Network Offloading is Vital - but is Wi-Fi Up to the Task?

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By 2013, global mobile data traffic will exceed two terabytes a month1. Video streaming, social media applications and smartphone signaling are the chief culprits. This data tsunami will swamp mobile network architectures, and operators face the challenge of finding the right way to offload it.

An ABI Research study, Mobile Network Offloading, forecasts that mobile data offloading will triple by 2015 to 48% of traffic. And because data traffic volumes will have grown by a factor of 30, it means that the amount of offloaded data will increase 100-fold in real terms. This could have a dramatic effect on operators' bottom line. According to a UBS research note, radio access networks and backhaul account for 70 to 80% of an operator’s network capex, so offload can save a substantial amount of capacity and capex.

The question is, can Wi-Fi be an effective offload mechanism as the volume of mobile data traffic ramps up, or does the key to offloading lay with femto-based small cells?

Limitations of Wi-Fi

There are a number of inherent limitations to Wi-Fi that make it an unsuitable technology for most mobile users. Aside from the reality that not all mobile devices are Wi-Fi enabled, Wi-Fi technology is best suited to simple wireless internet access for stationary users.

Firstly, Wi-Fi suffers from significant interference problems as the access point density grows. This is because Wi-Fi access points cannot regulate their power output so access points in close proximity can drown each other out (co-channel interference) leading to coverage black holes.

If mobile operators were to rollout, or commission, thousands of new Wi-Fi access points to offload growing mobile data traffic, they would be pushing Wi-Fi beyond its capabilities. For each new access point installed, the interference results in the effectiveness of an established one being diminished. This is non-linear growth.

Secondly, the additional power required by all these access points radiating constantly at 100mW will lead to a considerable increase in mobile operators' energy costs and total carbon footprint.

And thirdly, but no means least, is the user experience. Assuming a mobile

subscriber has Wi-Fi and the capability is turned on, they have to voluntarily log-on to an access point. If they move between access points (i.e they are mobile), the session will drop and a new access point will need to be found. Even when stationary, a session can end if the access point becomes over-crowded, which is a frequent occurrence with hotspots in busy locations. Because Wi-Fi is best effort, there is no inherent ability to reserve capacity for individual users.

Small Cells Key to Offloading

Femto-based small cells present a more viable option for large-scale data offloading, as Julia Mason has discussed on Wilson Street. And because femtocells use 3G standards, they are able to seamlessly work with existing macrocell deployments to provide improved voice coverage and quality. Additional capabilities such as their ability to self organize and control power output means less interference and less energy consumption by the access point and the end user's device. (A typical femtocell generates just 10-20mW.)

The presence of another access point on the same frequency nearby will cause the femtocell to regulate its power output so that there is seamless, not overlapping coverage. Consequently for every additional femtocell you install, you get one additional femtocell capacity. Unlike Wi-Fi, this is linear growth, and ultimately more cost effective.

In addition, femtocells provide a seamless end user experience by not requiring reauthentication. Femtocell user sessions automatically hand off to the next femtocell or macrocell without interruption, and because there is inherent quality of service, they will not be crowded out by other users. A session cannot commence unless a dedicated channel is available for that user.

From an option perspective, Wi-Fi is unregulated, does not scale well because of interference, and can undermine the user experience because of its best-effort limitations. Small cells, on the other hand, manage the radio emissions efficiently so it is easy to add additional capacity, while users enjoy a seamless experience - whether they are at home, in the office or enjoying a YouTube video while slurping a frappuccino.

To find out more about how small cell technology can relieve the strain on mobile macro networks visit: http://www.alcatel-lucent.com/femto [1]

Links:
[1] http://www.alcatel-lucent.com/femto