

# Congestion? What Congestion?

Mark Handley

## Is there a problem to be solved?

- TCP has done a pretty good job since 1988 of matching offered load to available capacity and avoiding congestion collapse.
  - Doesn't need any support from the network.
- If it's not broken, don't fix it?

## Bulk data transport

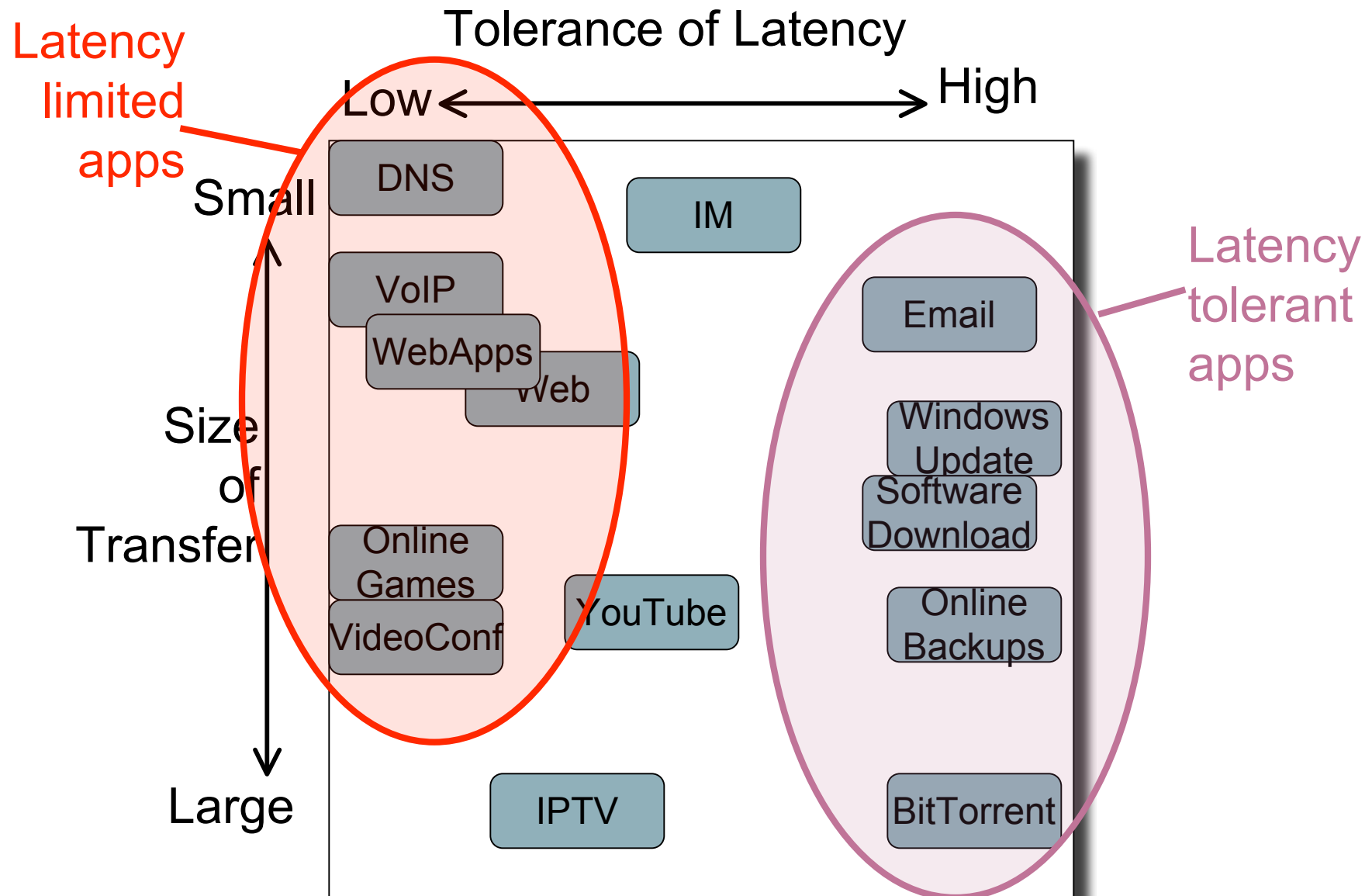
- An ideal transport protocol would move a finite-sized file from A to B in zero time.
  - “zero time” is probably not cost-effective.
- “Minimal time” requires filling the bottleneck link while the transfer occurs.
  - If some place along the path isn’t congested then the transport protocol is doing something wrong.

## “Packet loss is bad”

- Actually, so long as the link stays fully utilized, packet loss has no cost for bulk transfer apps.
  - Lost packets don't displace any others at the bottleneck link.
- But loss is bad for latency bounded apps.
  - ssh
  - VoIP
- ECN can reduce the impact of congestion but avoiding dropped packets.

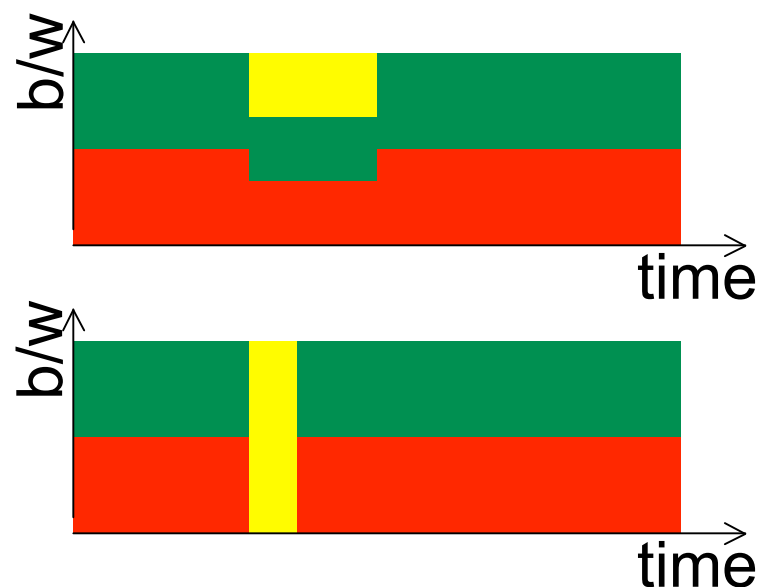
# Latency

- It's not just about bandwidth. Latency is at least as important.
- Two types of latency:
  - Packet transition time.
  - Transfer completion time.
- Both matter, but to different apps.



# Latency, latency and latency

- Traditional TCP-style congestion control and large router buffers:
  - Disaster for VoIP, games, etc
  - $\Rightarrow$  Need low latency packet forwarding
- Large file transfers (eg BitTorrent, software download, Flickr upload) very latency tolerant.
  - Prioritize short web transfers, and everyone would be happier.





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## US cable giant to throttle P2P

### No, not that one

By [Cade Metz in San Francisco](#) • [Get more from this author](#)

Posted in [Telecoms](#), 28th January 2009 23:05 GMT

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Cox Communications - America's third-largest cableco - is on the verge of testing new network technology that will fast-track certain "time-sensitive" internet traffic during periods of congestion.

This also means that "less time-sensitive traffic" will be slow-tracked.

As it announced late last night with a [post](#) to its website, Cox plans to test this new technology next month on broadband customers in Kansas and Arkansas.

"During the occasional times the network is congested, this new technology automatically ensures that all time-sensitive Internet traffic – such as web pages, voice calls, streaming videos and gaming – moves without delay. Less time-sensitive traffic, such as file uploads, peer-to-peer and Usenet newsgroups, may be delayed momentarily – but only when the local network is congested," the post reads.



## A vicious cycle.

- VoIP and games compete with P2P traffic and lose.
- ISPs use DPI to spot P2P and rate limit it.
- P2P becomes port-agile, encrypted, stealthy.
- DPI gets smarter, makes heuristic inferences from traffic patterns.
- ISPs use DPI to prioritize known “friendly” traffic.
- Innovation becomes hard - needs to look like “friendly” traffic.
- P2P traffic tries to look “friendly”.
- DPI needs to get even smarter.
- Strong temptation to use expensive DPI infrastructure for “business optimization”.

## DPI

- Common in UK, some other countries.
- Not commonplace yet in Japan, Germany, ...
- Seems to be more common where **cost pressures** are greatest.
  - UK: very competitive market for home broadband.

But...


- Giving low latency using DPI is deeply flawed.
- Conflict between privacy and service
  - Eg. VoIP over IPsec should work properly.
- Arms race of masquerading apps and detectors.
- Lock in to today's apps.

# Timely

- It isn't just P2P.
- Internet TV is already taking off.
  - Won't be long before time-synchronous TV broadcast will be obsolete for everything except sport.
  - My 8-year old son watches more TV on the BBC's iPlayer than he watches broadcast TV.
  - Huge shift in usage patterns, but no extra money to pay for carrying the traffic.
- Games, VR, video walls, wearable cameras, ....

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## Train Fire Wreaks Havoc on Baltimore

Train Fire Causing Problems With Traffic, Internet Service

July 20

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Almost two days after a train derailed and caught on fire in a tunnel below downtown Baltimore, transportation and Internet systems still remain crippled.

**Key point:** we need to take into account congestion from any point in the path.

# The

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## Police website hit by DDoS attack

Published: 29 Oct 09

**Dictionary tool** Do

A number of major Swedish authorities have been hit by what is believed to be a DDoS attack.

- **Tech glitch darkens Sweden**
- **Sweden tops broadband**
- **The Local falls foul of Google**

The Swedish police's website was inundated with external requests.

"We're the victims of an ongoing attack," said Mikael Widmark, shortly before the site went down at 5pm.

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## DDoS attack boots Kyrgyzstan from net Russian bears blamed

By **Dan Goodin in San Francisco** • **Get more from this author**

Posted in **Security**, 28th January 2009 19:57 GMT

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The central Asian republic of Kyrgyzstan was effectively knocked offline for more than a week by a Russian cybermilitia that continues to flood the country's internet providers with crippling data attacks, a security expert said.

The attacks, which began on January 18, bear the signature of pro-Russian nationalists believed to have launched similar [cyber assaults on the republic of Georgia](#) in August, said Don Jackson, a researcher with Atlanta-based security provider SecureWorks. The attacks on Kyrgyzstan were so potent that most net traffic in and out of the country was completely blocked during the first seven days.

 **UCL**

## If it's not broken, don't fix it.

- There is a certain amount of evidence it **is** broken.
  - Maybe not critically broken, yet.
  - The Internet does work (mostly).
- In the coming years, these limitations will matter more, not less.
  - Phone, TV, videoconferencing, games, critical infrastructure...

## IETF Goals?

- Mechanisms to **handle congestion better**.
  - Low latency apps should just work, not need explicit QoS.
- **Economics** of congestion need to make sense.
  - Theory says charge for congestion.
    - Only then does traffic displace other customers' traffic.
  - But end customers don't want to know.
    - And may not even be aware their machine is compromised.



## Summary

- ISPs don't have good tools for managing congestion.
- TCP congestion control isn't going away anytime soon.
  - But it's no longer sufficient.
- There's a disconnect between the sending of traffic and the effects that traffic has downstream.
  - To remedy this, first ISPs need to be able to **measure** downstream congestion.
- Not all traffic should be equal.