Managing the mobile data tsunami - Is 4G the answer?

by Constantine Polychronopoulos, Founder and CTO, Bytemobile

The explosive growth of data traffic generated by smartphones has created significant challenges for network operators, imposing an immense strain on available network resources and a negative impact on the user experience. Policy-driven optimization is perhaps the only technology that can alleviate the bandwidth crunch in existing 3G networks and also expand the effective capacity of emerging 4G networks.

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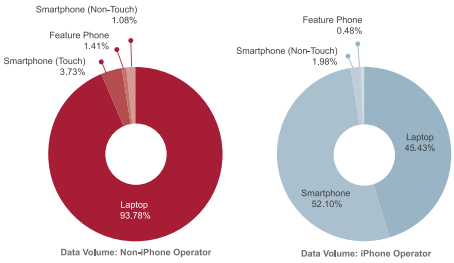
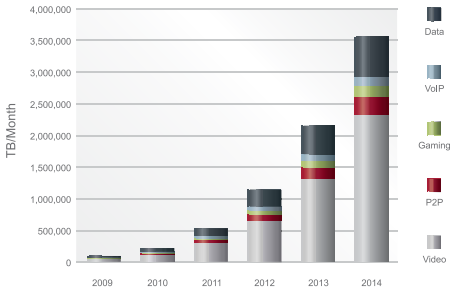
The latest generation of smartphones, particularly the Apple iPhone and Google Android devices, has contributed to exponential growth of data traffic in 3G networks. According to recent data from a cross-section of tier-one wireless network operators, those providing service for touchscreen smartphones have seen a dramatic increase in data volume - in some cases overwhelming their networks.



Source: Bytemobile, 4Q 2009

Projections from industry analysts, wireless operators and suppliers of mobile internet infrastructure technology converge on the fact that the pace of data traffic growth will continue to accelerate rapidly through 2014 and beyond.



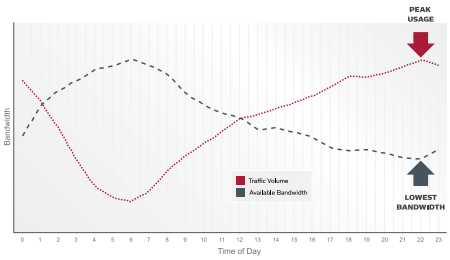
Source: Cisco Systems, 2010

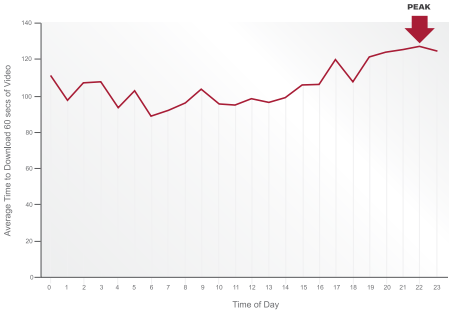
New realities of the mobile Internet era

Explosive traffic growth has created not only tremendous opportunities for all players in the wireless broadband ecosystem, but also significant challenges - especially for network operators. Most of these challenges stem from the fact that today's HSDPA (*High Speed Downlink Packet Access*) and HSPA+ (HSPA Evolution) networks - as well as emerging LTE (*Long Term Evolution*) networks - were not provisioned to process the traffic loads that high-end smartphones have been generating over the last two years.

The growth in traffic has imposed an immense strain on available network resources. This in turn has had a negative impact on the user experience. The result is often that subscribers churn to another network with more capacity and therefore a better experience. Another consequence of the data traffic strain on networks is that operators are delaying the rollout of new data applications, which slows revenue growth. It also provides a unique advantage to non-traditional service providers such as Google, RIM, Yahoo, and others to step in and offer smartphone applications for social networking and location-based services that create stickiness and loyalty among smartphone users.

The figures below show a direct correlation between traffic volume, network bandwidth availability and the user experience. As expected, decreased bandwidth directly impacts the quality of the experience.





Source: Bytemobile 2Q 2010

As data traffic continues to increase, not only will the user experience deteriorate further, but also operators will have to implement and enforce new billing policies and service plans in order to remain profitable. As we have seen in the transition from 2G to 3G, it will become critical for operators to serve more users and traffic within their existing infrastructure and offer a better user experience to reduce churn and remain competitive in the 4G environment.

No panacea

There are those who tout LTE as the ultimate solution for limitless bandwidth. While the new architecture will dramatically expand the bandwidth currently provided by 3G technology, different and complementary solutions will be required to address the quantum leap in LTE-enabled traffic by extending the capacity of the network. LTE will increase bandwidth to the device ten-fold over HSPA+, but at a cost of increased spectrum allocation. Effective bandwidth to the device is limited by the maximum bandwidth supported by the slowest link in an end-to-end connection. Given that LTE addresses only radio access, operators will need to re-provision the rest of their network infrastructure in order to address the bandwidth crunch.

Significant capital expenditure (*CAPEX*) allocations for new infrastructure may be bad news for an operator's bottom line, but the worse news is that CAPEX alone cannot fix the problem. However, there is good news for operators. A combination of commercially available technologies can deliver a definitive solution to backhaul network congestion by addressing the problem at its root and doing so in a cost-effective manner.

Options available to operators

Femtocells, Wi-Fi offload, content caching, traffic management, and optimization will be critical components of future wireless communication systems, enabling operators to deliver a high-quality user experience with a limited set of resources in the form of spectrum and radio technology.

These options are by no means mutually exclusive. In fact, most operators will use a combination of them and others as appropriate to meet their requirements.

Optimization's enduring value

While there is no single solution for the effects of explosive data growth on network capacity, it is important to understand optimization and how it enhances the positive impact of all solutions across all network elements.

Optimization encompasses an array of synergistic technologies for upgrading the wireless network infrastructure from end to end. It is the single fastest and most cost-effective way to boost network capacity and deliver a higher-quality experience. Unlike other approaches to capacity management, the benefit of network optimization is enduring in the sense that it increases effective bandwidth and decreases congestion and latency, regardless of the radio or network technology used. Moreover, optimization can be deployed easily and without the expensive infrastructure changes required by almost all other network upgrade technologies.

The adaptive nature of optimization makes it an invaluable embedded performance booster on an ongoing basis as operators upgrade segments of their networks toward 4G. Optimization expands effective bandwidth and network capacity through the dynamic application of different technologies, including hierarchical content caching, adaptive video streaming, policy-controlled content compression, adaptive transport resource scheduling, and congestion management.

Policy-driven optimization

Policy-driven optimization - which combines optimization with policy enforcement in a single gateway platform - results in more efficient utilization of spectrum and hardware, more effective distribution and prioritization of traffic, more flexibility of service plans across user profiles, and ultimately, more bandwidth for the unprecedented surge of data that LTE will inevitably produce. Unlike infrastructure-intense network upgrades, policy-driven optimization can be implemented quickly, with little or no change to the rest of the network. It provides an end-to-end bandwidth and network capacity boost of up to 50 per cent, depending on traffic profiles. It is perhaps the only technology that can alleviate the bandwidth crunch in existing 3G networks and also expand the effective capacity of emerging 4G networks.

When it comes to wireless broadband capacity, operators will continue to invest in optimization for as long as they continue to invest in better radio technologies - and as long as users demand higher levels of service. Policy-driven optimization comprises the only set of technologies that provide enduring value regardless of radio access technology and network architecture - and yet will be essential in the LTE environment. ●

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