

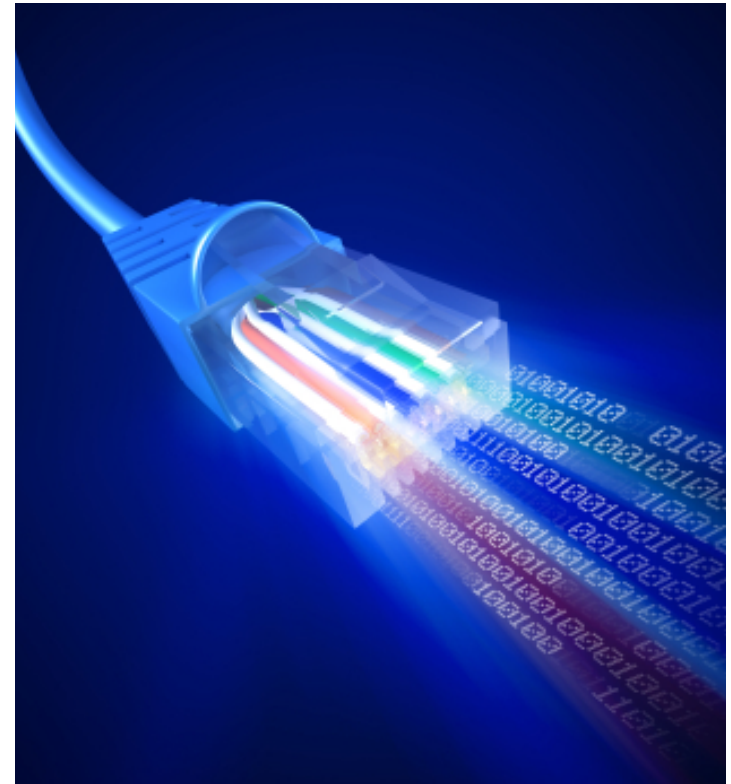
RITE

Reducing Internet Transport Latency

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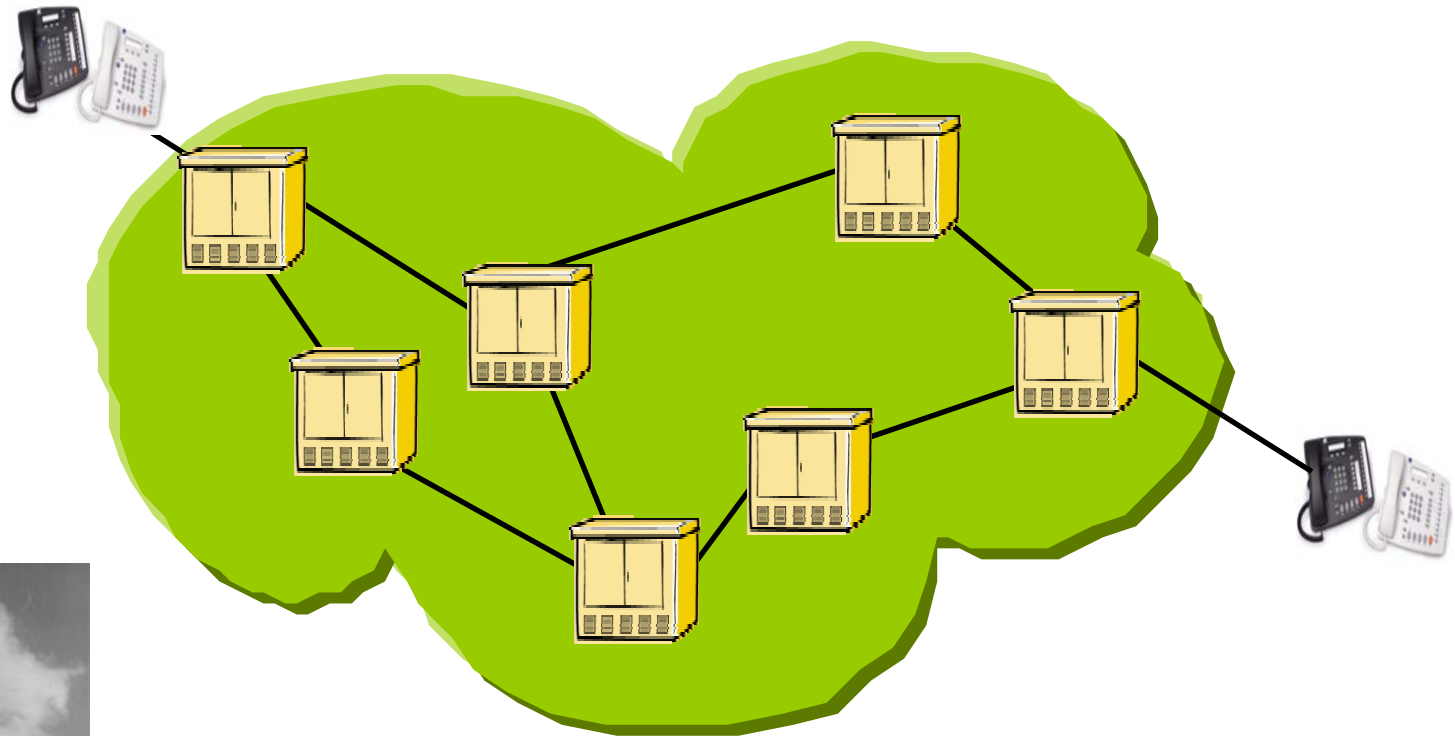
<http://riteproject.eu/>

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



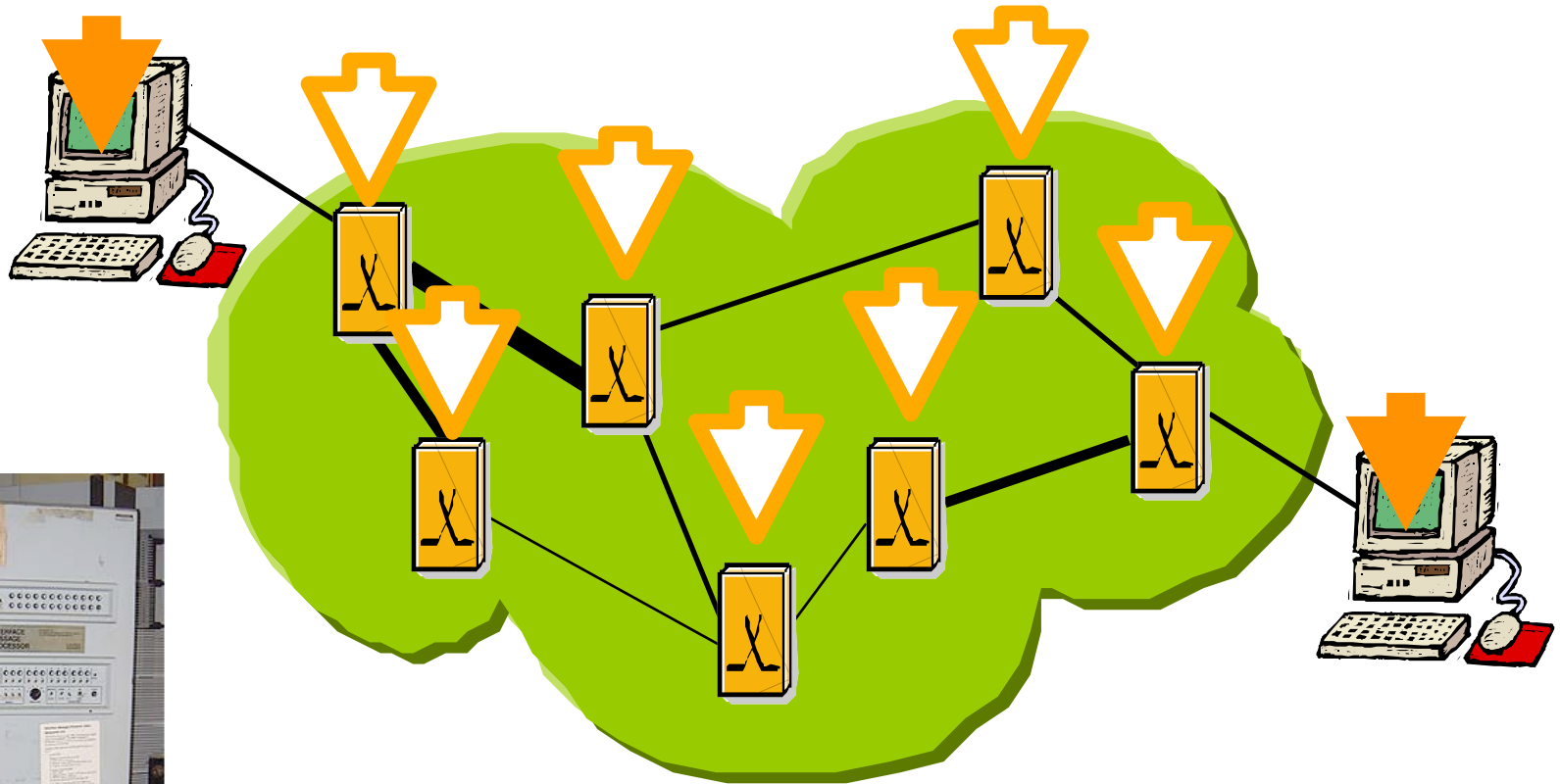
Before the Internet was “invented”

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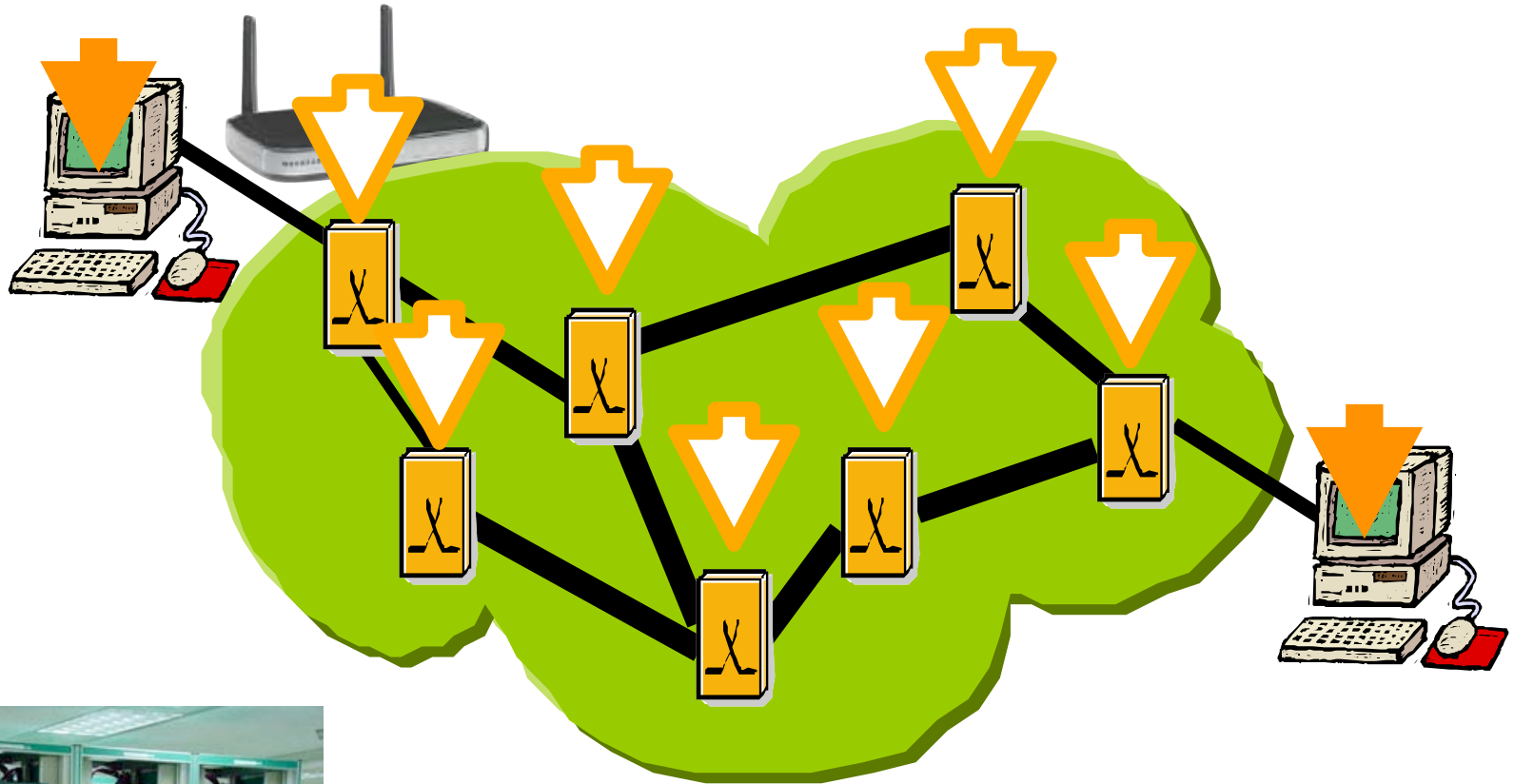
Users directly connected
Low delay, guaranteed capacity

After the Internet was "invented"



Shared capacity, but limited capacity
Router buffers

Today's Internet



Large capacity (lots of bandwidth)
Larger buffers (bufferbloat)

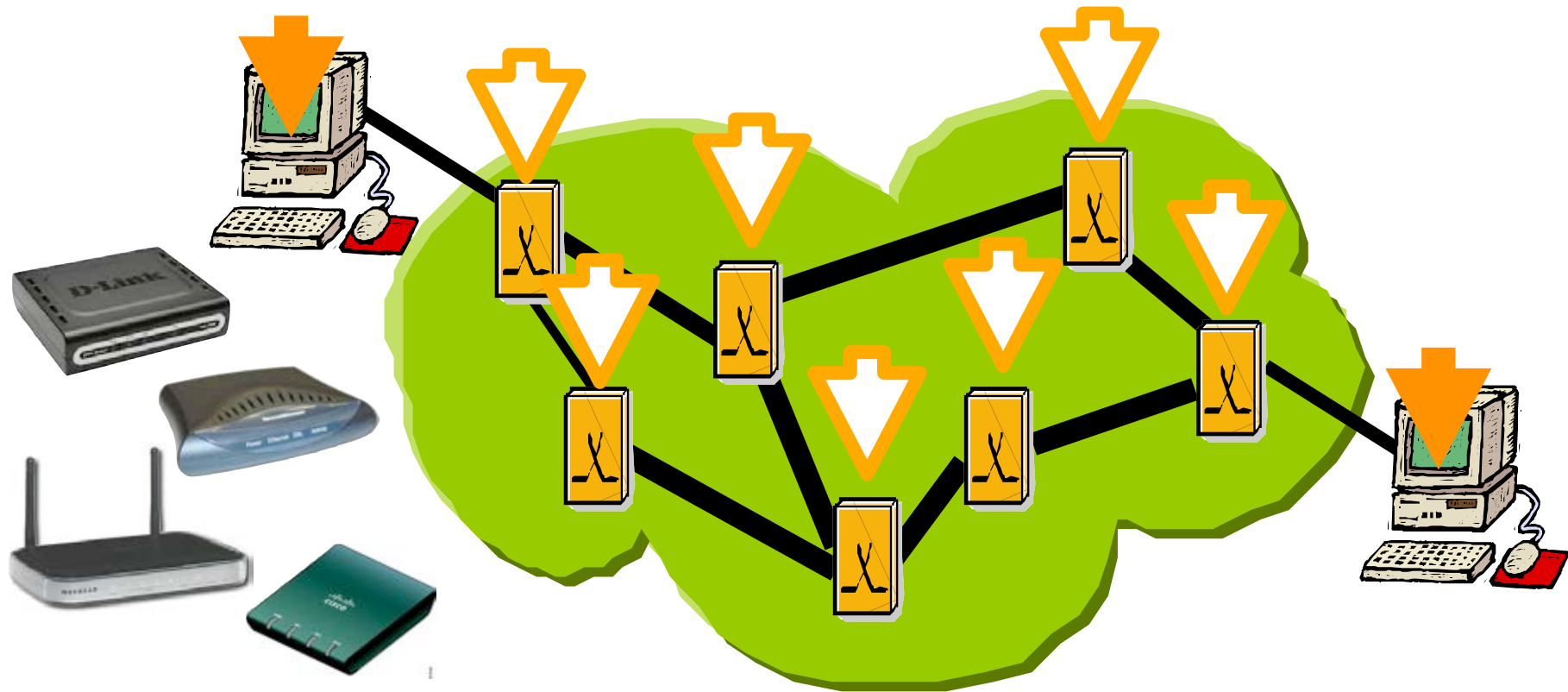
Confusing *bandwidth* and *speed*

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The image is a collage of several internet-related advertisements and banners. At the top, there's a 'Broadband' banner with a 'Choose a broadband package' button. Below it is a Telenor website snippet with a 'Bredbånd & Telefoni' section. In the center, a Verizon banner asks 'How fast is your Internet?' and features a speedometer graphic with a needle pointing to 30M. Below the Verizon banner is a FiOS banner with the text 'Is your home ready for America's Fastest Internet?' and a 'Check Availability' button. On the left side, there are smaller snippets from AT&T and other providers, including one that says 'DOWNSTREAM SPEEDS UP TO 24 MBPS'.

Bandwidth is about how many bits you can transfer per second

How *fast* is today's network?



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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

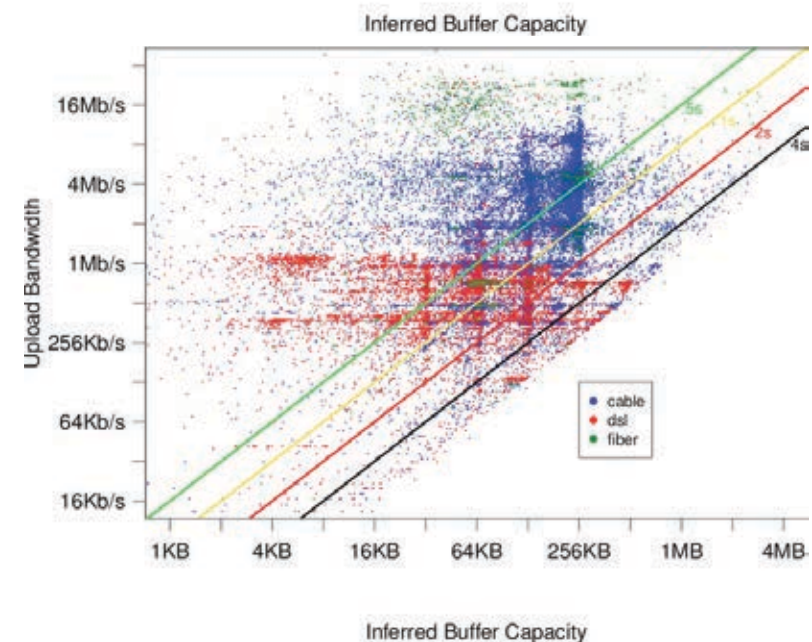
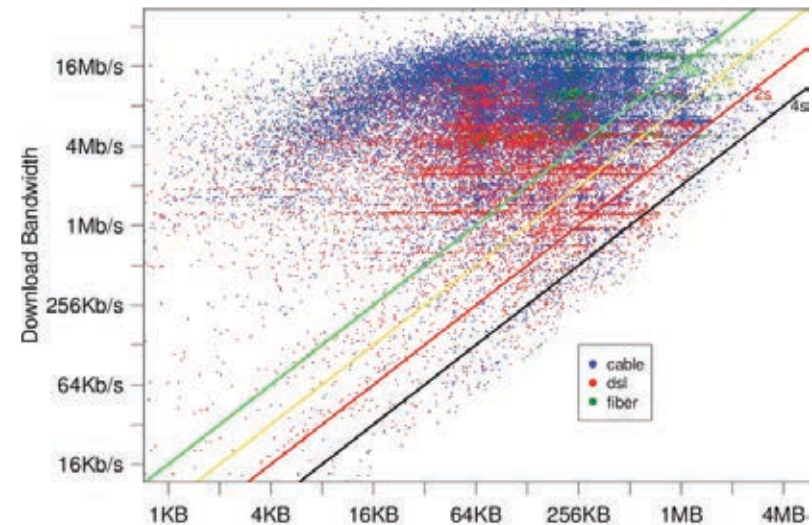
Downlink 59 ms

... 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

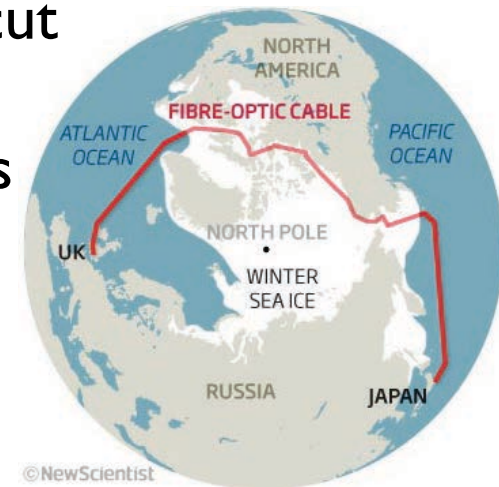


Video call



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?

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Bandwidth \neq 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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