Solution Brief
MobiVita RANFaster*
Intel® Xeon® Processors

MobiVita and Intel – Optimizing LTE Networks

The successful introduction and rapid expansion of 4G/LTE networks has led to a significant increase in wireless data usage – especially for video. Mobile network congestion very often takes place at predictable times (busy hours) and areas where people congregate for extended periods. But wireless usage also arises at unpredictable hours and locations (e.g. sales, sport events, etc.) across the network. Service providers need more intellectual solutions that can carefully target congested cells considering mobile users' quality of experience (QoE) and real RAN conditions. They need solutions that can specifically focus on subscribers and applications which add most to the congestion.

Mobile operators need a means of providing quality service levels to all of their customers under all conditions without the need for expensive overcapacity. MobiVita's RANFaster product, using Intel processor-based servers and network function virtualization (NFV) and software defined networking (SDN) techniques, offers a software product that intelligently optimizes service based on congestion levels, application types, and user service levels.

Challenge

Several technologies and products have come together to enable high-speed mobile networking:

- 4G/LTE wireless networks were successfully trialed and then rapidly deployed, covering most of the world.[1]
- Smartphones and tablets are available with all the capabilities of laptop and desktop computers.
- Small wireless cells have been widely fielded, extending the reach and capacity of LTE networks.

The amount of data delivered on LTE networks has increased dramatically. For example, in Hong Kong during early 2014[2] 4G-based data consumption was roughly double 3G data consumption. Peak data usage can be many times higher than the average, occurring at hot spots where people are relatively stationary at certain times of day. Viral events can result in widespread usage above peak levels. By far the largest consumption of wireless bandwidth is due to video; Cisco predicts[3] that video data will consume 70 percent of all Internet bandwidth by 2016 – most of it on mobile devices.

If peak load is not handled correctly, it can lead to poor video quality characterized by low resolution and annoying buffering. Wireless consumers have multiple network providers from which they can choose. Multiple instances of poor or unavailable service can result in devastating customer churn.

Wireless spectrum, and the bandwidth that can be supported, is an inherently limited resource. Network build-out is an expensive and time-consuming operation. It is just not cost effective to equip the cells that service hot-spots for worst case peak load even where spectrum is available. Small cells help to ameliorate this problem, but also come with a cost and deployment delay.

Congestion control is a technique by which users' traffic flows can be prioritized and limited to minimize network congestion.

LTE includes provisions for tagging flows with desired quality of service (QoS), but this is a static and coarse-grained means of controlling congestion. MobiVita and Intel have come together to provide a solution that optimizes network congestion in real-time based on wireless network conditions, current usage, and contracted services.

Solution

MobiVita, using Intel and cloud technologies, has developed RANFaster, an LTE congestion control solution that addresses network congestion in a way that optimizes available network bandwidth while maintaining QoE. Where customers have purchased levels of service (e.g. bronze, silver, and gold), RANFaster enforces those contracts.

RANFaster utilizes two cloud-hosted components: the Radio Access Network (RAN) Probe and the QoS Advisor. They are instances of network functions virtualization (NFV) and may be used in software-defined networks (SDN). They can be used in conjunction with stand-alone enhanced packet core (EPC) servers or with NFV-based EPC implementations. This allows RANFaster to be instantiated, provisioned, and connected with other EPC elements at the same time as the NFV-based EPC is deployed or expanded. It also allows RANFaster components to be quickly combined with other third-party services, such as QoE assurance software, local caching, and location-based services.

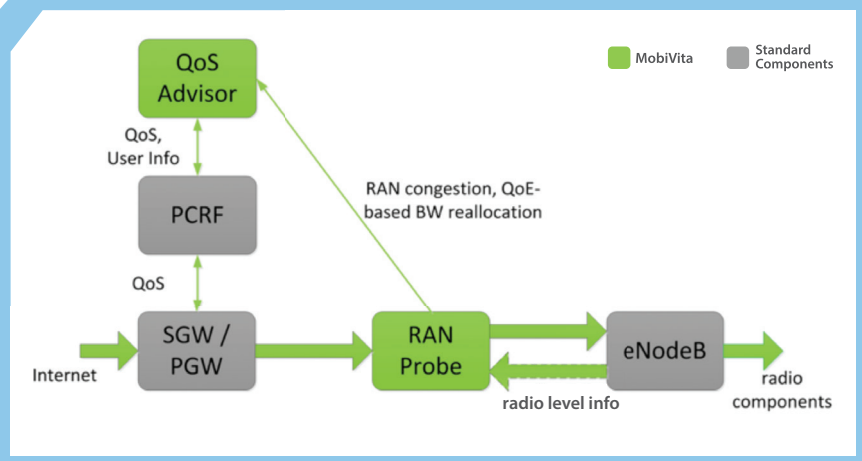

Figure 1. RANFaster Architecture

The use of NFV also allows operators to use RANFaster on a pay-as-you-grow, dynamic model. RANFaster may be optionally instantiated in the EPC for high-traffic cells, or to handle peak and surge loads.

The placement of the two components in an EPC is shown in Figure 1.

The standard LTE-EPC network components are:

- **eNodeB** – manages the connection with user equipment (UE). It works in conjunction with RF radio components, including antennas that together constitute the RAN.
- **SGW/PGW** – Serving gateway (SGW) and public data network gateway (PGW). These connect to other EPC components and to the Internet and/or private networks.
- **PCRF** – Policy and charging rules function (PCRF) manages user-specific information that controls billing and levels of service.

The RANFaster components are:

- **RAN Probe.** The RAN Probe analyzes traffic coming from the Internet via the SGW/PGW and is aware of local RAN conditions, including all sector[4] loads, UEs in each sector, and handovers between sectors and cells. The RAN Probe may optionally be co-located with the eNodeB in order to take quick advantage of local and/or proprietary information that may not be visible in the EPC, such as channel state and fluctuations.

The RAN Probe uses a technique known as deep packet inspection (DPI) to look at initial packets in each information flow. Each packet is thoroughly analyzed to identify the protocol in use and the type of information being transmitted, i.e. data, voice, or video. Where video flows are found, further information is gathered concerning the available bit rates.[5] Using this information, the RAN Probe calculates the bandwidth for each flow that will minimize congestion for each sector after applying QoS settings by QoS Advisor.

- **QoS Advisor.** The QoS Advisor implements the bandwidth adjustment schemes received from the RAN Probe. Working with PCRF, which has access to each user's level of service and other service information, the QoS Advisor calculates a set of QoS settings that relieve congestion. These settings are applied to traffic flows by the PGW.

In effect, each LTE sector is optimized to relieve congestion while observing service differentiation. The feedback loop between the EPC and RANFaster components keeps congestion control up to date as users and conditions change.

Key Features

- **Automatic congestion control.** Per-flow prioritization minimizes over-the-air congestion while maintaining maximum possible QoE for all users.
- **Optimizes video and other network** flows. Video traffic is analyzed using DPI, since it uses most of the bandwidth. All data flows, however, are optimized at the same time.
- **Enforces premium content differentiation**. Where users have paid for premium service, they receive higher bandwidth allocations.
- **NFV/SDN compatible**. This allows RANFaster components to be automatically deployed, provisioned, and connected to EPC components hosted as NFV elements or not.
- **Seamless and transparent integration**. RANFaster can smoothly integrate into existing LTE network by passive monitoring and through standard 3GPP protocols (Rx, S1-MME, S1-U). The product itself provides no changes in data traffic flow after the installation.
- **Pay-as-you-grow model**. RANFaster can be deployed when and as needed.

Wireless Operator Benefits

Wireless operators maximize their infrastructure investments with RANFaster. RANFaster congestion control provides them with the means to optimize their wireless bandwidth without expensive overcapacity. RANFaster ensures that all customers receive quality service wherever possible and that premium customers receive enhanced services, even during peak periods. Operators can use RANFaster on a pay-as-you-grow model to add its congestion control only where and when it's needed. RANFaster interoperability with NFV and SDN means that it easily integrates with NFV-based EPC implementations.

Conclusion

4G/LTE wireless networks are used by more and more users every day for more and more applications. High data usage, especially video applications, has stressed LTE cells – sometimes to their limits. RANFaster's intelligent congestion control limits, prioritizes, and optimizes the inherently limited bandwidth. MobiVita's RANFaster provides the means to keep wireless customers happy with their service and avoid further expensive wireless build-outs.

For more information about solutions from MobiVita visit, **mobivita.ru**.

Solution Provided By:

For more information about Intel® solutions for communications infrastructure, visit www.intel.com/go/commsinfrastructure.

[1] Except for most of Africa and parts of Asia, according to GSM World Coverage Map 2014 from www.worldtimezone.com/4g.html.

[2] http://www.mobidia.com/press-release/lte-subscribers-consume-much-more-data-than-3g-subscribers

[3] According to the Cisco Visual Network Index (VNI).

[4] A sector is a division of the 360 degrees of coverage around an antenna. LTE RANs often use only three sectors.

[5] Video streams are generally available in a choice of bitrates, so as accommodate different device resolutions and network conditions. Video servers and clients automatically select and adjust bit rates at run time.

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