

A different network? Driving the changes

by Jack Waters, Chief Technology Officer and President, Global Network Services Level 3 Communications

For years, sector analysts have worried about the ability of networks to handle the extraordinary growth of data traffic, but continuing innovation has come to the rescue time and again. There is no reason to doubt that providers will invest to add scale and improve efficiency while innovators find ways to reduce complexity and cost whilst increasing speed, throughput and quality. Despite the dire predictions, the networks will soon be able to handle the flood of video and advanced applications traffic.



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How many cell phones do you think are in use today around the world? Amazingly, the number is already more than five billion, approaching the world population of 6.8 billion. The number of connected devices keeps growing rapidly, as cell phones extend their reach from cities to farmers' fields and as TVs, gaming consoles and even cars join the fray. This impressive array of personal connectivity devices is accessing an equally dizzying array of network-based applications, from movie-streaming to digital bookstores, social networks and virtual farMs At the other end, we have millions of enterprises clamouring to get their data, services, information, products and advertisements to as

many of these users as possible. In the middle of it all is the network.

In terms of bandwidth demand alone, today's networks have a considerable challenge, but they are also tasked with supporting a highly variable set of services and business models, from wireless calling and cable TV to video-on-demand and popular Web-gaming applications. While the demands on today's networks are clear, the requirements of future networks are perhaps counter-intuitive.

Driven by consumer demand, devices and applications are changing and growing in sophistication, and, in so doing, they are

changing the way that the network is used and the requirements it must meet. It's interesting to note that while we assume technological advances will continue unabated in applications and devices, we tend to see the role and function of the network as being considerably more static. Nonetheless, the function that the network serves - and thus the requirements it must meet - will continue to change significantly to meet the demands of the applications it supports for consumers and business users.

In other words, at the core of it all is still the network - it just isn't the same network that it used to be. The network will continue to

evolve, because it has to. To illustrate this point, we need to look at some of the obvious trends we are seeing in telecommunications and their implications.

Device and application proliferation

Clearly, smartphones, hand-held computing devices such as tablets and Internet-enabled devices such as TVs and gaming consoles have grown exponentially. Even more prolific are the applications that ride on top of these devices. Looking at just one example, the Apple App Store alone boasts over 350,000 available applications, with countless more being developed daily.

Applications moving to the edge

Where once many applications were embedded, proprietary network functions (such as SMS texting, voice calling and broadcast TV), today, Internet-based services give users new options that leverage a different service model (such as Internet-based IM services, VoIP calling, and video-streaming applications).

The application development environments at the edge provide a fertile ground for opportunity, since applications can be written on top of a standard IP development platform, rather than having to navigate SS7 or other specific and often proprietary development interfaces. This more open environment decouples the need to understand embedded network functionality, and therefore encourages new innovation, the fruits of which drive further increases in demand.

The popularity of cloud computing solutions

A Gartner report indicated that in 2010, cloud computing services already represented over ten per cent of external IT service spending, and 46 per cent of respondents reported that they would be increasing their cloud computing investments in the future. By leveraging services 'in the cloud', enterprises can reduce the costs of hosting applications, such as servers and staff, while tapping into a wide range of solutions.

So, what are the implications of these changes? The nature and scale of network traffic is changing, and user demand is largely driving these shifts. As consumers and business users move to Internet-based applications, network providers are seeing less and less demand for the embedded applications that once provided their traffic bread and butter. For example, comScore reported that Internet video-viewing

grew 71 per cent year over year in 2010. As a result, traditional cable networks providing linear television saw their subscriber count fall for the first time.

While it is certainly a matter for debate, one can imagine a future where the Internet and IP-based networks become the networks for delivery of most - if not all - services. The embedded network intelligence that helped provide these services will move to the applications at the edge of the network. Voice services, voice routing, SMS texting and traditional broadcast TV will likely be overshadowed by Internet-based options over time, driven by continued adoption curves and future innovations.

These trends are driving escalating bandwidth demand, which is not likely to slow in the foreseeable future. Cisco's Visual Networking Index predicts that by 2014, the Internet will be four times larger than it was in 2009, with the equivalent of 12 billion DVDs of data crossing the Internet every month. There was a time when industry prognosticators estimated that Internet traffic growth would have slowed and levelled off long before now; but they failed to factor in the data-intensive innovations of the past decade. Nor can we accurately predict future innovations, which will create even greater demand.

These trends are unrelenting, and consumers and business users want unfettered access to their Internet-based applications. Which brings us, full circle, back to the network. How can networks meet the demands of the future?

For over a decade, some industry watchers have asserted that networks won't be able to scale to meet future demand, but continued innovation has allowed us to defy those predictions. Networks can meet the demand - but they must continue to adapt with a focus on improving scale and increasing efficiency.

To achieve scale, networks need to keep adopting higher speed technologies, economically. One example is 100Gbps interface technology. We see 40Gbps interfaces as a necessary stop-over on the way to 100Gbps - but it needs to be a brief stop on a fast trip to 100Gbps if we are to quickly scale to meet demand. Higher scalability will also require a reliance on standards-based, commodity-driven technology and components to derive the necessary economies and efficiencies of scale to support future growth. Ethernet is a good example of a commodity technology widely applied in the enterprise, in data

centres and by carriers to deliver scalable and cost-effective solutions. Although the standards for 100Gbps - such as packaging akin to CFP2/QSFP2 and optical interfaces such as SR4/SR10 - are being debated, we view the direction this technology is headed as very encouraging.

Networks must also become increasingly efficient. A good way to increase efficiency is to combine high-scale optical networks with clusters of content delivery network (CDN) servers. While often thought of as a delivery technology for video content, CDNs will also play an expanded role in supporting the efficiency of the network, helping to meet the scale, cost and quality that will be demanded by consumers. CDNs take advantage of the high price/performance improvement rates that we see with commodity servers (processors, memory, and disks) and provide an alternative to buying more networking equipment.

Multiprotocol Label Switching (MPLS), originally used to build multi-service networks, is seeing new utility in driving scalability and efficiency. The use of MPLS LSPs (*label switched paths*) limits the size of routing tables in the network core, reducing memory consumption and processing resources. It allows network providers to expand networks more efficiently, and over time, technologies like MPLS will allow networks to be even more resilient than they are today.

To summarize, we believe that the networks of the future can continue to scale to meet escalating demand, driven by data-intensive user applications. To get there, providers will need to focus their spending on those investments that add scale, efficiency or both. They will need to reduce complexity in the network to meet scalability objectives, as well as cost and quality requirements. And they should add intelligence in the network only when it supports the goals of scalability and efficiency.

There's little question that communications innovation will continue. Consumers will have seemingly limitless options for viewing and experiencing content through increasingly advanced devices and applications. And in the middle of it all is the network - but what will that network look like? Designed for resiliency, agility and ingenuity, the network of the future will be capable of meeting the demands of the changing technology landscape, even if it plays a different role than the networks of the past. ●