ITAC

Broadband metrics & Internet service

This short paper introduces a definition of Internet service and motivates the adoption of this definition as a precursor to developing standardized measurement methodologies for broadband infrastructure deployment. It also identifies a number of important considerations to bear in mind when discussing broadband metrics.

Defining broadband[1]

Broadband originally referred to the use of a wide-range high-frequency signal (a *broadband* signal) over the telephone network to convey computer data at transmission rates in excess of those achievable with the existing 'dial-up' modems that used the lower and narrower frequency range (narrowband) of the telephone voice service. The use of a different frequency range meant that the data service could be de-coupled from the voice service, and it was now possible to provide an 'always on' data service without the need to dial-up, and without restricting simultaneous use of the telephone voice service.

Broadband is now usually understood to refer to any residential or small office data communication service that enables 'always on' access to the Internet at data transmission rates above a specific threshold. As discussed below in more detail, broadband network infrastructure may also be used by service providers to provide access to their in-house, IP-based services. Although broadband transmission rates are widely used as product differentiators for marketing reasons, the transmission rate of the underlying broadband service is a very unreliable guide to the quality of higher-layer services, e.g. Internet service.

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[1] For a more detailed discussion and data concerning the evolution of Internet bandwidth and the impact on various stakeholders, see the Internet Society briefing paper, 'Growing Pains: Bandwidth on the Internet' (http://www.isoc.org/isoc/conferences/bwpanel/docs/bp-growingp-201003-en.pdf)

Defining Internet service

The Internet consists of many different and independent networks concatenated together through *open internetworking*. One of the key areas of confusion today stems from the very success of the Internet Protocol (IP) as a networking technology. Standard IP equipment and networking practices are useful for providing a number of networked services in addition to Internet service, such as voice services (VoIP) and video delivery (IPTV). When those services are offered over the same physical infrastructure as Internet service, concerns regarding traffic priority and service conflicts can arise — whether technical or commercial. In this short paper we seek to clearly distinguish Internet service from any other IP-based services, while acknowledging that both can coexist on the same broadband infrastructure. In future, the focus of policy and consumer labeling should be on ensuring that Internet service is unequivocally defined, offered, delivered and measured without disruption by or to other IP-based services.

Terms of Reference

Precise technical definitions can be found in Internet Engineering Task Force (IETF) specification documents.[2] This document outlines some terms of reference to bridge the gap from the technically rigorous to the experiential world to set a framework for discussion of policies and actions.

The Internet
The Internet is: the system of interconnected networks that use IETF-specified best current practices and protocols, including the Internet Protocol, for communication with resources or endpoints reachable via a globally unique Internet address.

Internet service
Internet service is: connection of an Internet endpoint or network to the rest of the Internet with non-discriminatory, best-effort routing of data packets as part of the Internet.

Internet service providers
Internet service providers are: companies that offer Internet service to customers. In this paper we are concerned with broadband ISPs that offer Internet service over some broadband infrastructure. They may or may not own or maintain that infrastructure — they may lease it, for example. These companies are responsible for the experience of

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[2] http://www.rfc-editor.org/rfcxx00.html

their customers over both the broadband infrastructure and the infrastructure that links the ISPs network to the rest of the Internet.

IP-based services

IP-based services are: services that are built using the Internet Protocol, but that operate within a single network (i.e. they are not internetworked). These networks are often optimized for a single service or service type, and rely on a single administrative domain controlling the network in order to ensure (or enforce) specific service characteristics. They may not conform to the full set of Internet best practices, including network management techniques. Examples of IP-based services include video delivery (IPTV) and telephony service offerings (VoIP).

Internet-based services

Internet-based services are: services that are delivered over the Internet service directly to end-users. They *do not* rely on administrative control from the network. They *do* rely on the underlying Internet service conforming to standardized best practices and non-invasive network management techniques. Skype is an example of an Internet-based VoIP service.

Internet service metrics

The key premise of this paper is that the only thing that should be advertised and retailed as *Internet service* is service that conforms to the definition of Internet service given above. Whether or not Internet service is offered along with other IP-based services, they should not impair the non-discriminatory nature of Internet service, and the advertised (and realized) properties should describe the Internet service itself. This leads to a number of measurement-related considerations.

- Apportioning bandwidth between IP-based services and Internet traffic: it is important that Internet service providers are fully transparent to their subscribers about the bandwidth being offered for Internet service. This can best be verified independently by testing throughput to a wide variety of Internet destinations at various times of day, and in the presence of bundled IP-based services if applicable.

- Managing interconnections with the wider Internet: historically, considerable effort has been put into ensuring that peering relationships and network gateways are optimized to allow good quality access to Internet destinations beyond a given network. ISPs may be commercially motivated to let the quality of these links atrophy over time to increase the relative performance of their IP-based services. It is therefore essential that measurements of Internet service performance are made to as wide a

range of destinations as possible, including many popular Internet-based services. These measurements must be replicated at regular intervals and compared with the stated performance characteristics of the subscribed Internet service.

- Ability to evolve: measurement methodologies need to verify that popular Internet-based services perform adequately over any given Internet service, but should also verify that a much broader range of less commonly used protocols, applications and destinations are similarly functional to ensure the continued availability of the Internet as a general purpose data networking and communications medium.

A key challenge for policymakers, as we collectively monitor the evolution of Internet service and IP-based services, will be to ensure that the Internet does not become the least-effort network. Key to ensuring this is a widely shared and well-understood definition of Internet service and proper labelling of service offerings — clearly identifying Internet service, where available, along with the expected performance profile. And, as with all products, consumers and consumer champions should be able to accurately confirm that they are in fact getting the service they purchased. A considerable body of work already exists in the IETF dealing with the technical complexities of measuring various aspects of Internet performance.[3]

Conclusions

Broadband deployment is a means to an end, not an end in itself. Broadband infrastructure is most useful to the extent that it robustly underpins the Internet service that is the thing of real value to citizens, businesses and governments. It is therefore vital that, as we proceed with increasingly sophisticated measurement methodologies related to broadband infrastructure deployment, we share and understand a definition of Internet service. We must simultaneously seek to develop measurement methodologies that reveal the quality of Internet service being delivered by ISPs, and aid consumers in making informed decisions about where best to obtain Internet service suitable for their needs.

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[3] See the documents of the IP Performance Metrics Working Group, for some examples: http://datatracker.ietf.org/wg/ippm/

In order to ensure that the Internet remains a basis for global innovation on all fronts, it is necessary to ensure that short-term operational requirements and commercial pressures do not create management practices or profiled service offerings that are described or accepted as Internet service.

About ITAC

The Internet Technical Advisory Committee (ITAC) to the OECD brings together the counsel and technical expertise of technically focused organizations, in a decentralized networked approach to policy formulation for the Internet economy. The main purpose of the ITAC is to contribute constructively to the OECD's development of Internet-related policies.