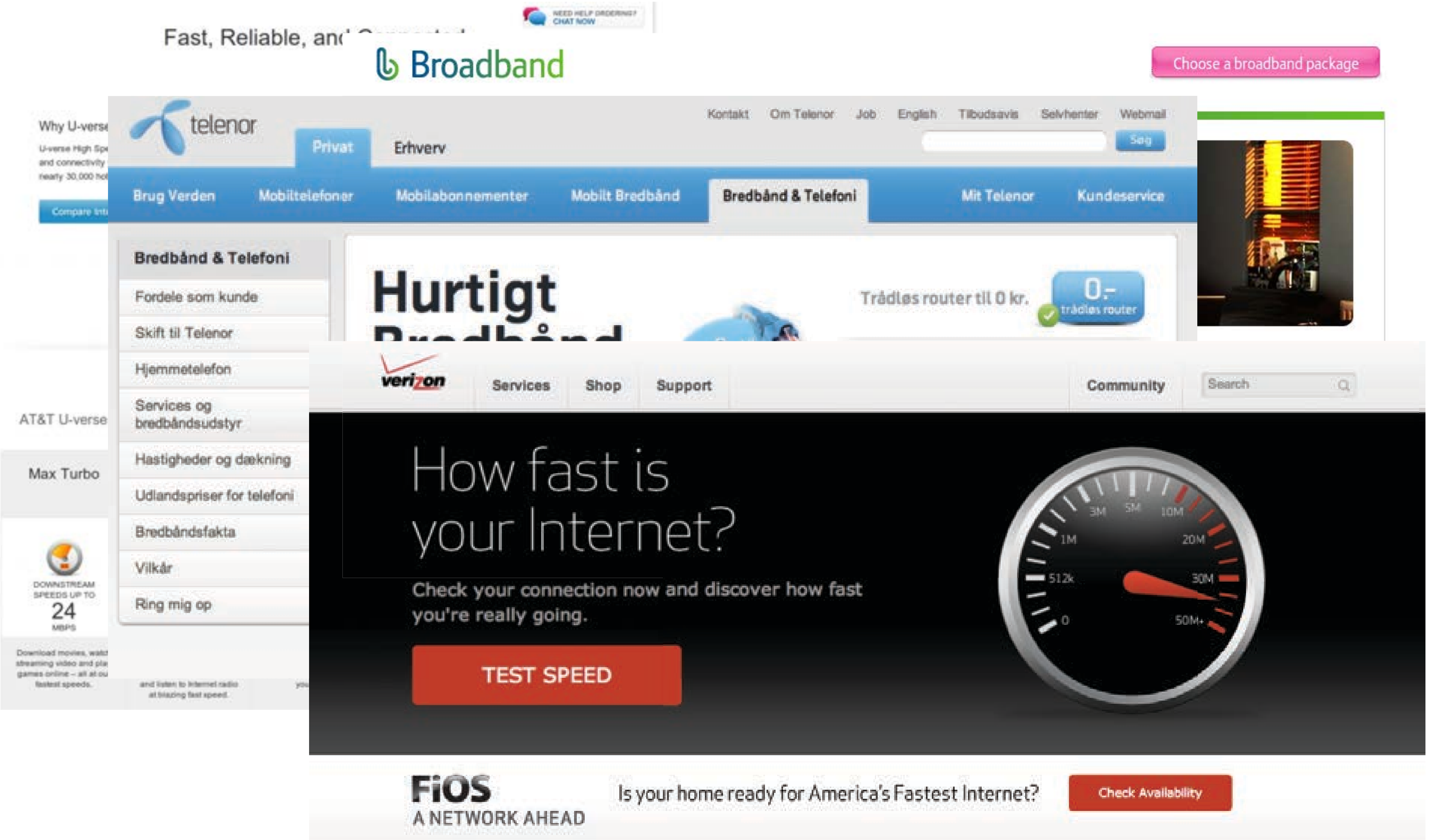


Large capacity (lots of bandwidth)

Larger buffers (bufferbloat)

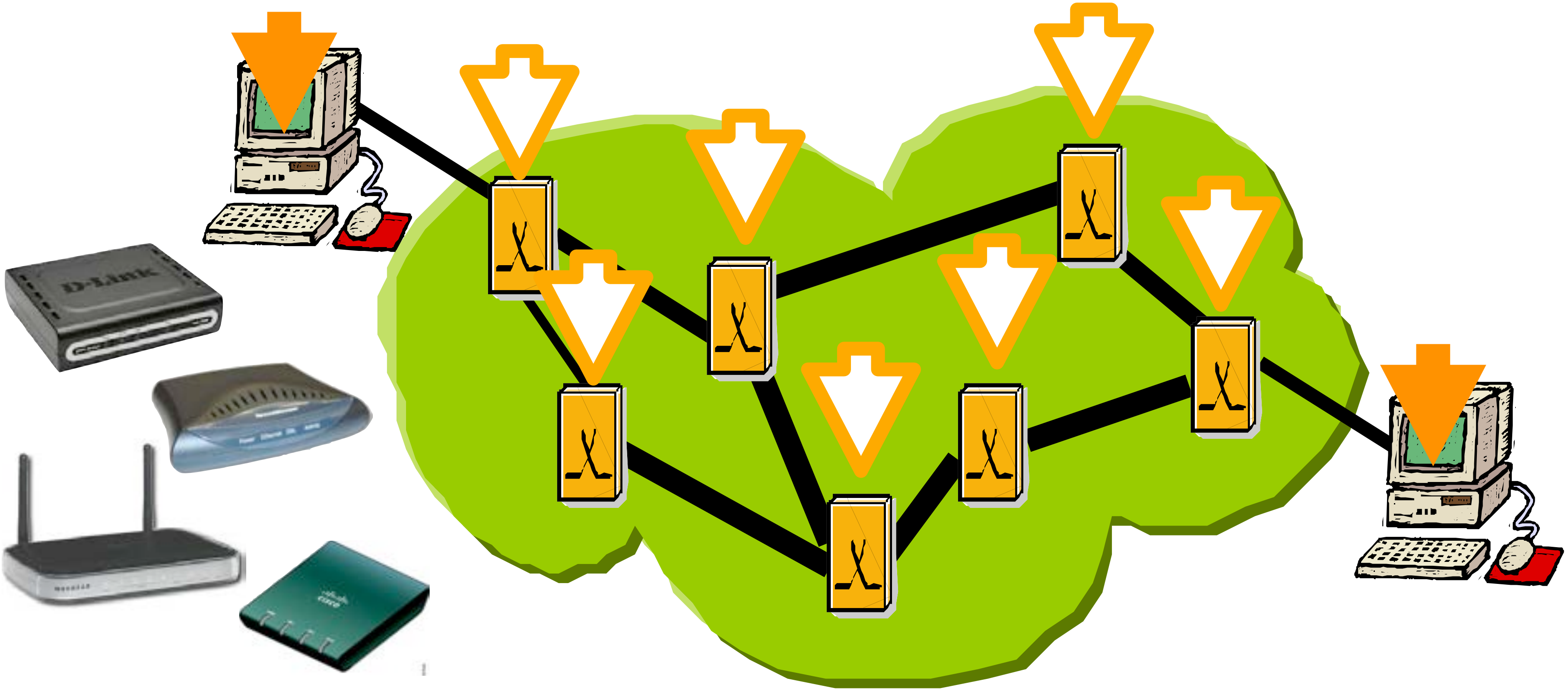
Confusing *bandwidth* and *speed*

Gorry Fairhurst (c) 2013, http://www.erg.abdn.ac.uk/users/gorry



Bandwidth is about how many bits you can transfer per second

How *fast* is today's network?



Speed is about how long it takes to complete a task

Users don't need more ***bandwidth*** to go faster

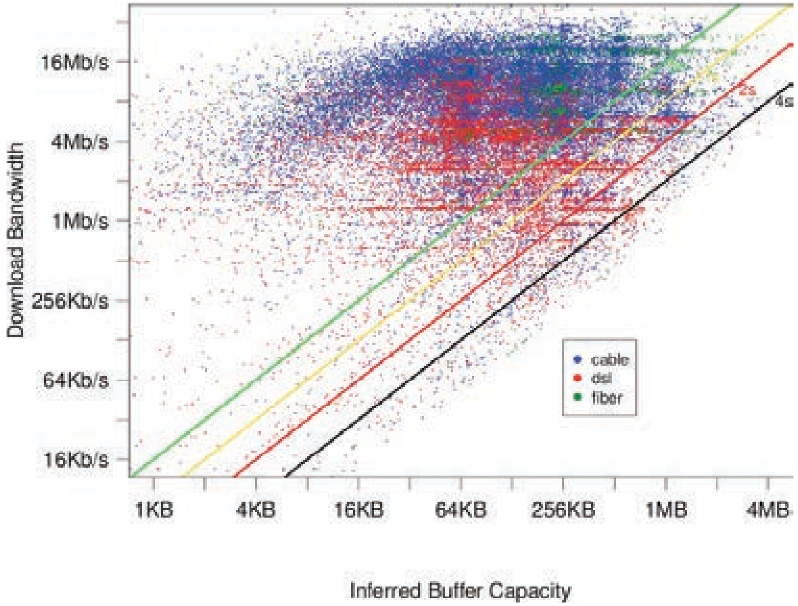
They need ***less delay***

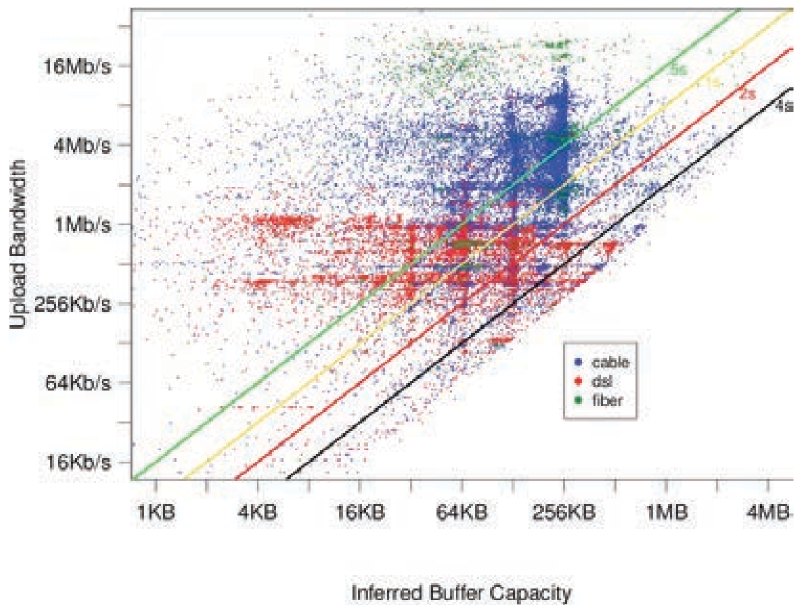
My home DSL

Network bandwidth:
Upload 930 Kbit/s
Download 8.7 Mbit/s

Network buffer:
Uplink 509 ms
Downlink 59 ms

... latency often *1-2 seconds!*
.... can be *10s of seconds!*

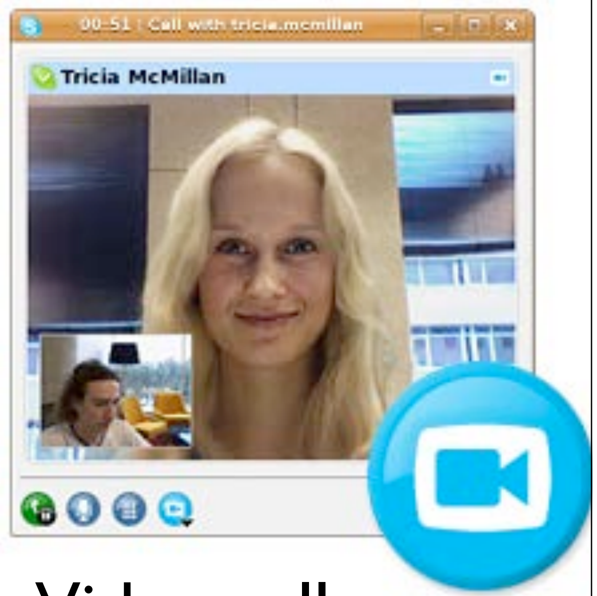




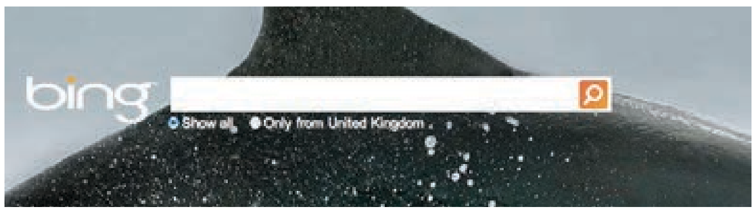
"Netalyzr: Illuminating Edge Network Neutrality, Security, and Performance"
C. Kreibich, N. Weaver, B. Nechaev, and V. Paxson

Does latency matter?

Gaming

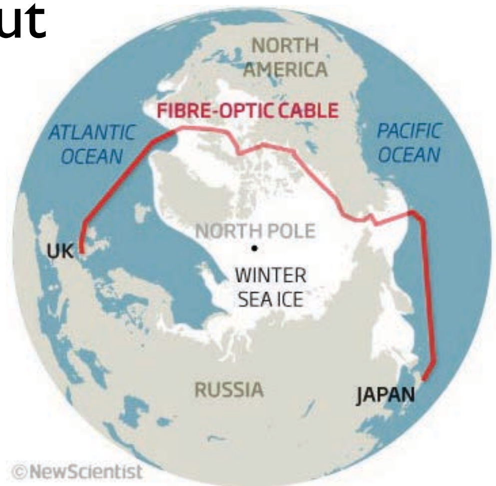


Video call



500ms extra delay
~ 1.2% less advertising revenue

$1.5 billion fibre cut
London-Tokyo
latency by 60ms



How can we fix this?

How do you pick a safe rate?
... you can't win lower latency competing with TCP
- not even using TCP!

TCP needs some small fixes for "thin" streams (cc/cwv, recovery) !

Dept. of wild claims:
Interactive applications produce traffic that is fundamentally different from what networks were designed for...

You can't just fix the host!
AQM, ECN, etc need to control latency
(CoDel????)

More killer apps?

Conclusion

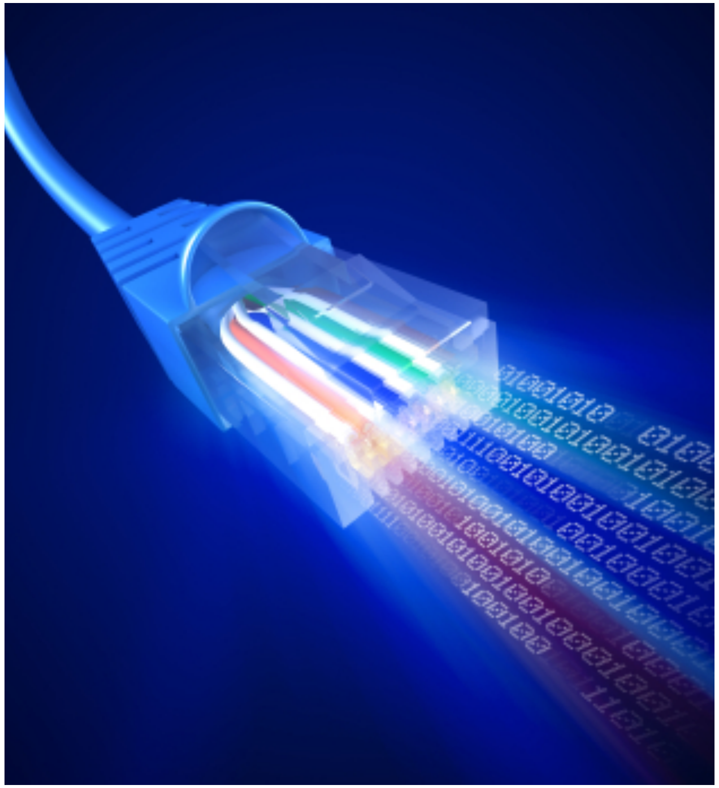
Bandwidth ≠ Speed!

- Seek to understand sources of delay
- Standing queues create delay

How do network stacks get smarter about delay?

- Solutions needed in transports to avoid over-feeding (or at least to stop quickly when they get it wrong)
- Solutions needed in networks to react to over-feeding

Questions?



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