Communications Research Network

A CRN Project Case Study

Net Neutrality: Beyond the Hype to Achieve a Balanced Solution

What's the issue?

The Internet is rapidly evolving as the mainstream network infrastructure for global communications. Early applications on the Internet were low payload services to deliver simple messages. The Internet now provides the infrastructure for a stunning breadth of applications and services, many of which have dramatically larger payloads than originally envisaged, or have real-time delivery requirements.

These developments mean that the original ethos of the Internet – equality of access for all users and applications – is under threat. "Net Neutrality" has been adopted as the simple phrase to encapsulate this issue – unfortunately reaching the appropriate conclusions about the future architecture and governance of the Internet is not so simple. There is a desperate need for balanced and well informed research – CRN members have been working hard to fill this void.

Where did we start?

The Internet was created with a simple ideal at its core. Its creators wanted to build a network infrastructure, which would allow applications to communicate across a common platform. At the heart of the Internet concept was the principle of net-neutrality – the simple idea that the Internet treated all applications (or users) equally and carried the traffic irrespective of what it was that was being carried.

However, that common view which inspired the original designers of the Internet is now not universally held. Currently there is a debate between proponents of a 'traditional' laissez-faire attitude to traffic and the proponents of a more interventionist approach (either to control costs or, in some cases, to favour their services over others). This debate has become more heated as the volumes of Internet traffic have grown, widespread occurrences of 'anti-social' behaviour on the Internet have adversely affected

'legitimate' Internet users, and as some ISPs have started to throttle certain types of traffic.

In order to balance the views, it became evident that a clearer understanding of a number of interlocking issues would be vital – technical, commercial and operational. A viable solution would require cooperation and communication between academia (including specialists in different fields of expertise), policy makers and industry.

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What did we do?

Members of the CRN have been central to developing a compromise position based on the unexpected insight that, rather than treating all applications equally, currently the Internet merely allows those who take most to have most. They developed mechanisms that allow operators, who choose to do so, to understand the costs to others (congestion) of each user's behaviour without knowing what is behind the traffic being carried. This principle is a compromise, which allows protection of 'socially responsible' Internet users without compromising the net neutrality principle.

The nucleus of the solution was defined in the work of Frank Kelly and Richard Gibbens of Cambridge University who developed the concept of shadow pricing and developed algorithms for its implementation. This work was taken up by Jon Crowcroft then of UCL, and now of Cambridge, who proposed the necessary modifications to TCP, which would allow the shadow-pricing algorithm to be implemented. Also Richard Steinberg of Cambridge University's Judge Business School analysed how to fit this work into wholesale business models typically used in the industry. In turn Bob Briscoe and his team at BT research worked out a way to deploy the controls so that customers could still enjoy flat pricing, and have drafted proposals for standards being progressed through the IETF*.

What was the outcome?

This process is ongoing with the proposals being debated at the IETF at the time of writing. It is expected to be a long haul as fixing the whole problem requires an addition to the Internet protocol itself, which can be deployed incrementally, but which requires wide and thorough consensus.

The approval of the standards merely allows network operators to monitor the costs caused by users on others, either limiting them within their flat subscription or allowing them to pay extra. It will not be compulsory for operators to do this when they have the capability. It is likely that some will and some will not depending on their individual policies, but each operator will always be accountable for the costs its users cause to other users on other networks. This will allow the appropriateness of the solution
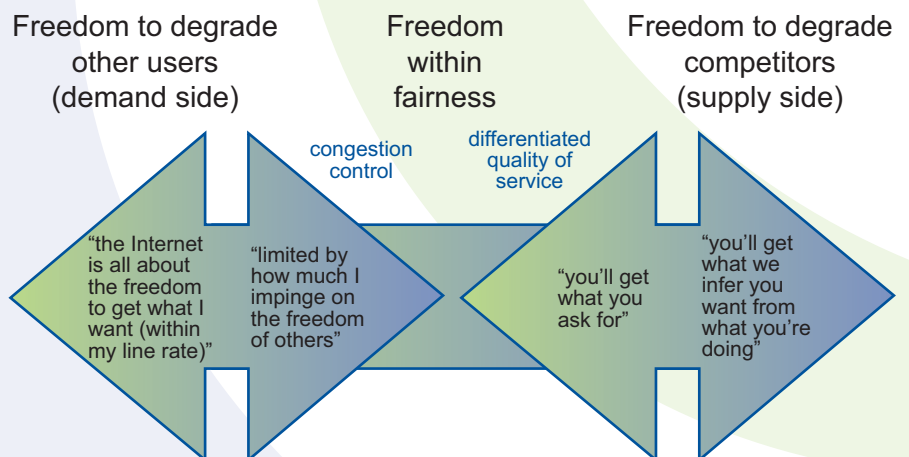
proposed to evolve through a process of market-based selection: if applying shadow pricing principles offers ISPs an advantage then we would expect the majority of ISPs to begin doing this. Only time will tell if this is the case.

Next steps

The CRN methodology is first to build an understanding of the major structural problems that face the industry by encouraging dialogue and cooperation between industry, government and academia. Then secondly to follow through by kick-starting whatever actions are necessary to resolve each issue, co-ordinating across standards, regulation and industry practice.

The CRN working group on Regulation & Innovation, called Innovation in Telecommunications, will be a vital focus for those searching for a reasoned and balanced consensus on how to take the Internet onto its next phase, beyond the hype of the current net neutrality debate.

Figure 1: Freedom vs fairness: resolving the net neutrality debate

Freedom to degrade other users (demand side)

Freedom within fairness

Freedom to degrade competitors (supply side)

congestion control

differentiated quality of service

"the Internet is all about the freedom to get what I want (within my line rate)"

"limited by how much I impinge on the freedom of others"

"you'll get what you ask for"

"you'll get what we infer you want from what you're doing"

*The Internet Engineering Task Force (IETF) is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet.

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