SEVEN Networks
Open Channel® Traffic Optimization

Revision 3.0
March 2014

The Open Channel family of software products is designed to deliver device-centric mobile traffic management and analytics for wireless carriers. Open Channel Traffic Optimization significantly reduces mobile signaling activity and the associated bandwidth consumption to relieve wireless network congestion. Traffic Optimization increases operator control over mobile data traffic and improves service quality. It reduces operator costs and extends the battery life of mobile devices.

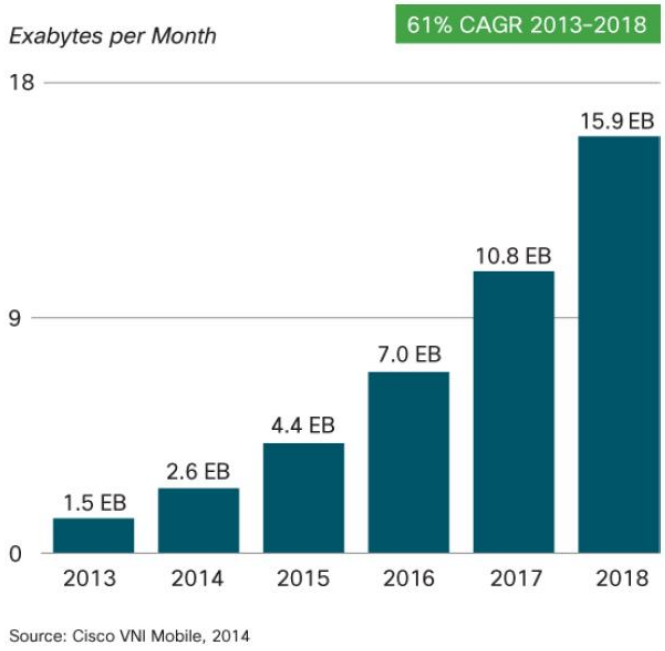
SEVEN Networks, Inc. • 959 Skyway Road, Suite 100 • San Carlos, California, USA

1. Introduction

We are in the midst of a new wireless era where smartphones and smart devices have become the standard for connecting to the world – friends, family, work, social networks, the Internet, applications, music, games, and more.

The mass adoption of smartphones, tablets, and other mobile devices has placed a significant burden on wireless networks and operators. The enormous volume of data traffic now being generated by mobile users has overwhelmed network capacity and introduced new challenges to the way mobile carriers manage networks, subscriber plans, and data delivery.

Global Mobile Data Traffic Growth, 2013 to 2018



Source: Cisco VNI Mobile, 2014

Cisco forecasts 15.9 exabytes of mobile data traffic per month by 2018

Faster networks and more data-intensive mobile applications are expected to escalate further the data demands placed on mobile networks around the world, as additional regions and their subscribers adopt mobile broadband services and download more apps. It is estimated that by the end of 2014, the number of mobile-connected devices will surpass the number of people on the planet and that by 2018 there will be more than 10 billion such devices, including machine-to-machine (M2M) modules, in use (Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2013–2018).

Of major concern is the background activity generated by “chatty” mobile apps, which contributes significantly to network congestion. Specifically, apps continually poll their servers for updates, causing devices to constantly connect to the network. The result is excessive

volumes of mobile signaling that stresses finite network resources. Much of this signaling is unnecessary, since it is often the case that no updates are available. Since each connection attempt consumes a small amount of data, this background activity also results in wasted bandwidth. Carriers find themselves adding capacity to accommodate background activity that yields no benefit to subscribers.

Adding radio network capacity is costly for wireless carriers, and it comes with long lead times. Carriers seek to make the most efficient use of existing capacity before they take the step of adding more capacity. They are scrambling for innovative ways to stay competitive, provide a positive end-user experience to retain customers, and gain greater control over mobile data traffic. Traffic optimization is an important technique for allowing carriers to achieve these goals.

2. Data Traffic Volume by Type of Device

In 2013, the typical smartphone generated 49 times more mobile data traffic (529 MB per month) than the typical feature phone (which generated only 10.8 MB per month of mobile data traffic). Each connected tablet generated 2.6 times more traffic than the average smartphone. In addition, each laptop generated over four times more traffic than the average smartphone. (Cisco, 2014)

Expected Average Traffic Growth per Device

Per-Device Data Traffic, Shown in MB per Month

Device Type	2013	2018
Nonsmartphone	10.8	45
M2M Module	61	451
Wearable Device	78	345
Smartphone	529	2,672
4G Smartphone	1,984	5,371
Tablet	1,374	5,609
4G Tablet	2,410	9,183
Laptop	2,455	5,095

Source: Cisco VNI Mobile, 2014

Subscribers will increasingly gravitate toward smartphones over feature phones, and more of those subscribers will be accessing 4G networks in the coming years. The usage patterns that result from these two trends will contribute to continued explosive growth in the volume of data traffic. The transition to smartphones in particular will also place higher mobile signaling demands on carrier networks.

3. Results of Network Congestion

The popularity of social media and the proliferation of mobile apps have subscribers relying heavily on their devices, leading to more frequent usage for longer periods of time. Many people take their mobile devices with them everywhere they go. These end users stay connected at all times, never powering down unless absolutely necessary – they insist upon access to the network 24 hours a day. The expectations of mobile users have been set: they want to enjoy the same real-time experience on their mobile devices that they have had on their computers – everywhere and all the time. End users don't know or care about the underlying technology that enables this always-on mobile experience. They simply expect their technology to function seamlessly, without a hitch, no matter what type of communication network is being accessed.

Users are downloading a large and increasing number of apps, both because of the apps' demonstrated value and because so many of them are free. Spontaneity in downloading new apps is integral to the mobile experience itself, even though few apps become frequently used favorites. Each subscriber typically has numerous apps, and they collectively generate a large volume of background activity.

The background activity of apps causes mobile device radio states to be constantly switching. Imagine millions of subscriber devices, each housing dozens of chatty mobile apps that are not engineered for network efficiency. Each time an application checks for updates, unless the device is already connected to the network, the device must establish a new network connection. Many of these connections are unnecessary, because no new app data is available. Nevertheless, each connection results in numerous signaling messages.

Excessive and unnecessary background activity creates signaling congestion as the network is overwhelmed with constant requests to connect. The bottleneck in 3G networks in the radio network controller (RNC); in 4G networks the bottleneck moves to the mobility management entity (MME), within the core network. Regardless of the type of network, this signaling activity also results in wasted bandwidth.

Excessive and unnecessary background activity creates signaling congestion as the network is overwhelmed with constant requests to connect. This signaling activity also results in wasted bandwidth.

Signaling activity that yields no benefit to the end user is unnecessary – the network resources consumed are entirely wasted. Unnecessary mobile signaling has an adverse effect on the end-user experience, including longer setup times, slower speeds, and even denial of service. It results in shorter battery life for devices – an issue that impacts both subscribers and device

manufacturers.

Wireless network congestion causes many issues for operators, including network outages or other types of service interruption. Decreased data transfer speeds, disrupted device service, even 'brown outs' where network access becomes completely unavailable and temporarily cripples communication, can all be the result of system overload.

It is important to note that different mobile applications have dramatically different profiles in terms of the type of congestion they can create. Video applications comprise the majority of data traffic volume but are not signaling-intensive. Many social media applications cause intense signaling, but their bandwidth requirements may be relatively modest. Most techniques for dealing with congestion only address that caused by the volume of data traffic (bytes). Signaling congestion is a distinct problem requiring a distinct solution.

4. Implications for Carrier Profitability

Carriers face increasing costs as they are forced to expand capacity to accommodate both excessive signaling activity and the associated bandwidth consumption. They also face mounting pressure as their costs for network upgrades and other related investments grow faster than subscriber-based revenues, which adversely impacts profit margins.

Consumers are only willing to pay for services in proportion to the benefits that they derive from those services. Wasting network resources prevents those resources from being used to deliver end-user benefits, and therefore lessens carriers' ability to monetize their infrastructure investments.

When mobile traffic is not optimized, carriers are able to deliver less benefit in aggregate to their subscriber base. Since revenue and profit scale with the benefit delivered, this results in less revenue and profit for a given amount of infrastructure. When the user experience suffers as a result of network congestion, the marginal consumer foregoes a data plan, uses less data, or switches to a competitor. In these scenarios, the linkage between adverse user experience and lower carrier profits is clear.

Optimizing mobile data traffic with respect to excessive signaling and the associated bandwidth usage presents an opportunity for carriers to increase profits. They can reduce costs by delaying the need to expand capacity. They can also increase revenue by delivering greater value in the form of higher service levels. Putting a solution in place to optimize signaling allows carriers to more fully monetize their infrastructure.

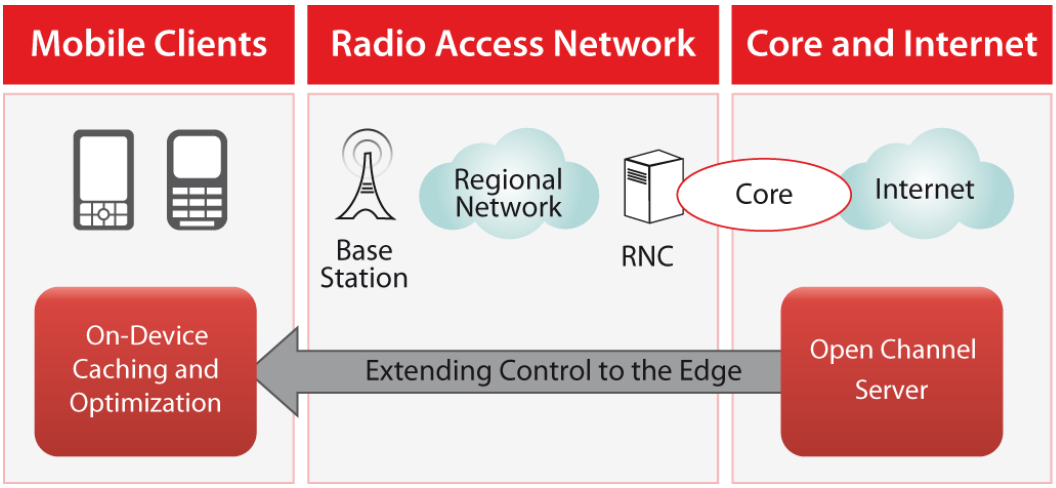
Optimizing mobile data traffic with respect to excessive signaling and the associated bandwidth usage presents an opportunity for carriers to increase profits.

5. Open Channel Traffic Optimization

An approach that addresses signaling optimization and redefines how devices, applications and the network interact with one other is needed. Open Channel Traffic Optimization from SEVEN Networks does just that.

Open Channel Traffic Optimization significantly reduces mobile signaling and bandwidth consumption to relieve mobile network congestion. SEVEN Networks has taken a unique, innovative approach that addresses the mobile signaling challenge at the source – the mobile client itself.

The software manages the exchange of control information and content between mobile devices and the network, using a patented virtualized proxy and caching technology. It analyzes mobile application data requests, transparently detecting redundant traffic patterns and caching the results of unnecessary requests on the client. The Open Channel server polls for updates, so that the client connects to the network only when updates are available. Optimizing signaling at the handset dramatically reduces unnecessary signaling before it can impact the network, enabling more efficient use of network resources. Traffic Optimization reduces operators' costs by delaying the need for expensive upgrades to wireless network infrastructure.



Optimizing traffic at the mobile client – before it can impact the network – improves network efficiency

Open Channel Traffic Optimization maximizes efficiency in the way devices interact with the network and lowers consumption of the wireless world's finite resources: battery, signaling capacity, and bandwidth. It reduces both the number of connections and the amount of time a device spends connected to the mobile network, without adversely impacting the user experience.

Traffic Optimization is transparent to end users and to the operation of their mobile apps, with

a negligible impact on device CPU and memory. The software requires no changes to applications or to the network itself, and supports any underlying mobile network technology. It complements other techniques for mobile traffic management, including compression and deep packet inspection.

Client and Server Components

Like other Open Channel products from SEVEN Networks, Traffic Optimization is comprised of a client component and a server component. Customers can choose between two deployment models for the server software. Hosted deployment allows customers to get the solution up and running as quickly as possible. In-network deployment of the server software is recommended for customers who want in-house, hands-on control over all aspects of the solution. In this model, the management server resides in the customer data center. For customers who deploy the Open Channel server in-network, a summary dashboard compares actual signaling activity to avoided activity, measuring in real time the impact of the software in reducing signaling overhead. The client component of the software ensures that signaling activity is optimized at the handset, before it can impact the network. This is superior to conventional approaches to addressing the signaling challenge, which rely on network-side capabilities such as deep packet inspection.

Key Benefits of Traffic Optimization

Significantly reduces mobile signaling
Devices no longer connect to the carrier network when no new data is available, and so overall signaling activity is significantly lower.

Reduces wireless operator costs
Reducing unnecessary signaling events helps carriers to control costs.

Conserves mobile network bandwidth
The software reduces bandwidth usage associated with background signaling. Caching content on the mobile client saves bandwidth that would otherwise be used to repeatedly download the same content.

Open Channel Traffic Optimization benefits both mobile operators and subscribers.

Delays the needs for wireless infrastructure upgrades
Carriers are able to delay expensive network capacity expansion by making the most efficient use of existing infrastructure.

Extends device battery life and improves service levels
Addressing excessive mobile signaling increases battery life and raises overall service levels for the subscriber base.

6. Economic Benefits for Mobile Operators

Open Channel Signaling Optimization allows carriers to improve customer satisfaction and reduce subscriber churn. The solution is completely transparent to end users, and they benefit from improved application interactivity, extended battery life, and less network congestion – minimizing instances when network access is unavailable, calls cannot be placed, or data delivery time is impacted. Carrier network resources are finite, and reducing the waste of these resources lets carriers employ more resources to deliver the benefits of mobile connectivity to subscribers. More benefit delivered to subscribers in turn means more revenue for carriers for a given level of infrastructure. Deploying additional base stations is an expensive proposition for carriers. Optimizing signaling activity lets carriers delay capacity expansion, helping them to reduce costs.

7. Summary

Open Channel Traffic Optimization has the potential to change the economics of the mobile industry for the better. This innovative technology enables wireless carriers to keep pace with the explosion of mobile device background activity, increase the quality of service, support more smartphone users with the same network infrastructure, and improve revenue margins on data delivery.

About SEVEN Networks
SEVEN Networks software solutions deliver device-centric mobile traffic management and analytics for wireless carriers. Extending control from the network to the mobile client gives operators the power to manage and optimize data traffic before it impacts the network. Device-based analytics offer deeper and timelier insight than solutions that are solely network based. SEVEN's Open Channel products reduce operator costs, increase efficiency in the use of wireless infrastructure, and enhance end-user experience. They bring immediate capacity relief to overloaded networks, simplify the creation of innovative new service plans, and provide actionable intelligence for mobile carriers. [WPTO03140319.]

More information is available at www.seven.com.