

Response to the Ofcom consultation on Traffic Management and 'Net Neutrality'

Introduction

We support Ofcom's separation of the traffic management issues from the more contentious content concerns. We note that emotive terms such as 'fair use rules' (often just meaning a download limit) and 'peer-to-peer' (often incorrectly implying illegal behaviour) can colour the debate in undesirable ways, and should be avoided wherever possible.

Many of the tensions reflect the rapid evolution of the networks and the applications that run on them (and hence of user behaviour), and this evolution is expected to continue for some time.

In essence user demand is growing fast and capacities originally associated with a handful of heavy users (some with doubtful uses) are now easily achieved by 'normal' users without their doing anything perverse or unreasonable - for example just watching *Eastenders* on iPlayer uses ~50GByte per month¹ (exceeding many download limits) and listening to the *Radio 1* could easily approach 20GByte per month. Thus a missing element in the generally excellent Ofcom analysis is a vision of the future of the UK broadband Internet.

To pay for the faster network needed to resolve this we may face a choice between increasing flat-rate charges for all or moving towards a system of proportional charging, adjusted according to the cost of provision and characteristics such as time of day and the nature of the usage. This implies a form of 'management' and would lead to a 'smart internet', a concept that might be easier to sell than a non-neutral one.

There is much more to traffic management than mere demand limitation and the consultation does not fully reflect the richness of the range of emergent user behaviours and applications or of the range of network capabilities, and how these are likely to develop as the technology advances. This richness also makes it difficult to specify the performance of links or the demands of applications and users; people already have issues with 'up to' data rates and download limits but there are many more subtle link characteristics such as latency, jitter and others that can seriously affect some popular applications, such as games or streaming video. A 'smarter' approach to service offerings, reflecting both varying demand (with time of day for example) and individual user requirements would clarify and often resolve many issues. This is the sort of thing planned for electricity and gas 'smart meters' - it would be ironic indeed if data communications cannot achieve the same.

We believe that it is an Ofcom/regulator role to monitor (or collate information on) patterns of data transmission usage in order to inform the debate, just as you currently monitor wireless spectrum usage for example. We note that such monitoring is not done at UK national level at present, though we have had some very useful data from an operator and from Japanese sources.

This data confirms that usage-by-customer distributions are quite close to the conventional

¹ Watching an average 3.7 hours of TV a day (Ofcom figure) ~360 GByte pm at normal definition. But this assumes 1.1MBit/s, standard for iPlayer, which is much more capacity-efficient than channelised TV.

power law 'Pareto' (80/20) form, much like a wide variety of other sales and income distributions. This means that 20% of users use 80% of capacity, and, since the law is self-similar, that 20% of the 20% use 64% of the capacity and so on. Thus half the network capacity is used by only a few % of users. Although similar distributions are found for many other products (perhaps including telephony) the widespread use of flat pricing models for wireless and wireline data creates an incentive for operators to use heavy-handed measures to get rid of the top few % of users rather than just charging them extra pro-rata. However the success of PAYG mobiles suggests that proportional charging is acceptable to consumers and we expect (& would wish to see) a convergence with telephony charging models (for example using extendable bundles). This will probably benefit all, but rapid changes have the potential to be unfair to emergent businesses that depend upon particular consumer charging models, and this needs monitoring.

Overall data transmission is of course rising, but the nature of the data transmitted is also changing. In particular quasi-continuous data streams such as video and VoIP are increasing. Even though the proportion of these that is actually live (like videoconferencing for example) may be quite small the proportion that is buffered but 'relatively live' such as video-on-demand may still be considerable. And as noted above changing technology makes it increasingly easy to use large amounts of download capacity without doing anything unreasonable. Indeed in many visions of the future internet-style data services such as VoIP, iPlayer and internet radio could progressively replace their older (& inherently less efficient) circuit-based services such as traditional telephony and channelised TV. We note for example that Skype is already the largest international telephony carrier, and that many new TV 'channels' are just time-shifted duplicates.

Different usage classes, for example:-

- Streamed live video (videoconferencing, security CCTV monitoring...)
- Streamed recorded video (YouTube, iPlayer...)
- Live VoIP (Skype etc.)
- Internet games
- General bursty internet traffic (e-mail, web browsing...)
- scheduled overnight downloads

approximately arranged in order of increasing 'burstiness' and decreasing 'liveness' make very different demands upon the network - and something like this might be used to categorise ISP offerings. These could be classified by what they were most suitable for ('video-grade 1' or 'browsing grade 4' etc.). Whilst definitions would have to be agreed with the industry and would doubtless be contentious this would enable time-of-day dependent characteristics and the like to be included, and could hardly be worse than the present system, with doubtful 'up-to' rates and specified network characteristics like contention ratios that have meaning in engineering terms but bear no simple relation to the user experience. One needs also, of course, to avoid inefficient regulation-driven pricing like first and second class postage.

As an engineering point we note that all communications systems since the telegraph absolutely depend economically upon efficient sharing of the core network, and thus upon traffic management, so a system with 'no management' is really not an option and has never existed – the issue is what kind of management. For example consumer line 'contention ratio' is a concern mainly because the line-sharing is occurring over relatively small user groups and close to the user. Similar levels of sharing averaged over larger

user groups nearer the core might be much less of an issue. Thus 'contention ratio' relates poorly to the user experience.

The specific Questions posed by Ofcom

i) How enduring do you think congestion problems are likely to be on different networks and for different players?

Congestion will remain a feature of the broadband Internet whilst the capacity provisioned is less than the peak demand...which is likely to be for some time for many users of the fixed broadband Internet and a *permanent feature* for users of the mobile broadband Internet. In other words usage is likely always to grow until it is congestion-limited.

Fibre to the home has the potential to provide a vast over-capacity where even peak demand becomes far less than the capacity provisioned. But this desirable and business-changing state of affairs depends on full fibre-to-the-home (as distinct from FTTC) and may not occur before 2020 for around half of the population. Nevertheless Ofcom may wish to consider ensuring that regulations are compatible with such a scenario.

ii) What do you think are possible incentives for potentially unfair discrimination?

Principally the flat (and perhaps data-capped) pricing model for data delivery.

We note the emergence of intensive usages of the broadband Internet (eg video) that appeal to a much larger number of customers and which are entirely free of any stigma of "improper" use. The dead weight of the flat rate pricing model remains in place and this creates the conditions where the discrimination that inevitably follows from some kinds of traffic management becomes potentially "unfair" to users of such applications.

Also perhaps the 'contention' sharing of capacity too close to the customer.

Any attempt to use data discrimination for purely commercial reasons (to promote an in-house service for example) seems to be addressable within Ofcom's existing powers.

(iii) Can you provide any evidence of economic and or consumer value generated by traffic management?

As has already been pointed out above, all communications networks have always and necessarily involved sharing much network capacity. The traffic management this inherently involves is also fundamentally discriminatory, if only according to which signal arrives first, and is hugely beneficial to all users (the cost of a full-capacity network that matched the potential maximum demand on every channel does not bear thinking about!). This benefit is magnified considerably for the mobile broadband Internet users where scarcity of economically usable radio spectrum makes the networks much more capacity constrained.

Traffic management that takes account of the nature of the data is also normal on the internet (consider TCP and UDP for example), and management to improve VoIP performance is also generally beneficial. These benefits are absolute performance gains and accrue to both suppliers and users. Telephone systems that prioritise some calls (e.g. emergency calls) also already exist, though the equivalent for texts does not but should.

(iv) Conversely, do you think that unconstrained traffic management has the potential for (or is already causing) consumer/citizen harm? Please include any relevant evidence.

Unconstrained traffic management has the potential to impair the enjoyment of some services, for example streamed real time applications, such as video. There is fairly conclusive historic evidence

to show how capacity short-comings of the Internet for streamed applications can kill off the market for this class of application. In the late 90's a number of innovative companies produced media players that worked over the dial up Internet and this encouraged companies to begin to offer streamed video content. But the result, with the prevailing congestion at that time, was such a problematic consumer experience that the market switched almost entirely to the down-loading of video content to be watched off-line.

(v) Can you provide any evidence that allowing traffic management has a negative impact on innovation?

The statistical traffic data ISP's have over the past 10 years show an inexorable rise in the average data shipped per month per household. This has been driven by much richer web sites (and some great innovations behind this), data rich innovations such as Google maps and considerably more video. In the future Cloud Computing and other new services may well drive huge amounts of data between users and the Cloud. Where ISP's are not investing enough in additional capacity to meet this rising volume of data being shipped per month - then congestion is the inevitable result.

Under difficult circumstances the application of data-discriminatory traffic management may help overall performance but may be damaging to some services. In particular rapid changes in management (or the threat of these) may damage emergent innovative services. The example quoted above against (iv) could be quoted - but the danger is that the threat may be enough, making examples hard to find.

(vi) Ofcom's preliminary view is that there is currently insufficient evidence to justify ex ante regulation to prohibit certain forms of traffic management. Are you aware of evidence that supports or contradicts this view?

We would generally favour this view. Traffic management is generally applied on the principle of "the greatest good" since this leads to the largest number of satisfied customers. Thus if Ofcom prohibits any form of traffic management then it almost follows logically that this will not achieve the best result i.e. it will create a larger number of dissatisfied customers.

(vii) Ofcom's preliminary view is that more should be done to increase consumer transparency around traffic management. Do you think doing so would sufficiently address any potential concerns and why?

Perhaps - but the difficulty is how to do this in ways that both:-

- Offer something meaningful to consumers
- Create helpful incentives for ISPs

We suggest that these objectives are both challenging! We have already suggested above some form of grading and characterisation for link performance, and any such system would automatically reflect traffic management effects. But this does not help to remove the flat-pricing-induced perverse incentives for ISPs. Ofcom might try to ease the, we believe inevitable and desirable move away from flat pricing by highlighting what happens when 'caps' are exceeded - encouraging pro-rata charges rather than evictive measures.

An initiative in favour of 'smart broadband' (for example including time-of-day based performance) to replace the fairly dumb models currently used might have value - but Ofcom needs to establish a definition.

(viii) Are you aware of any evidence that sheds light on peoples' ability to understand and act upon information they are given regarding traffic management?

Efforts were made by *ntl*, when it launched its Cable Modem service, to educate the media and

public about the lower contention ratio its network was running on compared with the competition. Most of the journalists could not grasp what a contention ratio was and the campaign was fairly ineffectual. We need measures that relate to the user experience - which contention does not.

It was the technically savvy community on the Internet that put the word around that the ntl cable modem network was providing a better performance than the alternatives at the time and this came to be more widely known via this route in a much simplified message – ntl cable modems are good.

The technically savvy community on the Internet have the technical skills to flush out what traffic management technique is being applied by an ISP even though the information may not be published. This information will circulate freely via chat rooms and may spill in a highly simplified form to the general public; but it may equally create myths.

(ix) How can information on traffic management be presented so that it is accessible and meaningful to consumers, both in understanding any restrictions on their existing offering, and in choosing between rival offerings? Can you give examples of useful approaches to informing consumers about complex issues, including from other sectors?

Some suggestions are offered in the opening text, but the scope for deliberate or accidental muddying of the waters is enormous: firstly traffic management itself is neither a good thing nor a bad thing under all circumstances; secondly, the existence of traffic management is not telling the whole story but has to be associated with other characteristics like the contention ratio and thirdly, the performance of an IP network can only be characterised statistically and expressed in probabilities.

(x) How can compliance with transparency obligations best be verified?

There is probably a rule of thumb that says...the less detail the less useful and the easier to enforce and the more detail, the more useful and the harder to enforce. It is important in this age of austerity for Ofcom not to load itself or the industry with disproportionate compliance costs.

xi) Under what circumstances do you think the imposition of a minimum quality of service would be appropriate and why?

This is a meaningless question unless QoS is clearly defined. As noted in the introduction the practical effect of any particular degradation (particularly packet loss and jitter) will depend very strongly upon the service being used, which itself will change over time. Management for the best truly live video (eg videotelephony) service will deliver less good results for bursty internet applications and vice versa. Some applications such as games may have different requirements at different times.

So this question makes sense only if Ofcom can establish a meaningful and verifiable set of performance categories, with some grading within each category, as mentioned above. This is a considerable objective, and would require wide, and perhaps international, consultation.

The critical factor will be whether the industry can establish a new business model where consumers or content providers attach a value to a higher quality of service for specific applications.

Ofcom discusses payment by content providers or consumers in the consultation document and appears relatively agnostic. We feel that the charging of content suppliers could be effective, for example much as Amazon offers slower or faster physical delivery of goods for appropriate fees, or as the iTunes store charges different rates for standard and HD versions of downloadable videos. The crucial consumer-facing issue seems to be that these involve paying a premium for an

exceptional service - not degrading the standard service as a device for raising charges, as the first/second class post is (probably correctly) regarded as doing. So one might pay more for rapid video-on-demand but less for overnight delivery for example. Charging content providers also has some merit in that this is the model prevailing on satellite and cable networks and thus if the model comes to be applied to the broadband Internet it offers a more level playing field across delivery platforms.

But the comparison shows that, whilst an Amazon-like or Apple-like model could strongly encourage small innovative suppliers a subscription TV like model might discriminate strongly in favour of large incumbents who can negotiate large deals.

Any model that offered clear gains from more capacity could encourage fibre to the consumer deployment, easing all such problems.

Wireless/Cellular

In addition to the specific questions above we think that, particularly in light of the Google-Verizon proposal, consideration should be given to treating cellular wireless networks differently from wireline networks.

Although at present cellular operators are competing (with dongles) directly with first-generation DSL broadband the GV deal appears to recognize that this is unsustainable, and will become progressively more so as fibre (with local wireless access) spreads. We think this may be too pessimistic for the medium term but Ofcom's role should be to ensure clarity of service offering, without introducing undue restrictions on operators. We note that content suppliers could also classify their offerings by class of required delivery.