Mobile Video Requires Performance and Measurement Standards
Quality can and must be quantified
About the author

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Daryl covers the wireless infrastructure space at Ovum, with a primary focus on market activities as they apply to the radio access network (RAN). RAN coverage includes macro-, micro-, and picocell solutions for CDMA EVDO, HSPA/HSPA+, LTE (TDD and FDD), and LTE-Advanced. Daryl’s research includes not only what infrastructure vendors are developing, but how mobile operators are deploying and using these wireless networking solutions.

As an industry analyst Daryl has been involved in such projects as helping technology vendors develop use cases for new products and services, identifying new technology trends, and providing market sizing and market share support. He regularly speaks at industry and vendor events on trends impacting the wireless infrastructure market. He is also sought out by trade publications to comment on mergers and acquisitions, new product announcements, and market developments as they relates to his coverage area.

Daryl brings over 14 years of industry analyst experience to Ovum. Prior to Ovum he held similar positions with Current Analysis and In-Stat. Before becoming an industry analyst, Daryl worked at telecommunications service provider Cable & Wireless USA, where he was a member of the marketing and competitive intelligence team.

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Contents

Summary .................................................................................................................................................................. 4

In brief ......................................................................................................................................................... 4
Ovum view ............................................................................................................................................... 4
Recommendations ........................................................................................................................................... 4

Video is the dominant application when it comes to smartphone data ......................................................... 5
Over half of all smartphone data traffic is now video ...................................................................................... 5
Video is a big part of the LTE story .................................................................................................................. 5

Measuring the end-user video experience ......................................................................................................... 6
Operators need a way to quantify video quality of experience ...................................................................... 6
Huawei’s vMOS ............................................................................................................................................... 7

Consumer insights with mobile video .............................................................................................................. 8
Consumers like mobile video ........................................................................................................................... 8
Consumers agree with Huawei on what impacts the viewing experience ....................................................... 9
Summary

In brief

Video, both from third-party providers and mobile operators, has become a big element in the consumer mobile broadband experience. As more consumers switch to LTE services, video as a component of mobile traffic will only grow. Mobile operators need to prepare for the impact video has on their networks and have a way of understanding the end-users’ quality of experience with video. For this to happen, operators need a consistent methodology for measuring video. Huawei’s vMOS is one such methodology. Mobile operators that ignore the end-users’ video experience risk losing those subscribers.

Ovum view

- **Video is the killer LTE application.** Where LTE has really distinguished itself in comparison with older mobile broadband technologies is its ability to handle traffic. As LTE usage grows so too will video as a proportion of mobile broadband traffic.
- **Poor video quality can lead to churn.** Consumers see video as an important part of their mobile broadband experience and are watching an increasing number of videos on their smartphones. If the video-watching experience is poor, consumers could churn to other mobile providers.
- **There needs to be standards around measuring “end-users’ video experience.”** This will require a methodology that can be applied across multiple markets and operators and provide a consistent measurement process.

Recommendations

- **Mobile operators need to build networks that support video.** Given the growing trend of watching videos on smartphones, operators need to build their networks in such a way that they can scale as video traffic levels increase without sacrificing the end-users’ quality of experience.
- **Mobile operators need to make network video testing an ongoing process.** Factors such as device screen sizes and where consumers congregate change over time. So operators need to make sure that testing the video quality of experience is an ongoing process, not just a one-off happening.
- **As consumers become more exposed to mobile broadband, what was once considered an acceptable quality of experience can change.** Mobile operators need to make a practice of regularly engaging with their consumers to make sure what the operator considers a good or excellent quality of experience still matches the expectations of their customers.
Video is the dominant application when it comes to smartphone data

Over half of all smartphone data traffic is now video
No other single traffic type has the impact on the mobile data network that video does. Ovum’s mobile network data forecast estimates that 56% of the monthly data traffic in 2014 can be directly attributed to video. But that is only the tip of the mobile data iceberg.

By 2020, Ovum estimates that monthly data traffic will equal 14,150 petabytes. Of that figure, 70% is expected to come from video (see Figure 1). For mobile operators there is no ignoring the impact video will have on their business. There is also no ignoring the fact that networks need to be designed to support mobile video.

Figure 1: Video as a percentage of all smartphone data traffic in 2014 and 2020

![Figure 1: Video as a percentage of all smartphone data traffic in 2014 and 2020](image)

Source: Ovum

Ovum’s traffic figures are based on a variety of sources. External sources include over-the-top service providers, mobile network operators, and equipment vendors. Internal sources include Ovum’s annual mobile network connection and smartphone forecasts. Furthermore, Ovum does research around consumer usage habits, service provider pricing, and marketing strategies as they relate to mobile data consumption.

Video is a big part of the LTE story
As LTE services have matured, it has become obvious that video is a big part of 4G. In fact, if there is a killer application for LTE, video would be that application. Conversations about mobile video traffic growth are basically directed towards LTE. No doubt the performance of LTE, along with the improved screen quality of LTE smartphones, makes video easier to consume and provides a better overall experience. It seems that for some age groups, smartphones are almost the preferred method for consuming video.

For mobile operators in more developed markets like South Korea and the US, the challenge of dealing with video as the majority of their data traffic shifts from 3G to LTE has already become apparent. Other markets will face the prospect of having to deal with the video challenge as they make that shift to LTE.

Figure 2 shows the percent of smartphone data traffic by 2G, 3G, and 4G for 2014 through 2020. Ovum already estimates that over half of data traffic was LTE in 2014. By 2020 Ovum forecasts that over 90% of this traffic will originate from LTE devices.
A real sense of the tie between the growth of video traffic and LTE is illustrated in Figure 3, which shows the monthly data traffic coming from LTE smartphones in 2014 and 2020. Ovum expects the monthly data consumption between the two time periods to increase by a factor of over 19. While total traffic is growing, video as a percentage of the total is expected to grow as well. In 2014, Ovum estimated video accounted for 60% of LTE traffic; Ovum forecasts that this percentage will grow to 74% in 2020. Clearly any mobile operator focusing on growing its LTE business had better be prepared to deal with video and recognize the importance of video to its end-users.

Figure 3: Video as a percentage of LTE smartphone traffic in 2014 and 2020

Source: Ovum

Measuring the end-user video experience

Operators need a way to quantify video quality of experience

Describing an experience as “excellent,” “good,” or “bad” is subjective. For instance, when asking two people to rate a restaurant, one might say it is excellent while the other might describe it as bad. How people feel about a dining experience depends greatly on their expectations. Mobile operators, which are now seeing 50% or more of their data traffic comprised of video, need a much more quantitative process based on a solid methodology to judge the quality of their end-user video experience.
Huawei’s vMOS

Quantifying something that is natively a qualitative experience is not easy. It takes time and research. Huawei, as one of the leading mobile infrastructure vendors and driven by customer demands, has, through its in-house research business unit mLAB, developed a methodology called vMOS to help mobile operators measure the quality of streaming video their customers receive.

mLAB is Huawei’s in-house research laboratory focusing on the analysis of Internet usage from a network and end-user experience perspective. Founded in Shanghai in 2012, mLAB has a dedicated team researching devices and applications as they relate to the mobile Internet, including their design and impact on the end-user experience, in order to understand consumer behavior trends. mLAB has collaborated openly and extensively with universities, operators, and other ecosystem partners to produce targeted research on behavior, mobile terminals, and mobile broadband services (MBB) services in order to ensure the best user experience for consumers.

In concept, Huawei’s video mean opinion score (vMOS) is similar to the International Telephone Union (ITU) voice quality mean opinion score (MOS) methodology for measuring voice quality. Specifically, mobile vMOS gives mobile operators a methodology for measuring the end-user experience with video at the device level.

Huawei’s vMOS focuses on three areas that need to be measured to quantify the end-user experience: video resolution, initial buffering latency (time for video to start streaming), and stalling ratio (amount of time the video stalls while playing). To rate the experience, Huawei has assigned a numeric value to the different performance levels within each category. Using a formula it has developed, Huawei can assign an overall number that signifies the quality of a streaming video session. Figure 4 shows Huawei’s vMOS formula and how the different elements are to be rated.

Figure 4: Huawei vMOS tool

<table>
<thead>
<tr>
<th>Performance related</th>
<th>Buffering related</th>
<th>Mobile vMOS formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Definition</td>
<td>Score</td>
<td>Stalling Ratio</td>
</tr>
<tr>
<td>Maximum Score</td>
<td>Initial Buffering</td>
<td>Mobile vMOS =</td>
</tr>
<tr>
<td>sQuality</td>
<td>Latency (sLoading)</td>
<td>f(sQuality, sLoading, sStalling)</td>
</tr>
<tr>
<td>5K or more</td>
<td>Excellent (5)</td>
<td>• For the typical 2K video with sQuality 4.63, if its Initial Buffering Latency is 1.8 seconds, and no stalling happens during playing, then the final vMOS is 4.02</td>
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<tr>
<td></td>
<td>Good (4)</td>
<td>sLoading = f2(init_buf_latency)</td>
</tr>
<tr>
<td></td>
<td>Fair (3)</td>
<td>sStalling = f3(stalling_ratio)</td>
</tr>
<tr>
<td></td>
<td>Poor (2)</td>
<td>• The formula is based on 30-second duration of videos (basic unit)</td>
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<td></td>
<td>Bad (1)</td>
<td></td>
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<tr>
<td>4K</td>
<td>Excellent (5)</td>
<td></td>
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<tr>
<td></td>
<td>Good (4)</td>
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<tr>
<td>2K</td>
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<td>720P</td>
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<td>480P</td>
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<td>360P</td>
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<td>Good (4)</td>
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<td>Poor (2)</td>
<td></td>
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<tr>
<td></td>
<td>Bad (1)</td>
<td></td>
</tr>
<tr>
<td>sQuality = f1(vres, vbr, vcodec, vprofile)</td>
<td></td>
<td></td>
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</table>

Source: Huawei

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Huawei did not create this formula for measuring vMOS entirely on its own. It is the result of research collaboration between the vendor, Oxford University, and Peking University. Thousands of mobile Internet users were studied as well to see how the reacted to different streaming video performance and to help verify the methodology. Those users came from the China, Indonesia, Japan, Thailand, and the UK. Figure 5 below provides more insight into Huawei’s framework for researching vMOS.

In Ovum’s opinion, Huawei’s methodology for measuring quality of experience when it comes to streaming video holds promise. vMOS appears to be a well-defined methodology and the vendor has extensively tested the methodology with consumers. What mobile operators need to consider is that what a consumer may consider good or fair in one market may not be the same in others. Certainly consumers who have more experience of using mobile data are very likely to have higher expectations than those new to mobile data. For example, in some markets a three-second delay may be considered by consumers the sign of a good experience, especially if they are used to longer wait times, while others in more developed markets may think anything more than a second is poor quality. Mobile operators need to be vigilant about monitoring changing market expectations and adjust as necessary when it comes to how they rate performance measurements. Rating “quality of experience” needs to be an ongoing process.

Consumer insights with mobile video

Consumers like mobile video

As part of its ongoing research on strategies for delivering a quality mobile video experience, Ovum is currently in the process of conducting consumer surveys across nine countries. The survey asks consumers such questions as frequency of video viewing, where they watch videos, and factors that affect the viewing experience. While its survey is not yet completed in all nine countries, Ovum does have results from the survey given to UK consumers and their answers do validate the criteria Huawei has used in creating vMOS. The survey was conducted in October 2015 using the Internet to reach 1,000 UK consumers ranging in ages from 16 to over 54 and it consisted of 14 questions related to video.
One of the first things that is obvious is that video is an important part of the mobile service experience: 58% of respondents said the ability to play videos on their smartphones was important and affected their “level of happiness” with their mobile service provider. However, when looking at responses that indicated how often they streamed video, it does suggest that the importance of this application when it comes to their service experience could be higher than they indicated: 65% of respondents said they watched mobile video at least once a week; and 54% said they watched streaming video more than once a week (see Figure 6). Not only does this support the importance of video as a mobile broadband application, it also helps to illustrate why video traffic is growing.

Consumers agree with Huawei on what impacts the viewing experience
As discussed in the vMOS section, Huawei had identified three areas to base its vMOS methodology on: video resolution/quality; the time it takes for a video to start; and the number of times the video stalls during stream. Early survey results support Huawei’s decision to focus on those areas with its vMOS tool.

When Ovum asked UK consumers what factors were important to them when it came to watching video on a smartphone, the three most important were loading speed, smooth play of video, and video picture quality. Of those respondents who originally said video was important, loading speed and smooth play were even more important to them than it was to the general respondent pool (see Figure 7). These factors even outweigh duration of adverts and cost of video when it came to importance.

As Ovum blends in results from other countries, the percentage levels for each factor could change. However, Ovum would be surprised if loading speed, smooth play, and picture quality were not still the three most important factors. As noted earlier, Huawei has already tested the importance of these factors in other markets, and the early results of Ovum’s survey support those results.

In early 2016, Ovum and Huawei will be jointly publishing a more in-depth look at the importance of providing end-users with a high-quality mobile video experience and how vMOS can help operators with that challenge.
Figure 7: UK, factors that are important when it comes to watching streaming video on smartphone, October 2015

Note: All respondents = 1,000; respondents who said video is important = 581
Source: Ovum
ABOUT OVUM
Ovum is a leading global technology research and advisory firm. Through its 180 analysts worldwide it offers expert analysis and strategic insight across the IT, telecoms, and media industries. Founded in 1985, Ovum has one of the most experienced analyst teams in the industry and is a respected source of guidance for technology business leaders, CIOs, vendors, service providers, and regulators looking for comprehensive, accurate and insightful market data, research and consulting. With 23 offices across six continents, Ovum offers a truly global perspective on technology and media markets and provides thousands of clients with insight including workflow tools, forecasts, surveys, market assessments, technology audits and opinion. In 2012, Ovum was jointly named Global Analyst Firm of the Year by the IIAR.

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