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The Enormous Appetite for Data

By David Chambers

It's not the same as voice

We have seen the enormous growth and takeup in unlimited voice plans in recent years. Just like all-you-can-eat diners, these plans are naturally limited by how much any individual can consume in the time available. Most people simply aren't able to talk for more than a certain amount of time per day, and even if they did, they might run out of friends to call if they repeated this too often.

On the other hand, mobile data devices can continue to communicate and eat up bandwidth even during our sleep. It is not uncommon for email capable smartphones to check for mail every hour or more. More complex features such as streaming music (Spotify), video, chat and games encourage ever-higher traffic throughput.

This has led to consumption of several hundred megabytes per device by many high end smartphones, with Clearwire predicting as much as 14GB/month for mobile users in the coming decade.

Setting customer's expectations

Unlimited data usage for a monthly fee could become a millstone around service provider's necks. Many unlimited packages are starting to introduce monthly "fair-usage" caps after which service is either terminated, charged at additional cost, or severely throttled.

Service providers' advertising often includes estimates of the large number of emails, webpages or video that their usage caps relate to. The trouble is that customers still find this difficult to estimate or compare with their expected behavior. "Bill shock" still occurs when overage is billed for, resulting in poor customer satisfaction. Many customers have little idea how much data they actually consume.

For example, the massive 5GB-per-month cap on Sprint's latest phone plan is still seen as offputting to some potential customers, despite typical traffic usage being less than 10% of this figure.

Delivering the customer experience

In order to match these growing customer expectations with resource contrained networks, service providers are turning to engineering solutions to shape and mould their customers' data experience.

Managing data traffic networks today is mostly about prioritising individual packets as they make their way through the network. There are two main control points:

a) Access network, near to the point of customer delivery
b) Centrally, near to the main offload or interworking points

These categories are complementary – both techniques are required – but in themselves do not tell the full story.

Access Network

Fixed broadband networks such as DSL apply traffic prioritization in the DSLAM where individual customer lines are concentrated before being routed through the core network. Contention ratios of 20:1 to 50:1 are common, with most customers being treated on the same "best effort" basis. Service providers may offer a premium "business class" service which prioritizes packets for those users, effectively providing a "better best effort" service.

Wireless networks provide this consolidation at the cellsite, where a limited resource of radio transmission capacity in any given cell must be shared out equitably to all the users in its coverage area.

Typically, the radio access network will accommodate short bursts of peak rate traffic from individual users, cutting back on the throughput to discourage continuous high load within the individual cellsite. Unlike the wireline network, the radio access network doesn't have individual subscriber or tariff information and can't prioritise based on individual user plans.

Moving the bottlenecks affects the planning processes

Unlike wireline broadband, until recently this "last mile" of radio access has been the limiting factor of bandwidth, with backhaul from the cellsite to core network matching the full capacity of the cellsite. With the latest 3.5G cellsites, this is no longer the case. There are many instances where the peak RF throughput exceeds that of the backhaul links.

This has changed the role of backhaul transmission planning for mobile network operators, who are investing heavily in transforming these links to Carrier Ethernet using both wireless microwave and fibre ethernet technology. Where before, the radio transmission capacity drove the planning and forecasting for the transmission network, now we are seeing a separate stream of capacity planning around the backhaul transmission itself.

Access control to the radio network at the point of delivery (the cellsite), therefore has to take account not just of the radio capacity for the cell providing coverage, but also the available backhaul transmission shared across the site.

Centrally, using Deep Packet Inspection

Real-time packet processing has advanced to the point where each and every packet can be inspected, classified and prioritised in real-time based on the subscriber's profile. Several vendors provide the technology to do this, handling both prepaid and postpaid data traffic in the same system. By associating each data stream with a Class of Service, and individual parameters such as monthly usage to date, traffic shaping can be applied to the real-time stream. Each type of service, whether email, web browsing or video streaming, can be treated differently to optimise the end user experience.

Introducing a premium service class

Up to now, many wireline but few mobile service providers have introduced a premium or better class of service for data users on their networks. By doing so, they can offer the opportunity to increase revenues from the same available capacity, rationing it out proportionally to those prepared to pay for it.

Standards and products already exist to manage the data traffic both in aggregate and at individual subscriber level. For mobile networks, these can include in-application requests for higher Class of Service for individual applications, which could be billed at premium rates.

How long is a piece of string?

But as with any resource limited traffic management schemes, knowledge of the available capacity and trends is essential to avoid disaster. Historic information must be compiled from as-built, used and demand traffic levels, then compared with predicted future market growth. Trend planning at this network wide level allows an accurate picture to be created from which both future marketing plans (how much is available to sell) and operational investment plans (how much do I need to build) can be derived.

Scenarios

Some vendors propose solutions which ask the customer to select the performance and bandwidth required on a per usage basis. Or to use a menu option to speed up the service in areas of poor quality.

Most users, however, like to keep things simple. One method to achieve this would be to increase the rate of consumption within the monthly useage allowance. For example, 1GB of high priority might consume 2GB of your monthly allowance. 1GB of video streaming priority might take up 3GB or more. In this way, consumers could relate to a single base tariff for data, and understand the proportional cost of additional data.

Understanding the total capacity available

Available bandwidth for any individual cell or DSLAM is always going to be determined in real-time based on the committed traffic demand placed on it at any point in time. Capacity cannot therefore be guaranteed for any individual user at any individual location. But service providers can manage their networks more proactively through these two techniques and establish premium data services at a premium price.

So what needs to be done?

Operators will need to invest in real-time network elements to prioritise and manage their bandwidth to each user.

An equally important investment will be in OSS systems which provide an accurate and comprehensive view of the total capacity available today and in the future. These systems will be used not only to design and plan capacity upgrades, but to work with marketing departments to assess and develop viable data packages and tariff structures.

With these tools in place, operators can balance the need to meet customer expectations with that of maximising the revenue from their existing data network capacity.