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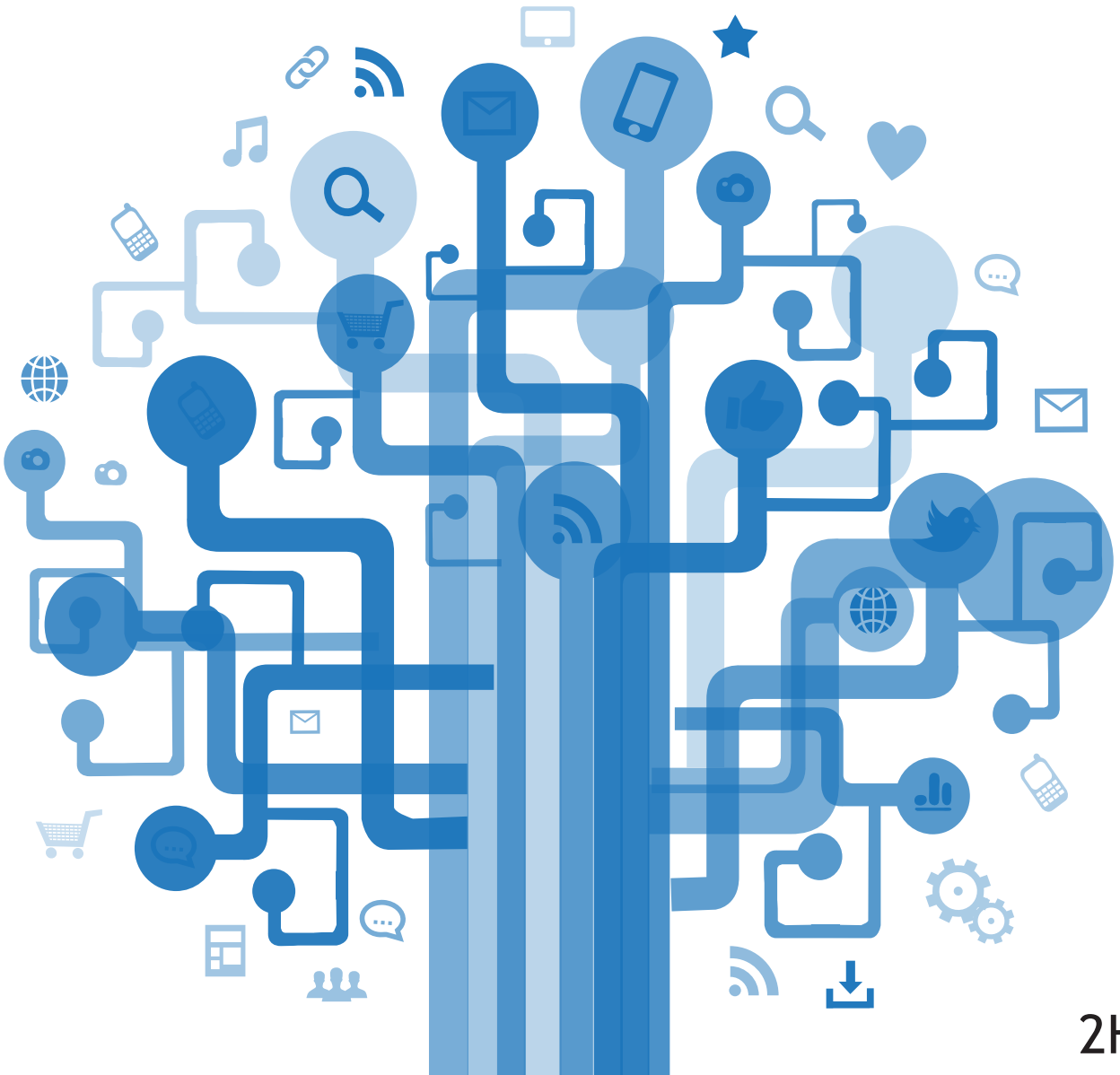
Intelligent Broadband Networks

Global Internet Phenomena Report



2H 2013

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Intelligent Broadband Networks

Executive Summary

The Global Internet Phenomena Report: 2H 2013 shines a light on fixed and mobile data networks around the world, identifying facts, fads, and the future trends that will shape the Internet's future. In this report, we present a mix of high-level observations, regional-focused analysis, deep-dives into specific subjects, and educational tidbits. Communications service providers (CSPs) in particular are in the position to act on this information, but we believe that the findings will be of interest to a wide range of readers.

As with previous reports, Real-Time Entertainment (comprised of streaming video and audio) continues to be the largest traffic category on virtually every network we examined, and we expect its continued growth to lead to the emergence of longer form video on mobile networks globally in to 2014.

In North America, the dominance of Real-Time Entertainment is due in large part to the continued market leadership of Netflix and YouTube, which when combined now account for over half of the downstream traffic during peak period. In other regions, YouTube continues to be the largest single source of Real-Time Entertainment traffic on both fixed and mobile access networks, which makes it the leading source of Internet traffic in the entire world.

Instagram and Dropbox have emerged and are now top-ranked applications in many regions across the globe. Due to the recent addition of video, Instagram is now the 7th top ranked downstream application on mobile networks in Latin America, making it a prime candidate for inclusion in tiered data plans which are popular in the region.

Filesharing continues to disappear from many fixed access networks across the globe as Real-Time Entertainment options that are providing subscribers a wealth of content at reasonable prices launch in new countries. Filesharing now accounts for less than 10% of total daily traffic in North America. This marks a significant change from our very first Global Internet Phenomena Report released over ten years ago, where it accounted for over 60% of total fixed traffic in North America.

Asia-Pacific mobile networks crossed a significant threshold, with average monthly mobile usage now exceeding 1 gigabyte. This consumption is driven by streaming audio and video, which accounts for 50% of peak downstream traffic.

Thanks to significant customer wins in the region, Sandvine is for the first time able to shine a light on mobile usage in Africa. Usage on the continent is drastically different than what is observed in other regions with Real-Time Entertainment accounting for less than 6% of total traffic, and BlackBerry smartphones being the top communications application in the region.

In addition to detailed analysis of global networks, this report includes focused spotlights that examine a particular emerging trend or observation. Interspersed among regional summaries, readers will find sections that tackle numerous topics including:

- An examination of the impact recent Apple product launches had on network operators
- An explanation of SDN and how it will impact network operators
- An overview of the various underlying factors that impact Internet quality of experience (QoE)

This 2H 2013 Global Internet Phenomena Report includes summaries of findings from 9 regional snapshots, all of which are available on www.sandvine.com:

- North America, Fixed Access
- North America, Mobile Access
- Europe, Fixed Access
- Europe, Mobile Access
- Asia-Pacific, Fixed Access
- Asia-Pacific, Mobile Access
- Latin America, Fixed Access
- Latin America, Mobile Access
- Africa, Mobile Access

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North America, Fixed Access

For 2H 2013, mean usage was 44.5 GB, which represents almost no increase from the 44.7 GB observed in our 1H 2013 report. Over the same period, median monthly usage also remained virtually unchanged moving from 18.2 GB to 17.6 GB. The reason for the lack of growth is unclear, but could be due in part to the seasonality of the study; in previous reports, we observed higher usage growth in our first half reports. After talking to customers, most are still experiencing a steady 20%-30% annual growth rate.

Monthly Consumption - North America, Fixed Access		
	Median	Mean
Upstream	1.2 GB	6.6 GB
Downstream	15.6 GB	37.9 GB
Aggregate	17.6 GB	44.5 GB

Table 1 - Monthly Consumption Figures - North America, Fixed Access

It comes as no surprise that once again Real-Time Entertainment is responsible for the total growth, which is consistent with all our recent reports. Maintaining its status as the dominant traffic category in the region, Real-Time Entertainment is responsible for over 67% of downstream bytes during peak period, compared to 68% six months ago in our 1H 2013 report.

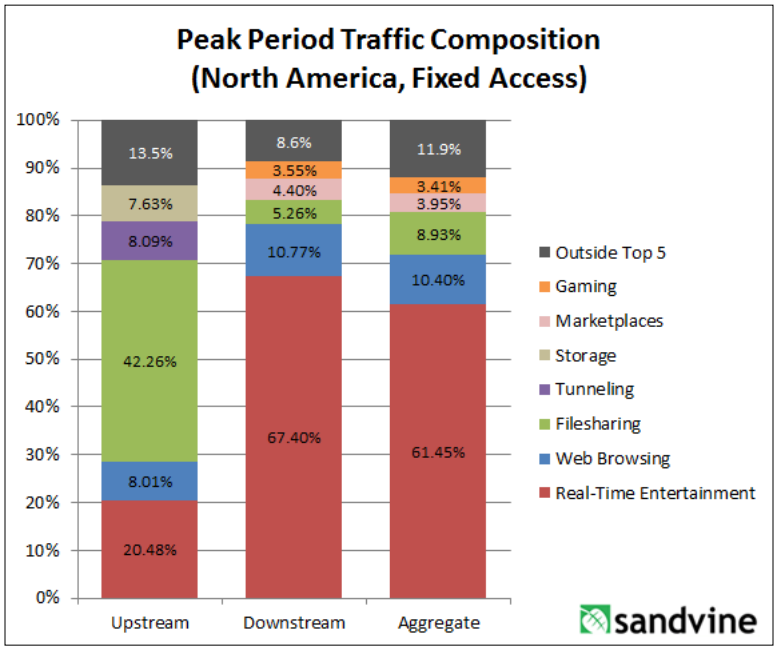

Figure 1 - Peak Period Aggregate Traffic Composition - North America, Fixed Access

Netflix continues to be the unchallenged leader for traffic, accounting for 31.6% of downstream traffic during peak period. While we observed that their share of traffic decreased slightly since our 1H 2013 study, it should not be interpreted as a decline in the dominance of the service at the expense of their competitors. In fact, the bulk of data collection for this report occurred before Netflix made SuperHD content available to all subscribers, regardless of the service provider. Based on initial findings from customers, we expect Netflix share to return to or even surpass its previous heights.

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	BitTorrent	36.35%	Netflix	31.62%	Netflix	28.18%
2	HTTP	6.03%	YouTube	18.69%	YouTube	16.78%
3	SSL	5.87%	HTTP	9.74%	HTTP	9.26%
4	Netflix	4.44%	BitTorrent	4.05%	BitTorrent	7.39%
5	YouTube	3.63%	iTunes	3.27%	iTunes	2.91%
6	Skype	2.76%	MPEG - Other	2.60%	SSL	2.54%
7	QVoD	2.55%	SSL	2.05%	MPEG - Other	2.32%
8	Facebook	1.54%	Amazon Video	1.61%	Amazon Video	1.48%
9	FaceTime	1.44%	Facebook	1.31%	Facebook	1.34%
10	Dropbox	1.39%	Hulu	1.29%	Hulu	1.15%
		66.00%		76.23%		73.35%

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Table 2 - Top 10 Peak Period Applications - North America, Fixed Access

YouTube continues to see growth in its share, now accounting for 18.7% of peak downstream traffic, up 9% from our 1H 2013 study. This growth is likely not caused by the adoption of paid channels, but instead by continued growth of smartphone and tablet use within the home (i.e. “Home Roaming”). While changes in share have been relatively minor, most interesting is the fact that Netflix and YouTube now combine to account for over 50% of downstream traffic.

As observed in previous reports, BitTorrent continues to lose share and now accounts for just 7.4% of traffic during peak period and Filesharing as a whole now accounts for less than 10% of total daily traffic. This demonstrates a sharp decline in share. Long are the days when Filesharing accounted for over 31% total daily traffic, as we had revealed in our 2008 report.

With many cable and DSL providers considering implementing usage based billing, an examination of usage distribution is of interest to many. In North America, the top 1% of subscribers who make the heaviest use of the network’s upstream resources account for 39.8% of total upstream traffic. The comparable downstream users account for 10.1% of downstream bytes. At the opposite end of the usage spectrum, the network’s lightest 50% of users account for only 6.8% of total monthly traffic.

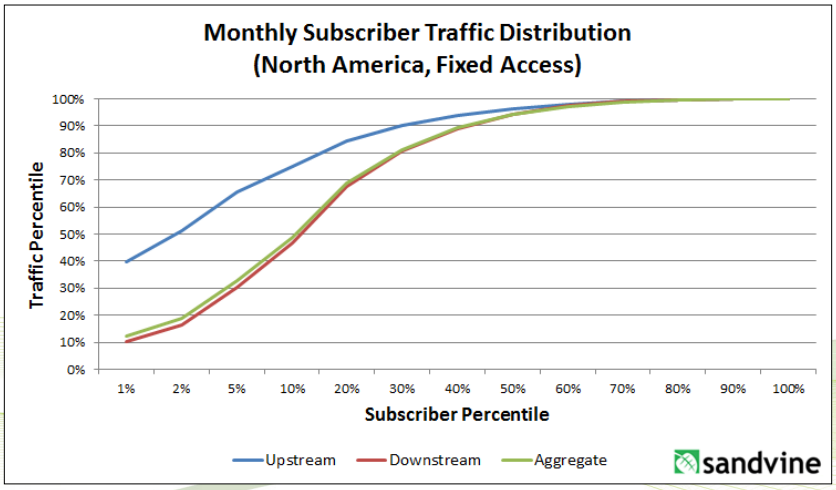
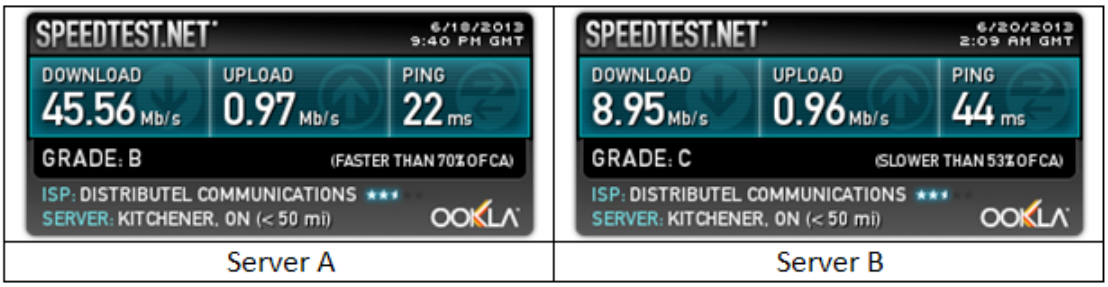


Figure 2 - Monthly Subscriber Traffic Distribution - North America, Fixed Access

Does Speedtest.net deserve a failing grade?

On the LTE portion of a mobile network in Europe, Speedtest.net is the eighth ranked upstream application accounting for over 2% of traffic at peak period. Looking at this behavior, it's clear that a lot of consumers are testing out the speed of their network and that they believe speedtest.net is the one true way to measure the speed of their internet connection; that is simply not the case.

Below are two tests conducted in Kitchener, Ontario, Canada. Regardless of the time of day the tests were ran, the results are pretty consistent, with one speed test server always under-reporting the other by a large margin.

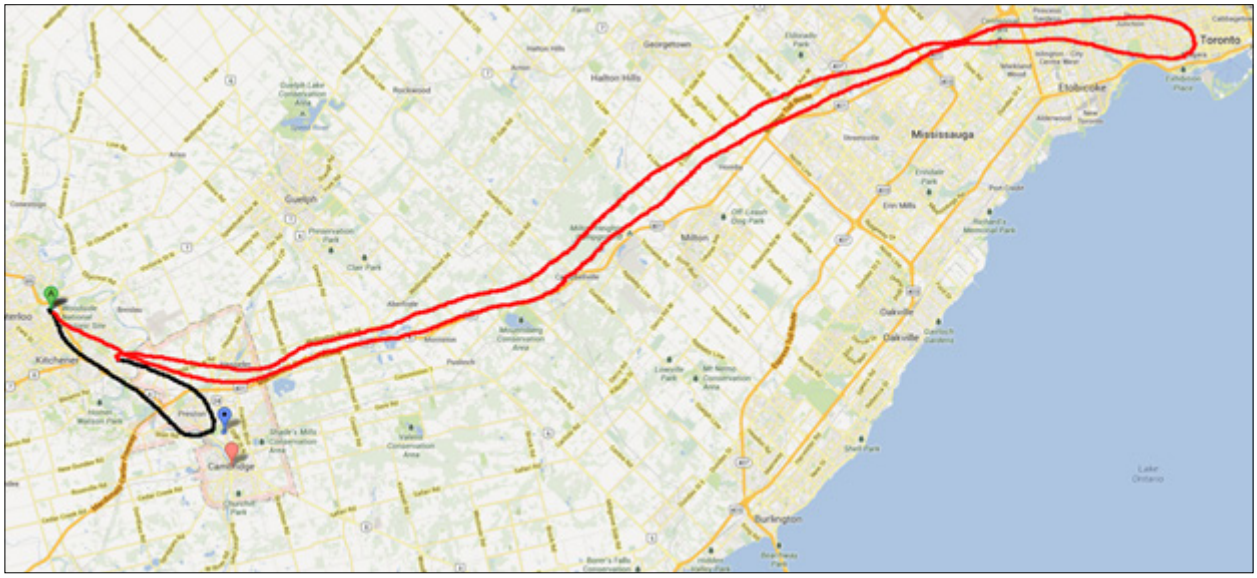


Server A	Server B

The tester subscribes to a 35Mbps service and as you can see, one server shows a reading of 45Mbps of downstream speed and the other 9Mbps.

So what is the cause of this discrepancy? It can be related to server performance: it takes a big machine to drive this amount of bandwidth to all the users testing it, or, it could be the upstream ISP paths. Using a traceroute tool, we know that both Speedtest.net servers above are actually in the same building (277 Lancaster W, Kitchener, ON: one via 'Megawire' and one via 'Netflash'), and that those servers are connected to the tester in quite a different fashion.

If we look at the map below, we can visualize the traceroute results[1] to see the very different paths taken for each test (server A in black, server B in red).



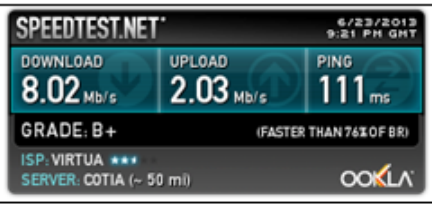
So what is the moral of the story? Don't believe every speed test you take. The access speeds offered by your ISP may be good, bad or ugly, but Speedtest.net is not necessarily the best or only measure.

1. http://pastebin.com/ZVC17uBG

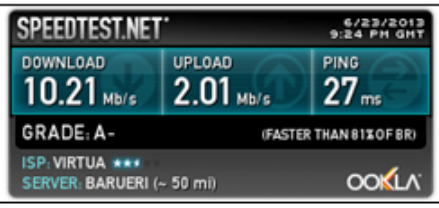
Below are additional tests we had Sandvine employees from around the globe run, which resulted in similar findings.

Sao Paulo, Brazil

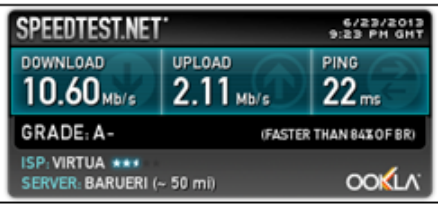
We can see that one server is an outlier (~110ms and ~20% slower) for the same time and same consumer location.



Server A



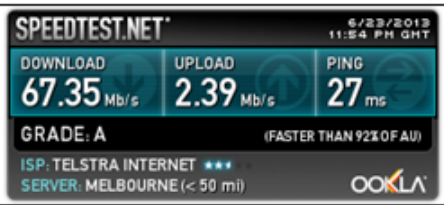
Server B



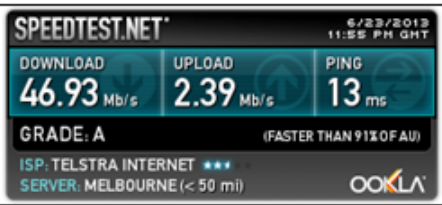
Server C

Melbourne, Australia

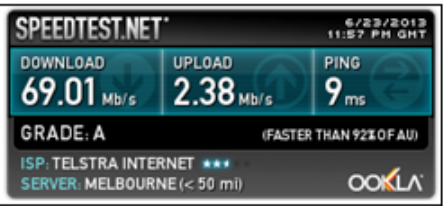
We see there is also one server that is an outlier with bandwidth ~30% slower than the others (interestingly its latency is lower than one of the faster servers suggesting this might be a server issue rather than a congestion issue).



Server A



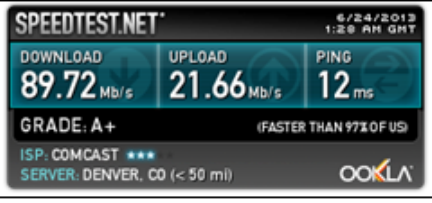
Server B



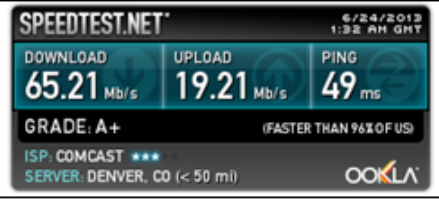
Server C

We also see very different results for the same time period in these US cities below:

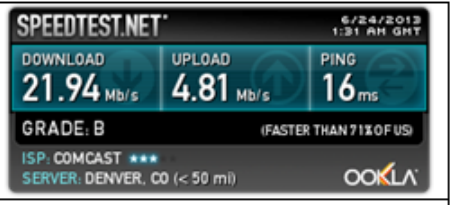
Denver, Colorado, USA



Server A

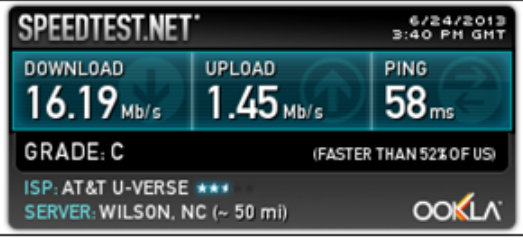


Server B

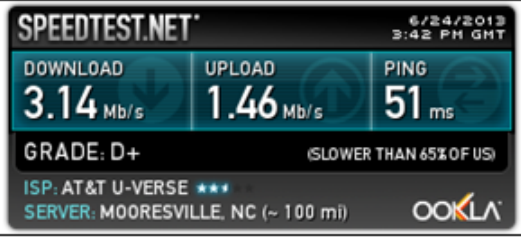


Server C

Raleigh, North Carolina, USA



Server A



Server B

North America, Mobile Access

Much like our examination of fixed access networks in North America, mobile networks have also seen only minor shifts in traffic composition in the past six months. Overall usage on the other hand has grown substantially. Since our last report, mean monthly usage has made a 13.5% jump, increasing from 390.1 MB to 443.5 MB. This increase is partially due to organic growth on the network, as well as the rollout of LTE by some participants in the study. Median usage, a figure we feel is more indicative of a "typical user", grew at an even faster pace by over 43% from 58.7 MB to 84 MB. This significant increase in median usage is a phenomenon we have been tracking over the past several years and believe the rate at which it is increasing is no longer tied to first-time adoption of smartphones by subscribers. Instead, we suspect it is driven by increasing individual usage, as first time smartphone adopters are now comfortable and unleashing the full power of their devices' technology.

Monthly Consumption - North America, Mobile Access		
	Median	Mean
Upstream	12.7 MB	59.2 MB
Downstream	67.6 MB	384.8 MB
Aggregate	84.0 MB	443.5 MB

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Table 3 - Monthly Consumption Figures - North America, Mobile Access

During peak period, Real-Time Entertainment traffic is by far the most dominant traffic category, accounting for almost 50% of the downstream bytes on the network. As observed in past reports, Social Networking applications continue to be very well represented on the mobile network. This speaks to their popularity with subscribers as these applications typically generate far less traffic than those that stream audio and video.

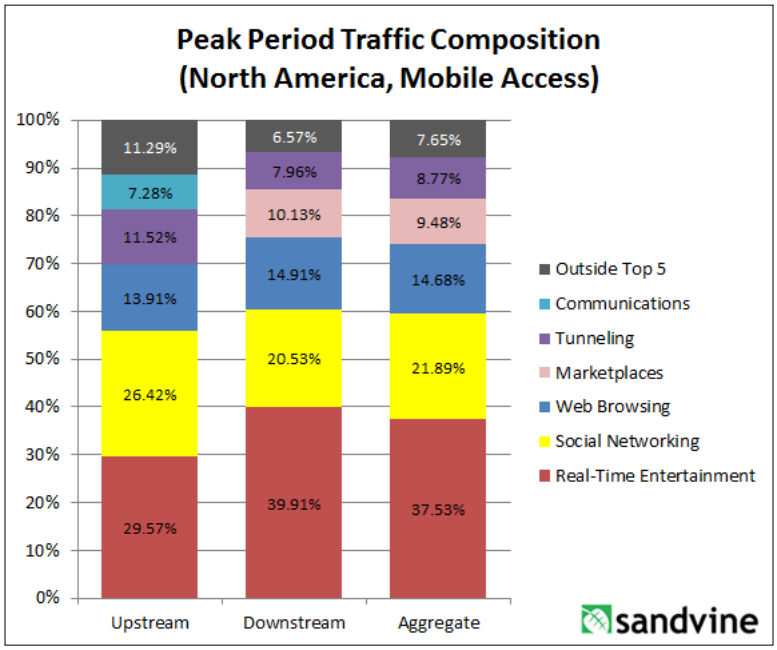

Figure 3 - Peak Period Aggregate Traffic Composition - North America, Mobile Access

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	Facebook	20.62%	YouTube	17.69%	YouTube	16.65%
2	YouTube	13.20%	Facebook	15.44%	Facebook	16.62%
3	HTTP	12.64%	HTTP	14.07%	HTTP	13.74%
4	SSL	11.11%	MPEG - Other	7.92%	SSL	8.59%
5	Pandora Radio	5.19%	SSL	7.84%	MPEG - Other	7.27%
6	MPEG - Other	5.11%	Google Market	5.99%	Google Market	5.75%
7	Google Market	4.95%	Pandora Radio	5.03%	Pandora Radio	5.07%
8	Instagram	3.52%	Netflix	5.01%	Netflix	4.36%
9	Netflix	2.19%	Instagram	3.53%	Instagram	3.53%
10	iTunes	1.59%	iTunes	3.16%	iTunes	2.80%
		80.12%		85.68%		84.40%

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Table 4 - Top 10 Peak Period Applications - North America, Mobile Access

YouTube continues to entrench itself as the dominant application on mobile networks. In our 1H 2013 study, YouTube accounted for 31.0% of peak downstream traffic, but has now declined by 13% to 17.7%. Interestingly, while we observed YouTube making some inroads on fixed access networks, we noticed Netflix gaining more and more momentum on mobile networks. While watching a full length movie or a 22 minute sitcom on a 4-inch smartphone screen may not be the ideal viewing experience, for many subscribers it is becoming a viable one. Netflix's downstream traffic share in North America almost doubled from 2.2% to 5.0% in just 18 months time. We believe that this number will continue to increase as longer form video becomes more commonplace on mobile networks in North America.

As for streaming audio, Pandora Radio continues to lead. Interestingly, its share of downstream traffic over a 24-hour period (5.5%) is actually higher than peak period (5%). This phenomenon is likely due to subscribers using the service consistently throughout the day, while some other applications may have their usage concentrated during peak period.

From a traffic distribution standpoint, the top 1% of subscribers who make the heaviest use of the network's upstream resources account for 18.6% of total upstream traffic. The comparable downstream users account for 11.5% of downstream bytes. At the opposite end of the usage spectrum, the network's lightest 50% of users account for only 2.5% of total traffic in large part due to the number of feature phones still in use by subscribers.

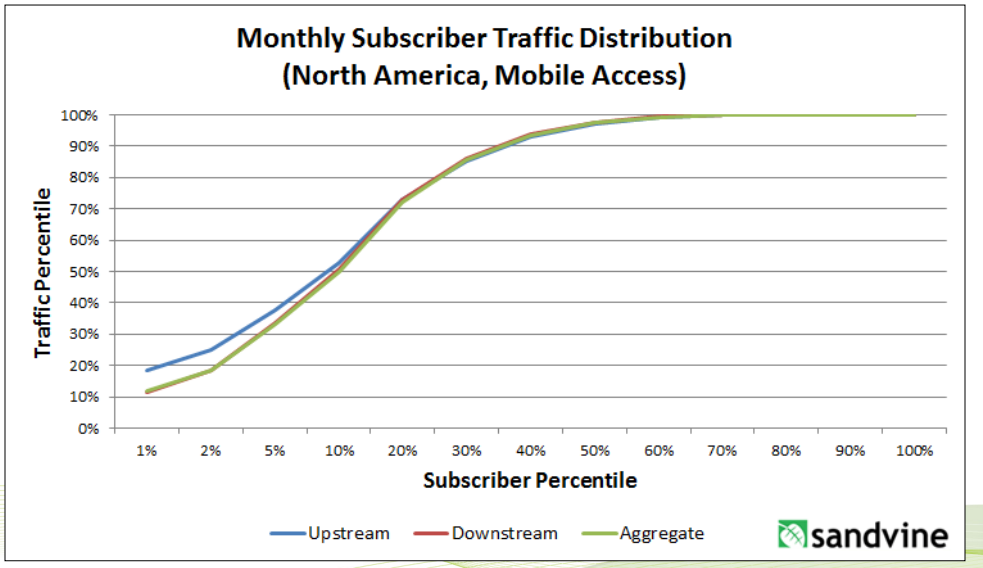
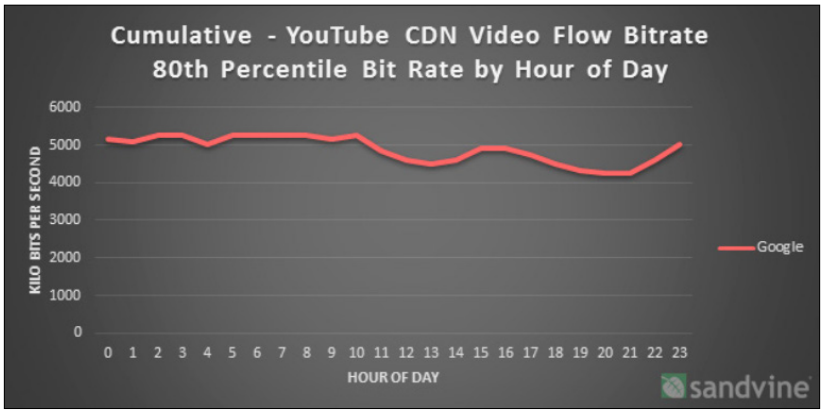


Figure 4 - Monthly Subscriber Traffic Distribution - North America, Mobile Access

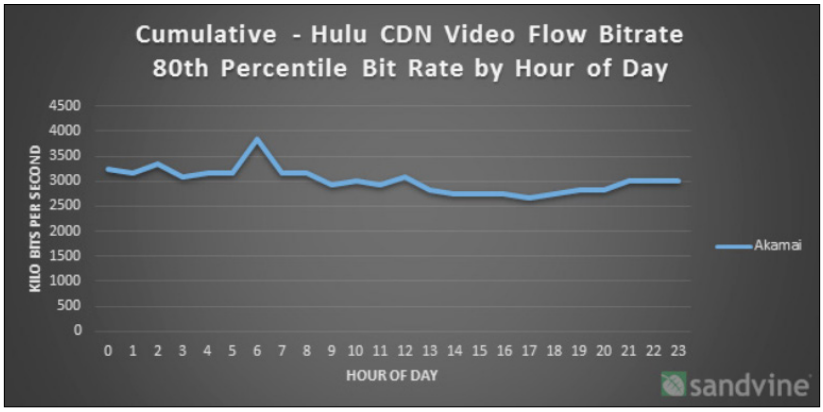
YouTube's Double-Dip in Quality

Below is a chart showing actual throughput (80th percentile) achieved by YouTube from a number of US Internet service providers (both Cable and DSL) for one week (all days overlaid) as collected in September 2013.



What is instantly noticeable in the chart is the fact that YouTube has two pronounced dips. The first may not surprise some as it occurs during the evening peak period when networks are most congested. The second dip however is far more interesting as it occurs over the lunch hour.

If we compare YouTube's performance with Hulu (another over-the-top video provider) seen below, for the same set of operators during the same time period, we do not see a similar lunch hour dip. In fact there doesn't appear to be a dip at all.



So why is YouTube suffering a noticeable drop in quality at two separate times in the day?

Many people immediately point to their ISP whenever they experience a symptom of poor Internet quality (i.e. video buffering). In this case however, because Hulu does not experience a noticeable dip in quality, and the data sample comes from multiple networks, we can rule out ISPs being the root cause of YouTube's quality issue.

Instead, we can conclude that the root cause the quality degradation is likely occurring because of an oversubscription in the Google server farm (where YouTube is hosted), which makes YouTube unable to meet high video demand during lunch time and European evening. This oversubscription would result from a commercial decision by YouTube regarding how much capital they wanted to invest in server capacity to maintain quality.

So the next time you try to watch a YouTube video and it buffers, don't automatically blame your ISP. YouTube may very well have made a commercial decision that limits the ISPs ability to improve quality and caused the tens of thousands of users, who would otherwise like to spend their lunch hour watching videos on YouTube, return to more productive activities.

For those interested in examining further, YouTube has a 'my_speed benchmark'[2] (not as widely publicized as Speedtest.net) which seeks to measure 'maximum demand' unlike Speedtest.net which seeks to measure 'absolute capacity'. You can use these benchmark tools to not only view your historical YouTube performance, but also measure in real-time the performance of a video you are viewing.

2. http://www.youtube.com/my_speed

Europe, Fixed Access

As discussed in our previous reports, Europe presents a mix of mature and emerging markets, with cultural, economic, technological, and linguistic diversities that combine to create traffic patterns that can prove to be interesting to roll-up. Regional analysis is intricate, as different applications can vary in penetration and availability depending on the country.

Sandvine first reported on European monthly usage in our 1H 2013 report, therefore year-over-year (YoY) growth figures are unavailable. Nonetheless, a comparison to six months ago still yields interesting findings. Europe's mean monthly usage of 17.4 GB and median monthly usage of 7.2 GB is significantly lower than that observed in North America. The growth of these figures, especially the comparison of the usage growth rate to other regions around the world, will be interesting to analyze in future reports.

Monthly Consumption - Europe, Fixed Acccess		
	Median	**Mean**
Upstream	751 MB	3.4 GB
Downstream	6.3 GB	14.0 GB
Aggregate	7.2 GB	17.4 GB

Table 5 - Monthly Consumption Figures – Europe, Fixed Access

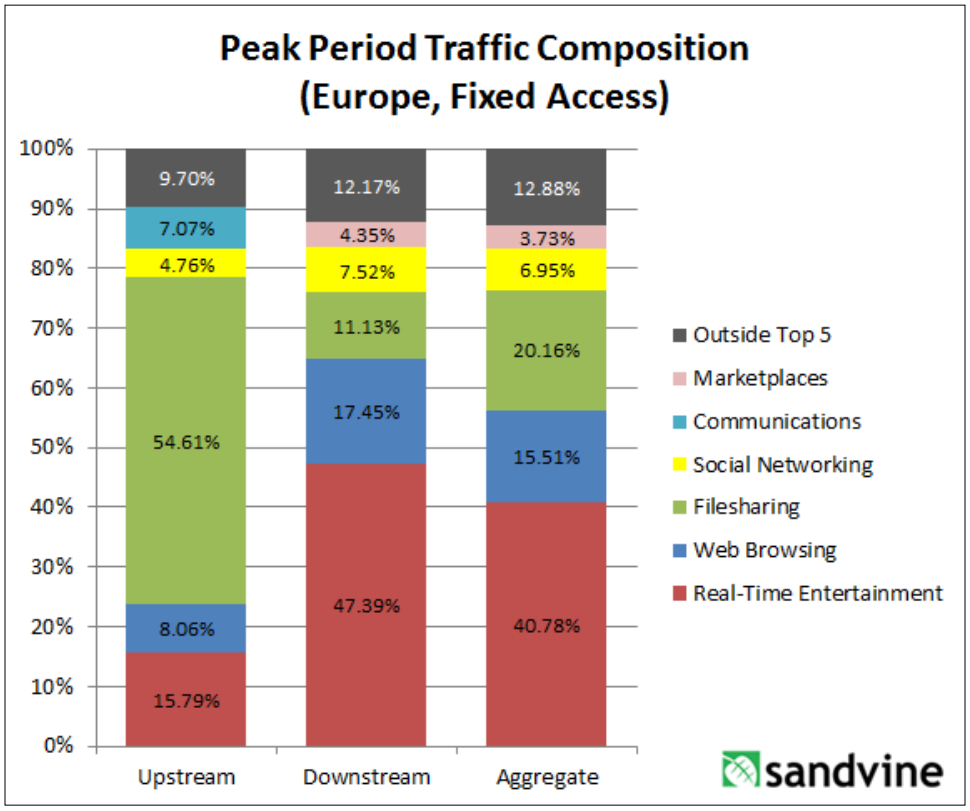


Figure 5 - Peak Period Aggregate Traffic Composition - Europe, Fixed Access

One aspect that all countries examined in Europe have in common is a thirst for streaming audio and video, which has once again made Real-Time Entertainment the top traffic category, responsible for 47.4% of peak downstream traffic, a 7.4% increase from 40% six months ago. Depending on the specific country however, this percentage ranges anywhere from 35% to over 60% of downstream traffic. This fluctuation in share is due in large part to the availability of over-the-top (OTT) video services in varying countries. Based on our observations in this report and previous ones, countries with access to paid services like Netflix or BBC iPlayer typically had a higher share of Real-Time Entertainment traffic on their network.

As highlighted in our 1H 2013 report, European countries with lower Real-Time Entertainment share typically have higher Filesharing traffic, which has lead us to believe that subscribers are likely using applications like BitTorrent to procure audio and video content not available in their region. We also predicted that Filesharing's share of traffic may have reached its peak, and it looks like we were correct. Aggregate traffic share of Filesharing applications saw a decline from 21.5% to 20.2%. We believe this decline will continue to accelerate as paid OTT video services continue to expand their availability throughout the European region.

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	BitTorrent	48.10%	YouTube	28.73%	YouTube	24.21%
2	YouTube	7.12%	HTTP	15.64%	BitTorrent	17.99%
3	HTTP	5.74%	BitTorrent	10.10%	HTTP	13.59%
4	Skype	4.96%	Facebook	4.94%	Facebook	4.65%
5	Facebook	3.54%	Netflix	3.45%	Netflix	3.33%
6	Netflix	2.83%	MPEG - Other	3.10%	MPEG - Other	2.57%
7	SSL	2.47%	RTMP	2.82%	RTMP	2.42%
8	eDonkey	1.12%	Flash Video	2.56%	Skype	2.32%
9	Dropbox	1.12%	SSL	1.91%	Flash Video	2.16%
10	RTMP	0.85%	PutLocker	1.25%	SSL	2.03%
		77.83%		73.23%		75.25%

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Table 6 - Top 10 Peak Period Applications - Europe, Fixed Access

Generally, European networks have a consistent set of dominant applications and services that are available in each region, which account for 80-85% of all traffic. A set of localized websites and region-restricted applications make up the remainder of traffic. This can be seen in the list of top 10 applications for the region, all of which have global availability. One application that is noteworthy however is Netflix whose appearance accounts for 3.45% of peak downstream traffic. While not available in all European countries, it is available in the Netherlands and Nordics as well as the British Isles where it accounted for over 20% of peak traffic on several networks. This is an amazing feat considering the service has only been available since January 2012, and it took Netflix four years to achieve that level of share in the United States.

From a traffic distribution standpoint, the top 1% of subscribers in Europe who make the heaviest use of the network's upstream resources account for 36.5% of total upstream traffic. The comparable downstream users account for 12.6% of downstream bytes. At the opposite end of the usage spectrum, the network's lightest 50% of users account for only 6.4% of total traffic.

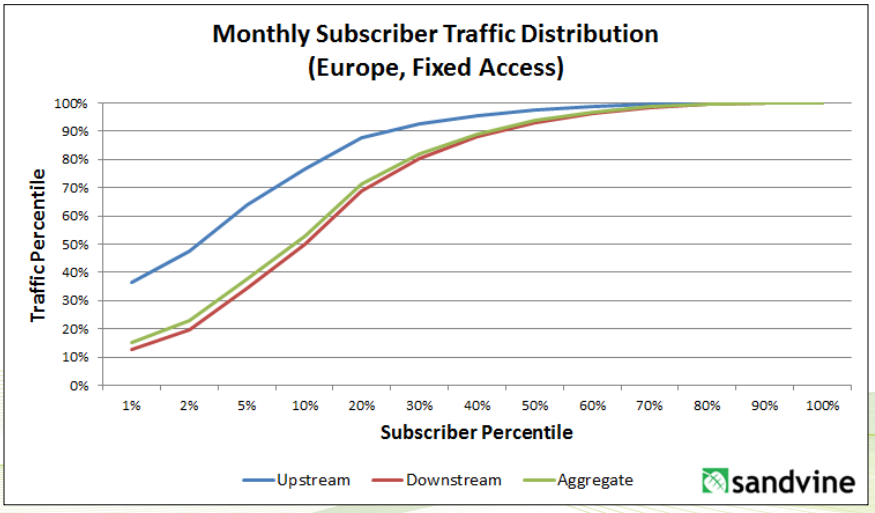


Figure 6 - Monthly Subscriber Traffic Distribution - Europe, Fixed Access

Unleashing the Super HD Streams

In late September, Netflix announced that they would be allowing all of their subscribers to access Super HD content (the highest bitrate video that Netflix offers), regardless of whether their ISP has the Netflix Open Connect CDN peered in their network.

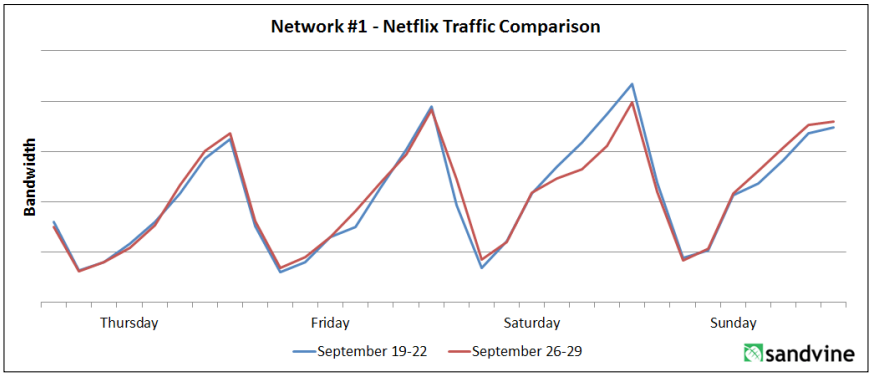
So what's the big deal about Super HD content? Its throughput and size. Super HD streams are available at a bit rate of up to 5800Kbps, which is 50% higher volume than the 3850Kbps bitrate of the highest non-Super HD stream.

1080p	Super HD 1080p	Difference
3850Kbps	4300Kbps	+11.6%
	5800Kbps	+50.6%

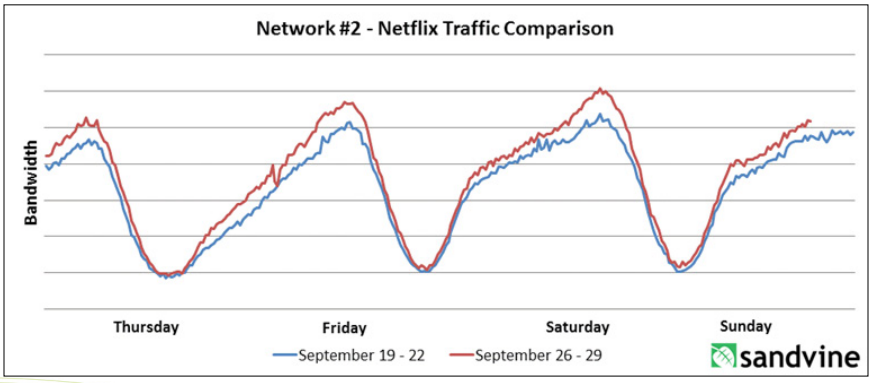
So did a drastic increase in the available stream size have a drastic impact on fixed operators without Open Connect in their network? The data collected for this report leads us to believe that it will vary between operators.

Netflix removed the Super HD restrictions on Thursday, September 26, so below are comparisons of total Netflix bandwidth on two US fixed access networks during the first few days of its availability, with the total bandwidth from the previous week.

Below is a sample of data from Network #1 which shows that surprisingly they experienced no significant change in total Netflix volume.



Contrast this with Network #2 below, who saw a 10-15% increase in Netflix traffic and 3-5% increase in total traffic during peak hours.

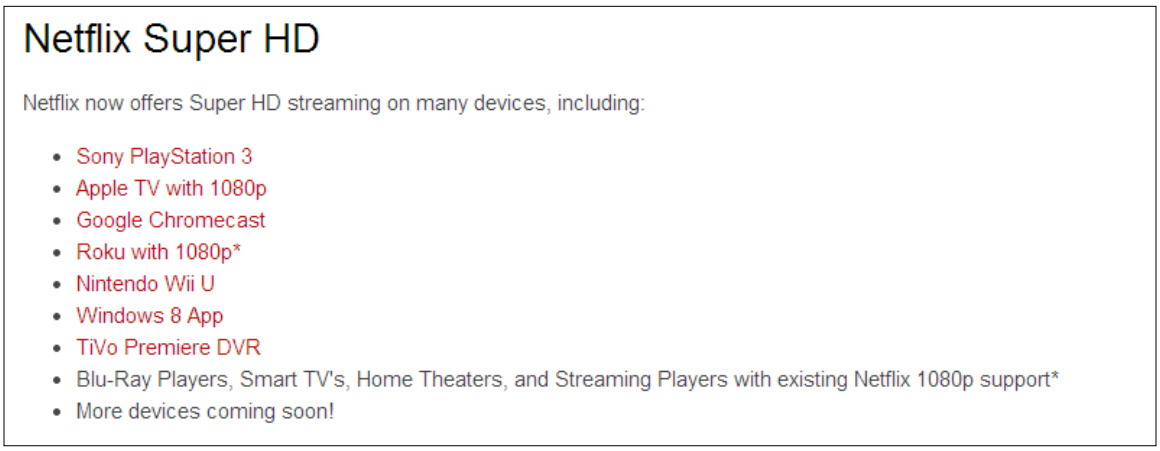


Note: The charts appear slightly different due to Network #1 providing data with one hour granularity, and Network #2 providing data with 15 minute granularity.

So why might overall traffic not have moved much on one network but saw a significant increase on another? At first we considered speed tiers might have been the cause. If comparing the two service plans of the networks, Network #1 offers several plans below the 7Mb/s minimum requirements for Super HD content, while Network B does not. We would suspect however, that a person savvy enough to be a Netflix streamer would be subscribing to a plan capable of at least 7Mbps in speed, should they have the option.

So that leaves two more probable explanations. The first could be related to peering arrangements. Network #1 could be peering with different CDNs than that of Network #2. Because of these commercial decisions made by the parties involved, Network #2 is seeing the availability of Super HD content have a greater impact on their network. The second possibility could be a CDN at Network #1 was already at maximum capacity. Therefore when Super HD was turned on there was no capacity for it, while a CDN at Network #2 had excess capacity to take on the additional Super HD bandwidth.

That still may leave you asking, "*if Super HD content is up to 50% larger than before, why did Network #2 still only see a 10-15% increase in traffic?*" We suspect two reasons for that: content and devices. Not all Netflix content is available in Super HD and more importantly, as seen in the list below, only select devices have the capability to stream Super HD content.



Netflix Super HD

Netflix now offers Super HD streaming on many devices, including:

- Sony PlayStation 3
- Apple TV with 1080p
- Google Chromecast
- Roku with 1080p*
- Nintendo Wii U
- Windows 8 App
- TiVo Premiere DVR
- Blu-Ray Players, Smart TV's, Home Theaters, and Streaming Players with existing Netflix 1080p support*
- More devices coming soon!

Source: https://support.netflix.com/en/node/8731

Even with device limitations in place, the lifting of ISP restrictions for Super HD content is a great step towards making a ubiquitous consistent experience for all subscribers. But as seen in the charts above, a longer view will be required to fully understand how it will impact ISPs.

Europe, Mobile Access

As discussed earlier, examining mobile networks in Europe provides the same set of challenges for regional analysis as fixed networks due to the diversity in each country's culture, economy, languages, and deployed network technologies.

One metric that may not be impacted too significantly by some of these factors is monthly subscriber consumption. It's not unreasonable to expect that subscribers will use their devices in a similar way; the only difference is that they will simply substitute the services that are most popular or only available in their country. In our analysis, subscriber usage was relatively consistent across many of the European countries who participated in this report. Mean monthly usage for Europe was observed to be 358.4 MB, an increase of over 15% from 311 MB observed six months ago. Interestingly, over that same time period, median usage saw higher gains increasing over 28% from 13.2 MB to 16.9 MB.

Monthly Consumption - Europe, Mobile Access		
	Median	**Mean**
Upstream	2.8 MB	56.3 MB
Downstream	13.8 MB	301.8 MB
Aggregate	16.9 MB	358.4 MB

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Table 7 - Monthly Consumption Figures – Europe, Mobile Access

Much like other mobile networks during peak period, Real-Time Entertainment traffic is the clear traffic category leader. Web Browsing and Social Networking, as seen commonly in other regions, round out the second- and third-most popular traffic categories. What is most noticeable in Europe (and consistent with previous reports) is the increase in the share of Tunneling, which accounts for 13.8% of upstream traffic and 6.8% of downstream traffic during peak period. The exact cause for the increase is uncertain, but we suspect it may be indicative of subscribers using VPNs to access regionally restricted content, as well as increased concern about privacy online.

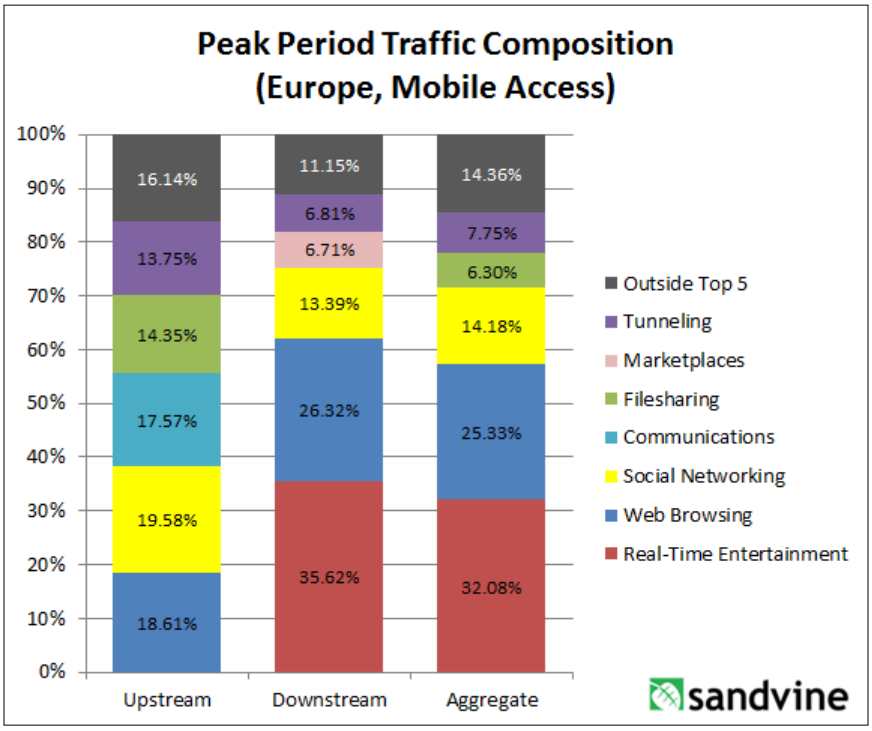

Figure 7 - Peak Period Aggregate Traffic Composition – Europe, Mobile Access

Skype is the application that continues to drive the majority of communications traffic, now accounting for over 62% of that category's traffic. The remaining top applications vary from country to country, but we have observed continued growth of over-the-top (OTT) messaging application in many European countries with WhatsApp continuing to be the dominant player. But it will be interesting to see in future reports how WhatsApp will compete with the introduction of the new cross-platform Blackberry Messenger (BBM), as Europe has many countries with a high BlackBerry user base.

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	Facebook	17.09%	HTTP	23.86%	HTTP	22.65%
2	HTTP	14.47%	YouTube	20.62%	YouTube	18.51%
3	BitTorrent	12.70%	Facebook	11.04%	Facebook	11.80%
4	Skype	10.97%	SSL	6.03%	SSL	6.70%
5	SSL	10.93%	MPEG - Other	5.06%	BitTorrent	5.67%
6	YouTube	4.36%	BitTorrent	4.61%	MPEG - Other	4.49%
7	Dropbox	2.15%	Flash Video	3.16%	Skype	2.87%
8	Gmail	2.01%	Windows Update	2.64%	Flash Video	2.80%
9	Teredo	1.40%	RTMP	2.63%	RTMP	2.38%
10	SPDY	1.37%	Skype	1.78%	Windows Update	2.37%
		77.44%		81.43%		80.25%

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Table 8 - Top 10 Peak Period Applications – Europe, Mobile Access

Interestingly, HTTP is the application that generates the most bandwidth both in peak period and the entire day, slightly edging out YouTube which is often the top ranked application on the mobile networks we study. The appearance of BitTorrent and Windows Update on the list indicates that the use of aircards or dongles is a popular practice in Europe, possibly as fixed line replacement, since running these applications on a smartphone or tablet is almost impractical.

Additional evidence that suggests the use of aircards or tethering on the participating networks is demonstrated in the distribution of monthly usage by subscribers. The top 1% of subscribers account for 44% of upstream traffic, and 40% of all traffic. At the opposite end of the usage spectrum, the network's lightest 50% of users account for only 0.64% of total traffic which, much like on North American networks, is likely caused by the number of feature phones still in use by subscribers.

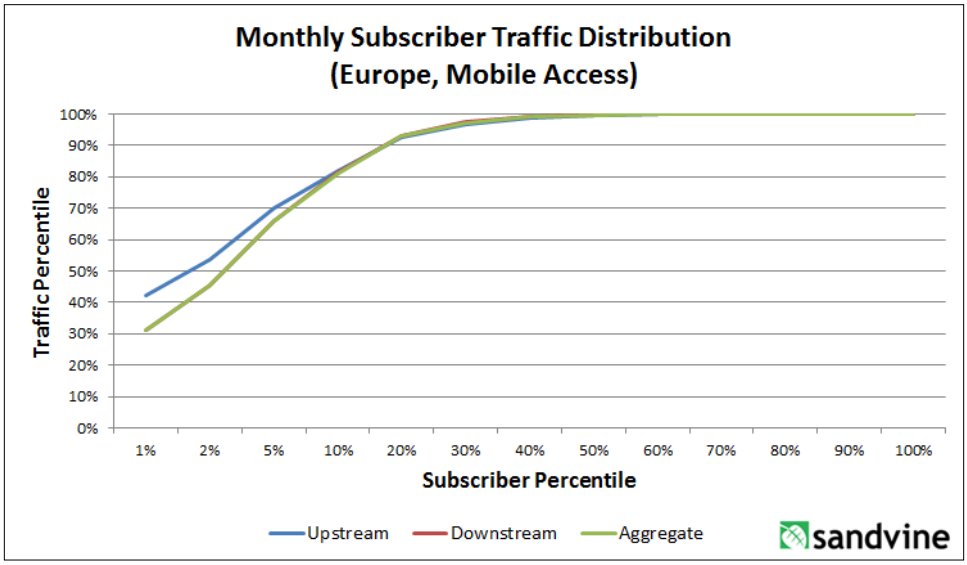
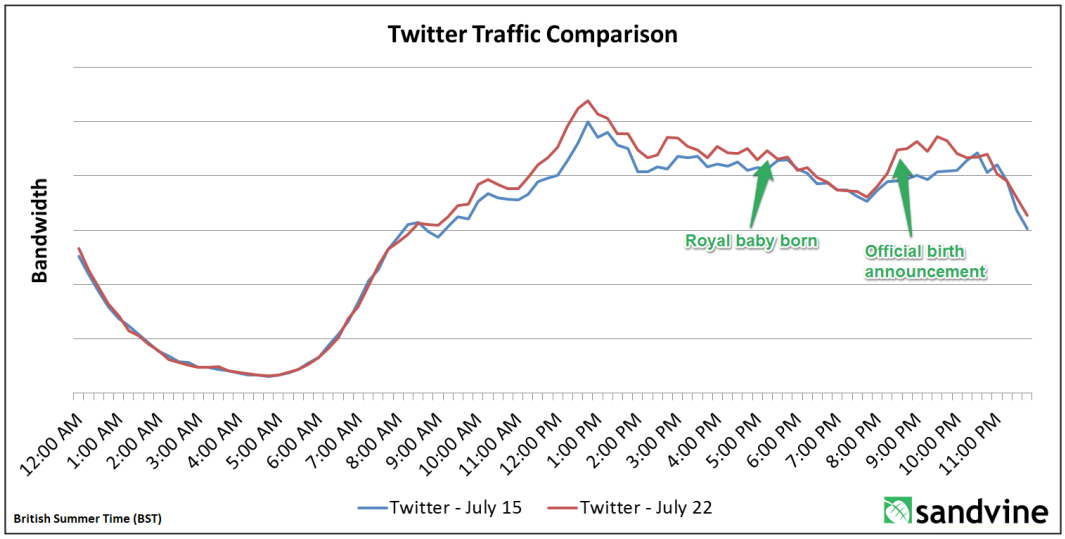


Figure 8 - Monthly Subscriber Traffic Distribution - Europe, Mobile Access

Royal Baby Bump

In July 2013, it seemed like everyone had Royal Baby fever. Since Sandvine is headquartered in Canada, we thought it would be interesting to take a look at how a fellow Commonwealth country responded to the announcement of our mutual (potential) future Head of State.

On the mobile network examined, Facebook, Instagram, YouTube, and various other social or video sites saw very little change in traffic when comparing levels to the previous week. Twitter on the other hand saw a noticeable jump (or bump) in bandwidth and volume of tweets[3]. The chart below (using British Summer Time) shows how the spike in bandwidth coincided with the official birth announcement[4] from the Clarence House Twitter account – the official account of the London residence of The Prince of Wales, The Duchess of Cornwall and Prince Harry.

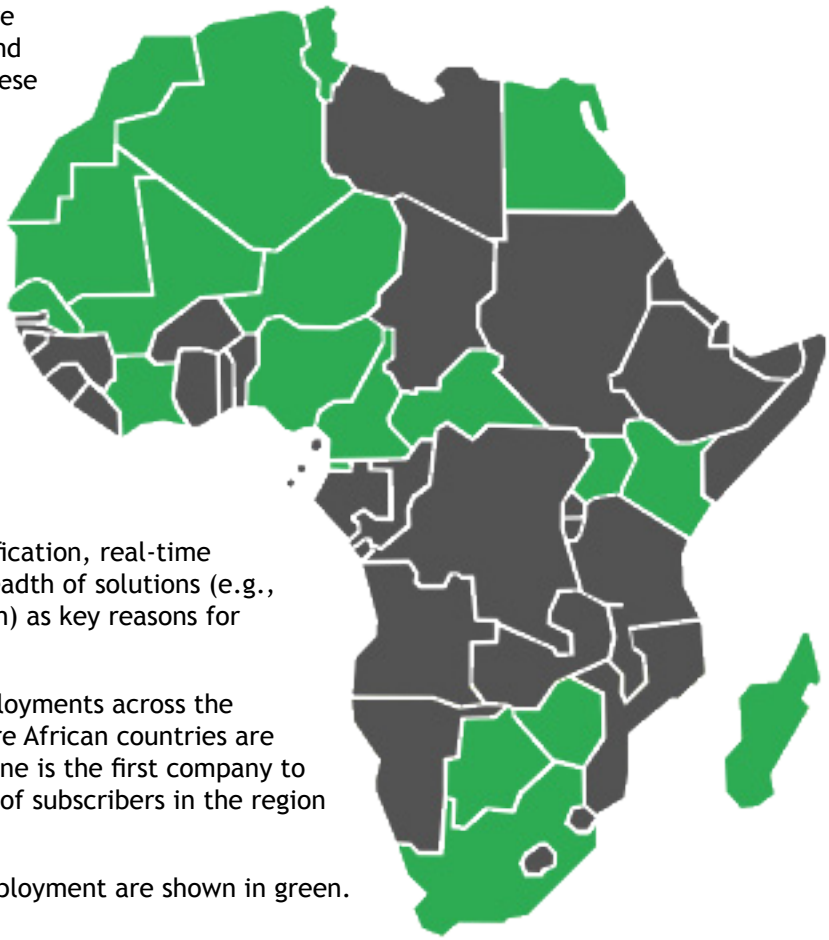


Since the network's peak traffic actually occurred eight hours prior to the birth announcement, the increase in Twitter traffic likely had little to no impact on the network's ability to deliver a high quality of experience to subscribers. It does however reinforce the idea that major news events can significantly impact network traffic, and network operators need to ensure their networks are prepared for the increased traffic load, should the next major event occur during peak period.

3. https://blog.twitter.com/2013/royalbaby
4. https://twitter.com/ClarenceHouse/status/359396416566734848

Sandvine is Turning Africa "Green"

Across Africa, communications service providers (CSPs) are rapidly building out their networks to enhance services and extend coverage into new locations. While engaging in these expansion activities, CSPs must overcome competitive pressures and malicious misuse of the network, as well as demographic challenges including relatively lower disposable income levels and a high percentage of prepaid customers.



Sandvine has a proven track record of deploying network policy solutions across Africa, for large multi-national providers and small operators alike, to improve subscriber quality of experience, control operational costs, protect the network from malicious activity, and drive revenue with service innovation and a broad range of use cases.

Operators cite our leading technology (e.g., traffic classification, real-time charging accuracy, and congestion management), and breadth of solutions (e.g., business intelligence, network security, service innovation) as key reasons for replacing their incumbent vendors with Sandvine.

With several recent wins and long-standing customer deployments across the continent, more communications service providers in more African countries are making the switch to Sandvine and because of this Sandvine is the first company to be able to provide detailed insight on the usage patterns of subscribers in the region as part of our Global Internet Phenomena Report.

African countries with at least one Sandvine customer deployment are shown in green.

Africa, Mobile Networks

Africa is a region with tremendous potential for growth, but few understand what the traffic composition in the region is. At Sandvine, we believe that to understand Africa, you must be in Africa, and thanks to now being deployed in over 20 networks in the region, Sandvine is able to publish mobile usage statistics for the first time and bring to light just how unique the region is.

Monthly Consumption - Africa , Mobile Access		
	Median	**Mean**
Upstream	536 KB	8.1 MB
Downstream	852 KB	12.9 MB
Aggregate	1.5 MB	21 MB

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Table 9 - Monthly Consumption Figures - Africa, Mobile Access

Consumption figures are the first thing that stand out when looking at usage in the region. Unlike other regions where smartphone penetration is well above 50%, Africa and particularly its west and central regions still have a large number of subscribers using feature phones. Because of this, median monthly usage is less than 1.5 MB, and mean monthly usage is just over 21 MB - a far cry from the 1GB mean observed in Asia-Pacific.

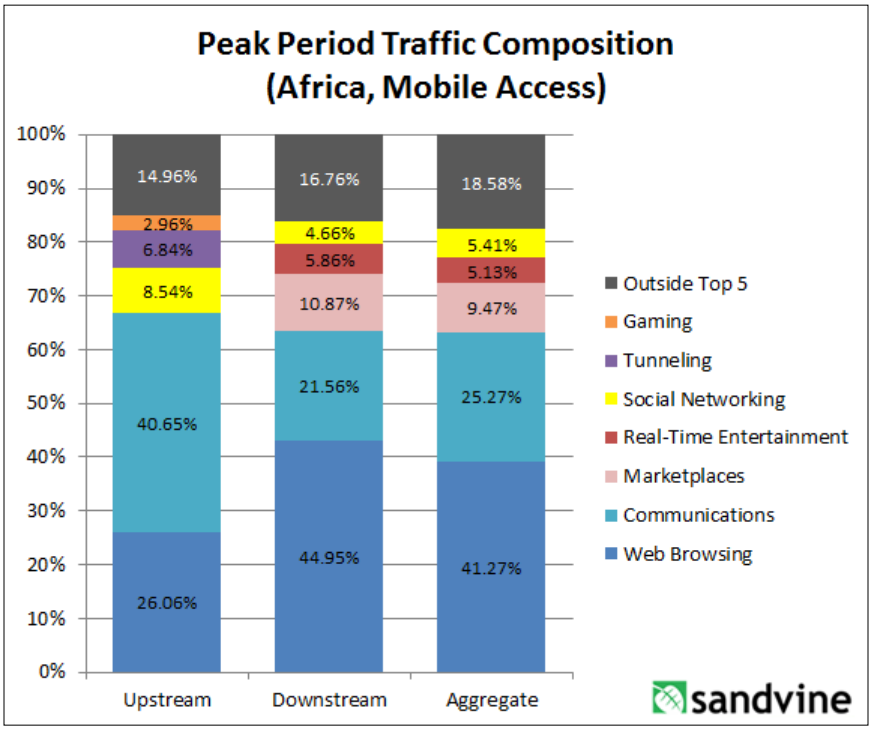

Figure 9 - Peak Period Aggregate Traffic Composition - Africa, Mobile Access

In most regions, Real-Time Entertainment is the traffic category that is the most dominant. This is not the case in Africa however. During peak period, Real-Time Entertainment accounts for only 5.9% of peak downstream traffic, which crowns Web Browsing as the dominant downstream traffic category, accounting for over 40% of total traffic. Communications is not far behind at 28%.

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	BlackBerry	17.23%	HTTP	32.23%	HTTP	28.81%
2	HTTP	14.66%	BlackBerry	13.21%	BlackBerry	13.99%
3	WAP v2	4.55%	WAP v2	7.24%	WAP v2	6.72%
4	SSL	4.25%	YouTube	3.41%	YouTube	2.90%
5	Facebook	3.41%	Windows Update	3.28%	Windows Update	2.77%
6	Yahoo! Messenger	1.94%	Google Market	2.87%	SSL	2.38%
7	BitTorrent	1.74%	SSL	1.93%	Google Market	2.37%
8	Whats App	1.67%	Facebook	1.40%	Opera Mini	1.82%
9	Skype	1.38%	BitTorrent	0.93%	Facebook	1.79%
10	Opera Mini	1.24%	Whats App	0.82%	BitTorrent	1.09%
		52.07%		67.33%		64.64%

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Table 10 - Top 10 Peak Period Applications - Africa, Mobile Access

In most regions, YouTube is the application responsible for generating the most bandwidth, but in Africa it accounts for just 3.4% of traffic. HTTP traffic is the leading source of traffic at 32.2% and WAP Browsing (typically web browsing on a feature phone) is also a contributor at 7.2%. Africa is also the only region where Opera Mini, a web browser focused on data efficiency, is among the top 25 applications. While BlackBerry has seen a significant decline in emerged markets, the devices are incredibly popular in emerging markets such as Africa because of their low cost and data efficiency. BlackBerry smartphones are efficient because all of their data (email, browsing, BBM) is tunneled to a network operations center (NOC), and because of this it is seen as one singular source of traffic accounting for 14.0% of traffic.

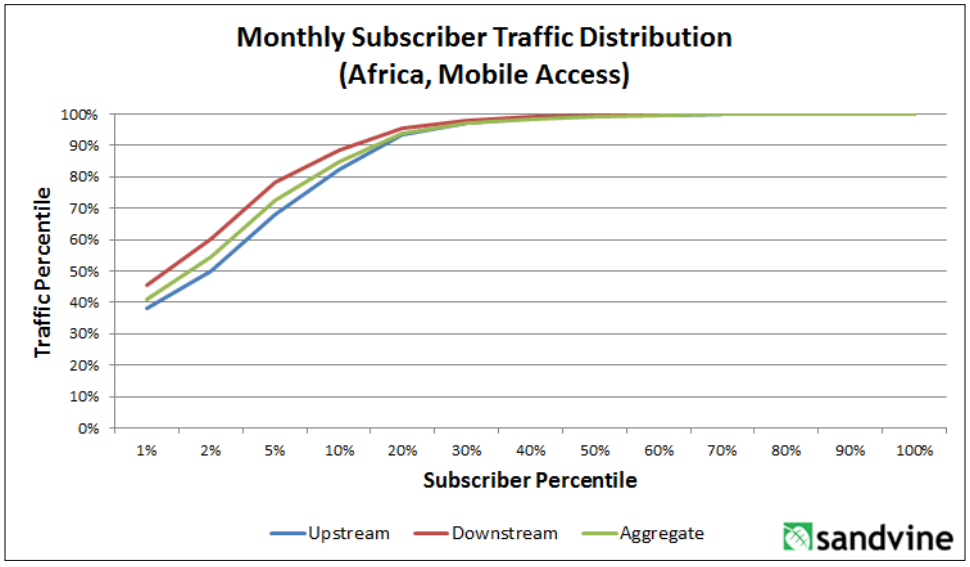

Figure 10 - Monthly Subscriber Traffic Distribution - Africa, Mobile Access

In Africa, the 1% of subscribers who make the heaviest use of the network's upstream resources account for 38.0% of upstream, 45.5% of downstream, and 41.1% of aggregate bytes each month. This concentration is among the highest observed, which we believe is due to the disparity in usage between those subscribers with higher consuming smartphones or aircards, and those who are using traditional feature phones.

Industry Phenomena meets Consumer Internet Phenomena

Over the last six months, CSPs' interest in Software-Defined Networking (SDN) and Network Functions Virtualization (NFV) has gained a lot of momentum. Conversations that were once centered around, "*what is SDN and NFV?*" have evolved into discussions about lead use-cases and proof-of-concept trials. While NFV serves to abstract software functionality from the hardware platform, for the objective of reducing CAPEX and OPEX, SDN abstracts the control layer from the infrastructure layer, allowing for flexible programmability of network services. While each stands on its own merits, the combination of the two architectures serve to bring greater benefits to the ICT industry – carriers, cloud providers, content providers and consumers alike.

This phenomenon has a wide appeal to many CSPs, as witnessed by the participation in the respective forums that are shepherding the evolution of standards, such as the ONF, and the ETSI NFV ISG. However, this doesn't mean that full network deployments are around the corner. It will be a gradual learning, trialing and migration exercise over the next few years to deploy these technologies, depending on the use case the provider chooses to tackle. The most oft-cited use cases are: interconnection of Data Centres, Infrastructure as a Service (Iaas), virtualization of CPE, virtualization of the Evolved Packet Core, and network services chaining of value-added services.

While the focus thus far has been on virtualization and programmability of Layer1-3, network services such as traffic classification (DPI) and policy enforcement which operate at IP Layer 4-7 are also at play. In the SDN/NFV world, these technologies can serve, not only to drive the policy charging and traffic management applications that they do today, but also they can provide a vital analytics feedback loop to the SDN controller for dynamic optimization of network functions and network routing.

What impact will this new architecture have on the consumer network? What benefits will consumers reap on SDN/NFV architected networks, in comparison to today's networks? Will carriers start to market "Software Defined Networks" as they do "LTE networks"? Will it become synonymous with higher speeds, which will attract consumers and drive higher consumption on networks, just like LTE did? We hypothesize that it will. The adoption of SDN paves the way for quicker time to market of innovative services. It also opens the door further for agile MVNOs, due to IaaS lowering the barrier to entry.

All-in-all, the future rollouts of SDN and NFV will have an impact on consumer Internet behaviors, and advanced network analytics will play an important role in understanding this phenomena.

Latin America, Fixed

As a market where mobile networks are subscribers' primary way of accessing the Internet, an examination of fixed access networks in Latin America reveals some interesting findings.

Monthly Consumption - Latin America, Fixed Access		
	Median	**Mean**
Upstream	366.7 MB	1.2 GB
Downstream	3.8 GB	8.8 GB
Aggregate	4.4 GB	10.0 GB

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Table 11 - Monthly Consumption Figures - Latin America, Fixed Access

One of the first findings is that monthly fixed-access usage in Latin America is significantly lower than what has been observed in other regions around the globe. Mean monthly usage is 10.0 GB, and median monthly usage is 4.4 GB, figures that are essentially unchanged since our previous report. When comparing these numbers to North America, which has the leading consumption around the globe, subscribers on Latin America's fixed access networks continue use less than a quarter of the data per month than those in North America. A big reason for this is access speeds in Latin America are typically slower than what you will find in other regions of the world.

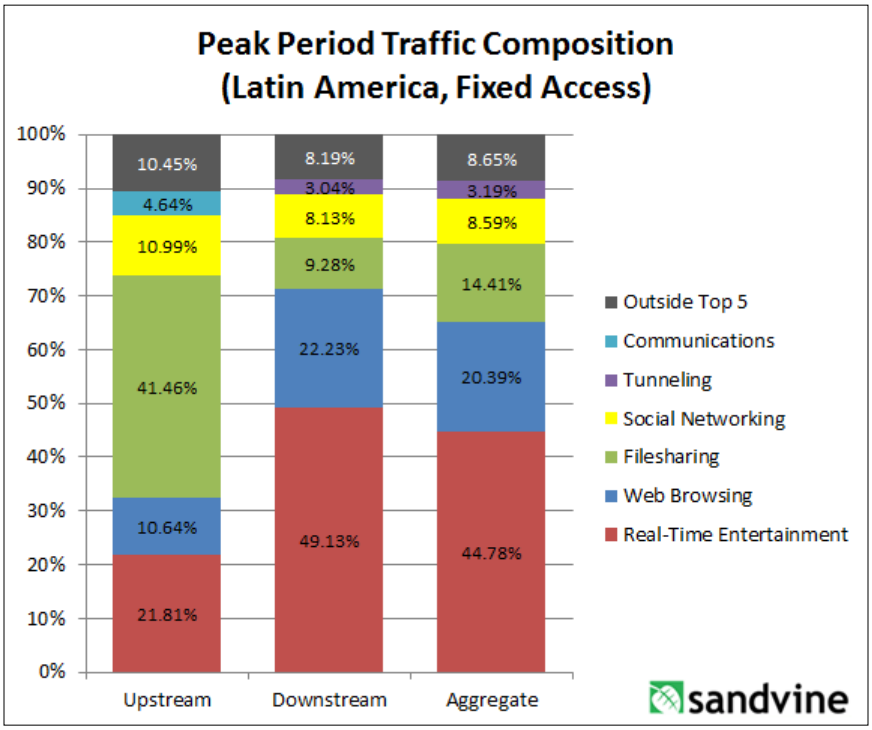

Figure 11 - Peak Period Aggregate Traffic Composition - Latin America, Fixed Access

Despite this lower usage, the consumption habits of subscribers in the region are very similar to that observed around the globe. Unsurprisingly, Real-Time Entertainment is the leading source of traffic; continuing to account for essentially half of the downstream bytes during peak period, while Web Browsing and Filesharing round out the top three traffic categories.

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	BitTorrent	29.70%	YouTube	36.82%	YouTube	33.29%
2	YouTube	14.70%	HTTP	20.01%	HTTP	18.10%
3	Facebook	8.55%	BitTorrent	7.63%	BitTorrent	11.14%
4	HTTP	8.01%	Facebook	6.22%	Facebook	6.59%
5	Ares	5.61%	SSL	2.81%	SSL	2.88%
6	SSL	3.22%	MPEG - Other	2.68%	MPEG - Other	2.36%
7	Skype	2.81%	Flash Video	2.23%	Flash Video	1.99%
8	SPDY	1.00%	Netflix	2.17%	Netflix	1.94%
9	RTMP	0.97%	RTMP	1.79%	RTMP	1.66%
10	eDonkey	0.77%	SPDY	1.22%	Ares	1.64%
		75.34%		83.57%		81.60%

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Table 12 - Top 10 Peak Period Applications – Latin America, Fixed Access

Looking at the top applications, YouTube at 36.8% of peak downstream traffic is the clear leader in traffic share, almost doubling the second ranked application (HTTP). Making an appearance in our top 10 applications once again is Netflix, which accounts for 2.2% of peak downstream traffic. When we last provided Latin America usage numbers in our 1H 2013 report, Netflix accounted for only 1.9% of peak downstream traffic. In just six months' time, their share has increased by more than 20%, and while not yet at the levels observed on North American networks, Netflix is the clear bandwidth share leader in paid-streaming video services in Latin America.

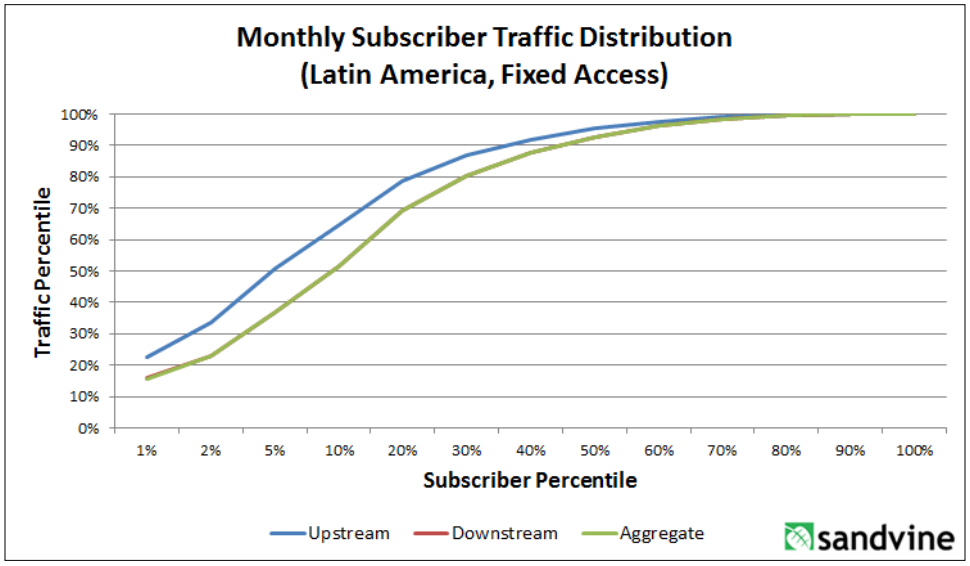
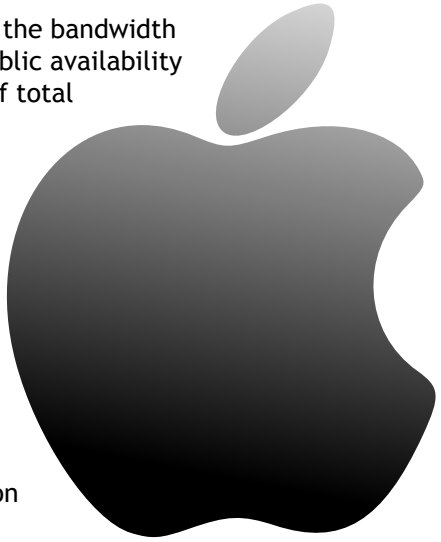


Figure 12 - Monthly Subscriber Traffic Distribution – Latin America, Fixed Access

From a traffic distribution standpoint, the top 1% of subscribers in Latin America who make the heaviest use of the network's upstream resources account for 22.7% of total upstream traffic. The comparable downstream users account for 15.9% of downstream bytes. At the opposite end of the usage spectrum, the network's lightest 50% of users account for only 7.3% of total traffic. These figures are very much in line with what has been observed on fixed networks elsewhere around the globe.

iOS 7 Lifts Off



Below is a report from a single North American fixed access operator, showing both the bandwidth and traffic share that Apple Updates accounted for in the days leading up to the public availability of iOS 7. Upon release at 1PM ET, Apple Updates immediately became almost 20% of total network traffic, and continued to stay above 15% of total traffic into the evening peak hours.

Most interesting is the fact that the launch noticeably increased the total volume of traffic during peak hours. This presents a unique challenge for operators, since they must engineer their networks for peak demand, and Apple product launches and software updates are infrequent in nature.

Last year, Apple introduced over-the-air (OTA) updates which allows users to download changes to the core OS, but Apple still has yet to implement any kind of incremental update system for apps like Android[5]. This means that users consume significantly more bandwidth when updating apps, and creates the potential for bill shock given that that Apple now allows app updates up to 100MB on a cellular network.

Several of Sandvine's customers were closely monitoring the traffic demand the launch would cause, and based on the results we observed, we expect they will have a plan in place to manage the load when iOS 8 launches next year.

Device	OTA Update Size	iTunes Update Size
iPhone 5	760 MB	1.2 GB
iPad 2	900 MB	1.4 GB
Apple TV	729 MB	N/A

iOS 7 Update Sizes

5. http://www.engadget.com/2012/06/27/google-brings-incremental-app-updates-to-android-added-encrypti/

Latin America, Mobile

Latin America is a region that has great variation in the types of mobile networks, and because of this usage varies greatly from country to country. Most networks in the region are 2G/3G networks, however with the rollout of LTE in some countries, mobile networks have begun to offer an experience that is equivalent and in some cases even better than that of fixed access networks in the region.

Monthly Consumption - Latin America, Mobile Access		
	Median	**Mean**
Upstream	17.3 MB	39.0 MB
Downstream	78.4 MB	308.5 MB
Aggregate	89.7 MB	347.5 MB

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Table 13 - Monthly Consumption Figures – Latin America, Mobile Access

In our analysis, we observed a mean monthly usage of 347.5 MB, virtually unchanged from what we observed a year ago. It should be made clear however, that there is wide variation in usage from country to country and network to network. For example, as discussed in our previous report, in one Latin America country we observed mean monthly usage on a 3G network to be 343 MB, while on an LTE network in the same country it was 2.7 GB. The wide disparity means that operators, particularly those in emerging markets with low fixed access penetration, should prepare themselves for drastic changes in the usage of their networks as subscribers are sure to take full advantage of LTE's speed and quality of experience (QoE) benefits. Don't mistake the lack of change in mean usage over the past six months, as an indicator that there was no usage growth; Latin America continues to be one of the regions with the fastest mobile growth rates in the world. With recent wins in the region, Sandvine has been able to expand the number of Latin American participants in this study.

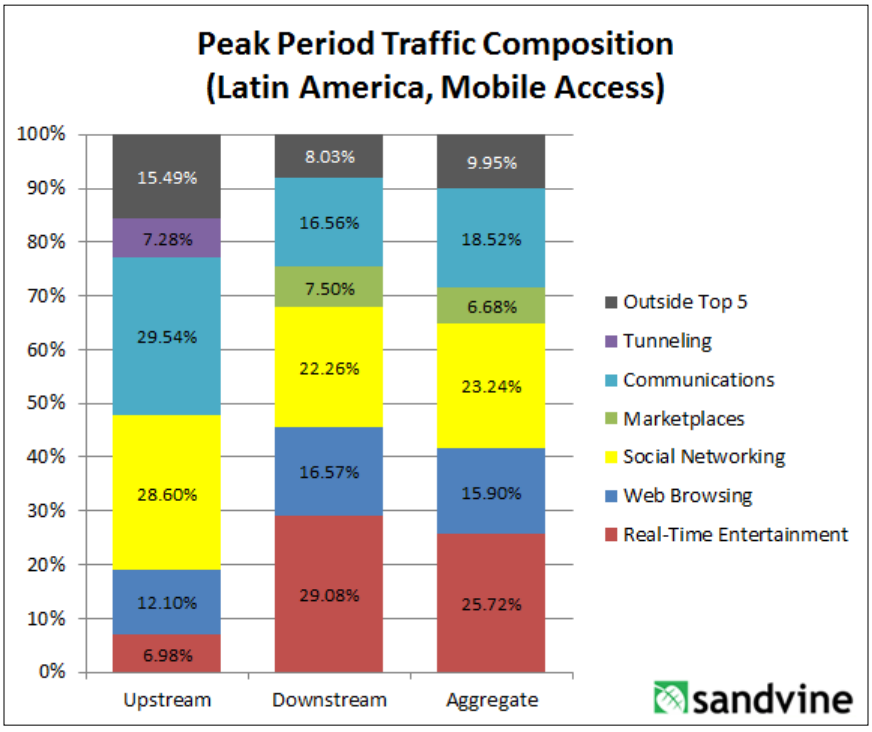

Figure 13 - Peak Period Aggregate Traffic Composition – Latin America, Mobile Access

Because fixed access network penetration is not as widespread as Europe or North America, mobile networks in Latin America offer a mix of personal handsets and air cards that serve as a household's primary Internet connection. This mix results in interesting traffic profiles. Applications and traffic categories that are usually most prominent are those that are typically popular on both mobile devices and PCs.

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	Facebook	21.14%	YouTube	20.73%	YouTube	18.25%
2	BlackBerry	13.13%	Facebook	15.34%	Facebook	16.24%
3	HTTP	8.05%	HTTP	13.84%	HTTP	12.97%
4	SSL	5.85%	BlackBerry	11.56%	BlackBerry	11.79%
5	YouTube	4.37%	SSL	4.04%	SSL	4.32%
6	Ares	4.01%	Google Market	3.48%	Google Market	3.05%
7	Whats App	4.00%	Instagram	3.15%	Instagram	2.88%
8	Skype	3.19%	MPEG - Other	2.54%	MPEG - Other	2.21%
9	Picasa	1.73%	Whats App	1.69%	Whats App	2.04%
10	Gmail	1.69%	Flash Video	1.54%	Flash Video	1.33%
		67.15%		77.91%		75.09%

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Table 14 - Top 10 Peak Period Applications – Latin America, Mobile Access

Like most regions across the world, in Latin America, Real-Time Entertainment is mobile traffic's largest driver, accounting for 29.0% of peak downstream traffic. Similar to fixed access networks in the region, YouTube is the largest source of that downstream traffic, accounting for 20.7%. Frequent readers of the Global Internet Phenomena Reports will notice both those figures are down slightly when compared to previous reports. This is due to the introduction of new participant networks to our study who have implemented tiered service plans, that allow lost cost access to social networking and communication sites. Because of this, Social Networking's peak downstream share almost doubled its share since our last report from 12.3% to 22.3%.

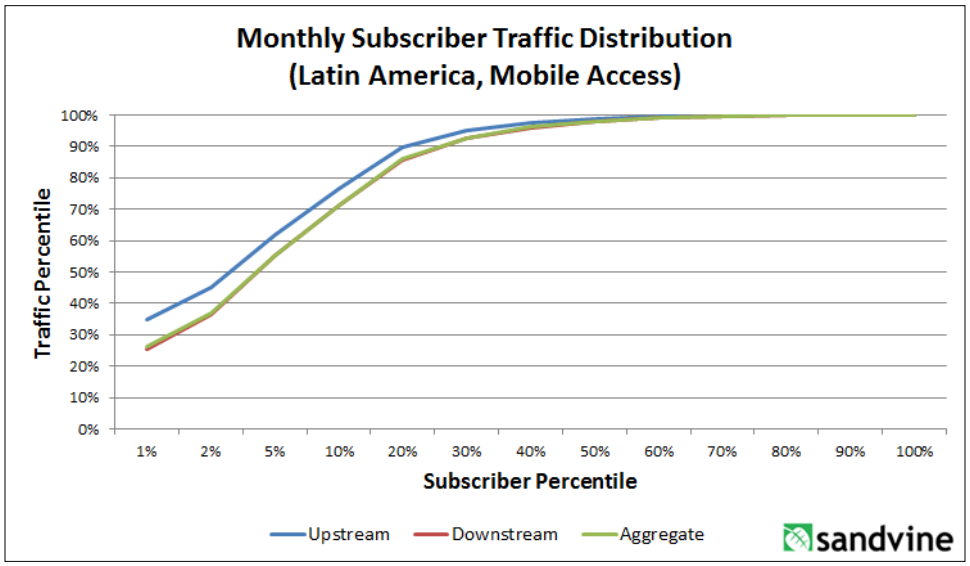


Figure 14 - Monthly Subscriber Traffic Distribution – Latin America, Mobile Access

In Latin America, the 1.0% of subscribers who make the heaviest use of the network's upstream resources account for 28.1% of upstream, 28.0% of downstream, and 28.8% of aggregate bytes each month. Much like observed in Europe and Asia-Pacific, this high concentration among the top 1.0% of users is likely due to the use of computers as opposed to just smartphones on the network.

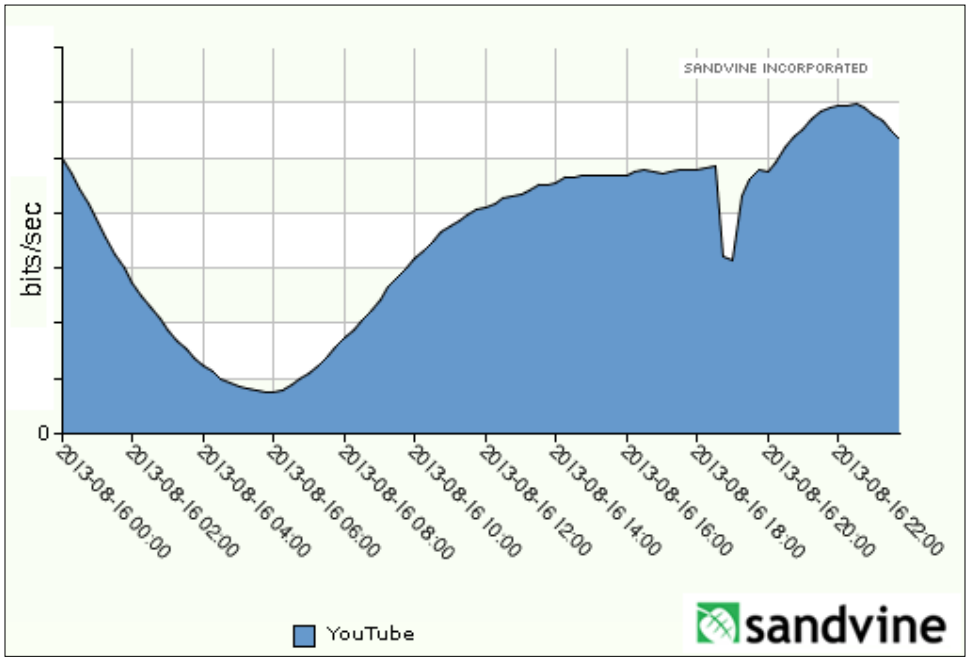
The Not So Great Google Outage

Contrary to some reports, a Google outage on in August did not cause global consumer internet traffic to instantly drop by 40%[6]. Was it still significant? Absolutely.

In this report we reveal that YouTube accounts for 16.8% of total traffic during peak period on fixed access networks in North America. While no other Google service cracks the top 10 in bandwidth use, it's safe to assume that popular services such as Search, Google+, and Maps likely account for a combined 5% of traffic. This means that when a Google outage occurs, consumer Internet traffic in North America likely experiences a 15-20% decline.

While Google is major mover of Internet traffic, and the outage likely impacted many subscribers, the overall impact on total Internet use for the day was negligible because the August outage only lasted between 1-5 minutes[7].

Below is a report showing YouTube from a US fixed access network, which will help visualize how people were briefly unable to spend that Friday evening watching cat videos online.



Note: This chart does not show the full decline because the network is configured to report in 15 minute intervals, and YouTube was only inaccessible for five minutes.

6. https://engineering.gosquared.com/googles-downtime-40-drop-in-traffic
7. http://www.google.com/appsstatus#hl=en&v=issue&ts=1376711999000&sid=1&iid=0a668851fc3f5856b360e2bdb8781fc1

Asia-Pacific, Fixed Access

For 2H 2013, mean usage in the region was 35.4 GB. This is interesting because of the amount of Filesharing and Peercasting traffic on the network, the upstream-to-downstream ratio is among the lowest observed in this study at 2.1. When comparing mean usage to North America, it is significantly lower in Asia-Pacific, but interestingly, median monthly usage is broadly in line with usage levels observed in North America, at 17.0 GB.

Monthly Consumption - Asia-Pacific, Fixed Access		
	Median	**Mean**
Upstream	2.0 GB	11.4 GB
Downstream	13.9 GB	24.0 GB
Aggregate	17.0 GB	35.4 GB

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Table 15 - Monthly Consumption Figures - Asia-Pacific, Fixed Access

As observed in other regions across the globe, consumption in Asia-Pacific is driven by the use of Real-Time Entertainment, which accounts for over 50% (54.8%) of total downstream traffic during peak period. This marks a small increase from 51.2% in our previous report.

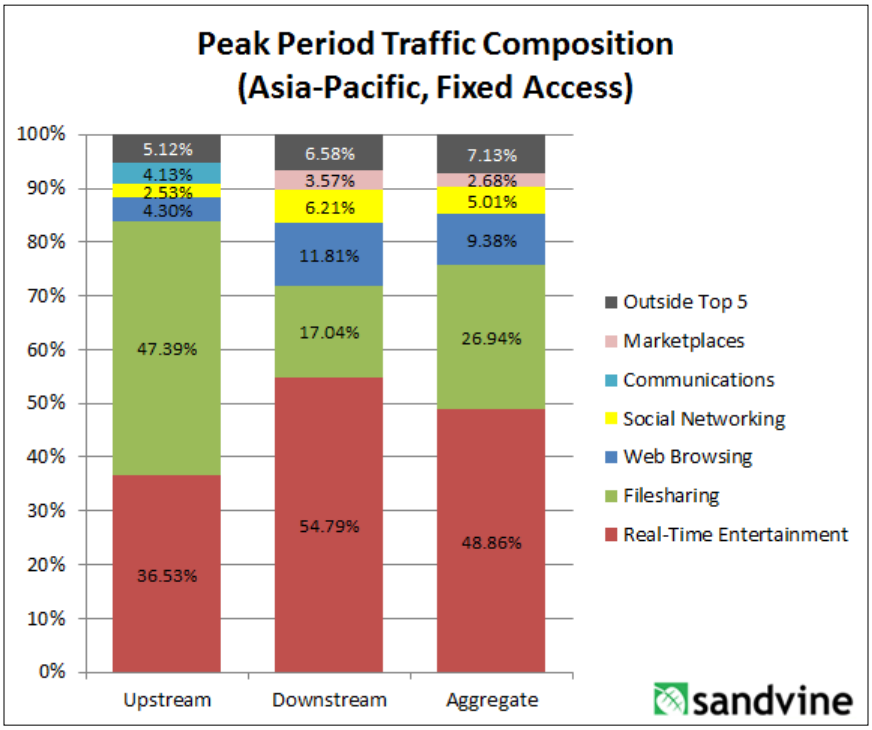

Figure 15 - Peak Period Aggregate Traffic Composition - Asia-Pacific, Fixed Access

As covered in our previous report, a unique characteristic of the Asia-Pacific region is the popularity of peercasting applications, particularly PPStream and QVoD. These applications allow users to stream live events while simultaneously helping to distribute the stream to other viewers, which drives large volumes of upstream traffic. In our 1H 2013 report, Asia-Pacific was the only region we observed where BitTorrent was the top application during peak period. In many other regions, Filesharing applications have seen a decline in share over recent reports, and that is a phenomenon we have begun to observe in Asia-Pacific as well; BitTorrent is now the second ranked application during peak. The decline in BitTorrent share has been somewhat less significant, although we believe this will change and the rate of decline will accelerate, as more over-the-top Real-Time Entertainment sources are made available to subscribers in the future.

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	BitTorrent	35.72%	YouTube	31.22%	YouTube	23.30%
2	QVoD	14.10%	BitTorrent	14.25%	BitTorrent	21.18%
3	YouTube	6.65%	HTTP	10.48%	HTTP	8.08%
4	RTSP	5.00%	QVoD	4.51%	QVoD	7.61%
5	Thunder	4.03%	Facebook	4.45%	Facebook	3.57%
6	HTTP	3.04%	MPEG - Other	3.65%	RTSP	3.24%
7	Skype	2.03%	RTSP	2.40%	MPEG - Other	2.62%
8	Facebook	1.74%	iTunes	1.70%	Thunder	2.20%
9	PPStream	1.30%	Dailymotion	1.69%	iTunes	1.28%
10	Funshion	1.17%	Flash Video	1.67%	Dailymotion	1.21%
		74.78%		76.03%	0.00%	74.28%

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Table 16 - Top 10 Peak Period Applications - Asia-Pacific, Fixed Access

From a traffic distribution standpoint, the top 1% of subscribers in Asia-Pacific who make the heaviest use of the network's upstream resources account for 22.1% of total upstream traffic. The comparable downstream users account for 11.3% of downstream bytes. At the opposite end of the usage spectrum, the network's lightest 50% of users account for only 10.6% of total traffic. These figures are very much in line with what has been observed globally.

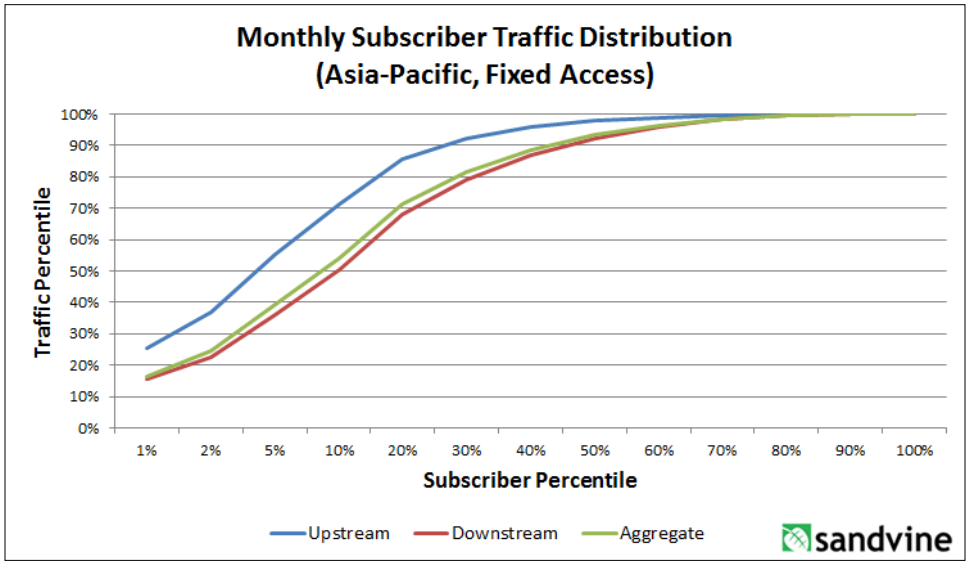


Figure 16 - Monthly Subscriber Traffic Distribution - Asia-Pacific, Fixed Access

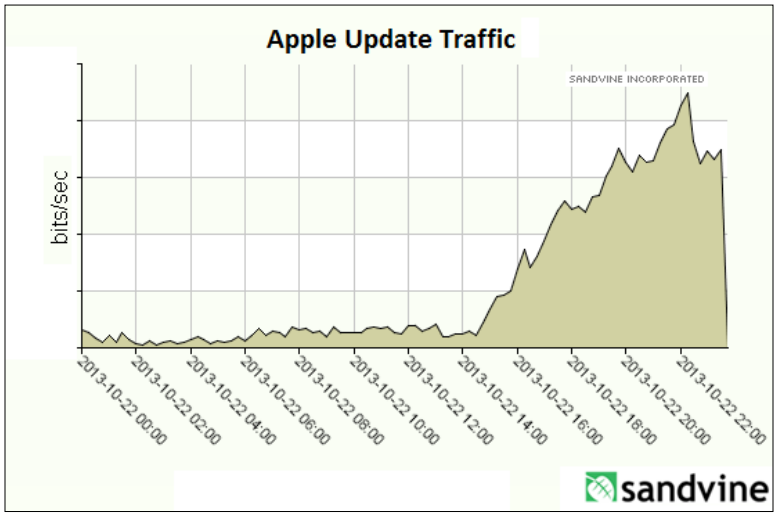
Traffic Spotlight: OS X 10.9 Mavericks

"Surprise!" That is what Apple said to both customers and network operators when it released new versions of its desktop OS (10.9), mobile OS (7.0.3), and productivity suites (iLife and iWork) for free in October 2013.

With a digital distribution now in place on both desktop and mobile devices, Apple has the ability to cause a tremendous impact on networks because of the size of these updates and the number of people that have their products.

For example, in a home with an iMac (desktop), a MacBook Pro (laptop), an iPad, and two iPhones, over 20 GBs of updates were released in a single day.

So what does that look like to an operator? Below is Apple update traffic as captured from a portion of one fixed network in North America which shows almost a 10x increase over typical Apple update levels.



How does that compare to when OS X 10.8 was launched last July as a $19.99 update? Last year, on the same network, we observed only a 6x increase in traffic.

So what was the cause for the increase? It's likely a combination of larger file sizes (OS X 10.8 was 4.4 GB, OS X 10.9 was 5.0 GB), increased user base size, and of course, the free price tag.

With the recent launch of iOS 7 in September 2013, and now OS X 10.9, it is clear that ISPs should keep a close eye on not only publicly announced release dates of Apple products, but media events as well, in order to ensure future Apple surprises don't negatively impact their networks.

Asia-Pacific, Mobile Access

Asia-Pacific mobile subscribers have traditionally shown the highest consumption numbers among users in the Global Internet Phenomena Report and that is unchanged in this edition. Looking at mean monthly usage, Asia-Pacific made significant gains since our last report increasing from 700.4 MB to over 1 GB per month; the first region in our reporting to achieve this. We expect this consumption leadership to continue in future reports for the foreseeable future.

Monthly Consumption - Asia-Pacific, Mobile Access		
	Median	**Mean**
Upstream	39.7MB	107.5MB
Downstream	287.0MB	1.0GB
Aggregate	336.8MB	1.1GB

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Table 17 - Monthly Consumption Figures - North America, Mobile Access

This high usage is driven by Real-Time Entertainment accounting for 50% of total downstream traffic during peak period. Unlike other regions where one or two applications drive much of the category, in Asia-Pacific, multiple applications including YouTube (19.9%), Wowza (3.8%), Yoku (2.8%), PPStream (1.44%), QVoD (1.38%), and Dailymotion (1.35%).

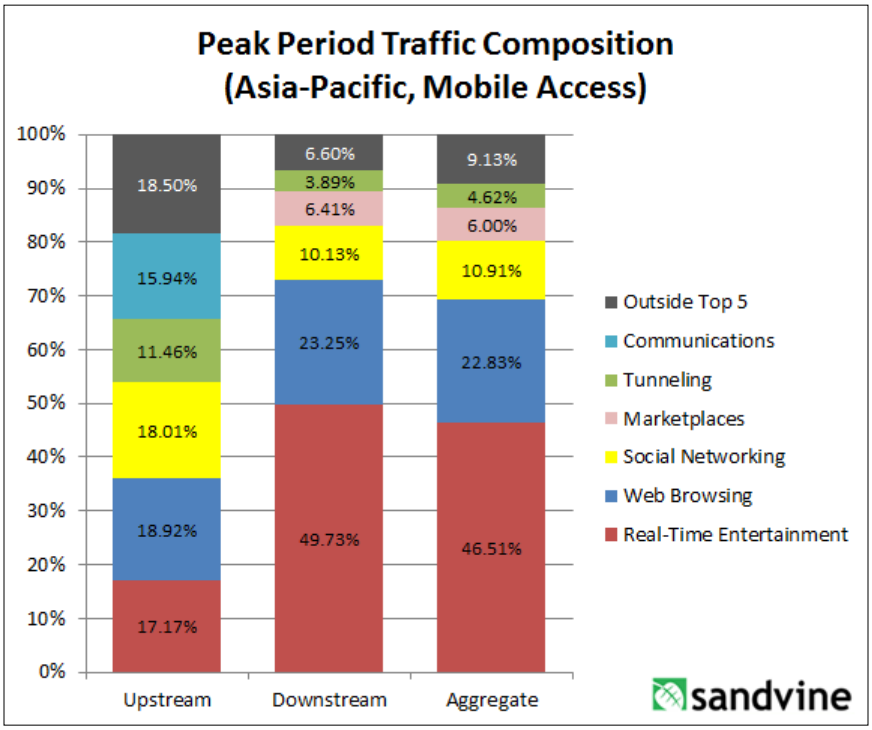

Figure 17 - Peak Period Aggregate Traffic Composition - Asia-Pacific, Mobile Access

Other than the appearance of multiple applications accounting for the high Real-Time Entertainment share, Asia-Pacific's traffic is for the most part similar in composition to that of leading networks in Europe and North America. The one difference that may be present is the popularity of marketplaces in the region which accounts for 6.4% of downstream traffic. When combining the traffic share of iTunes and Google Play, subscribers in Asia-Pacific are the highest consumers of apps, music, and movie downloads than any region in the world.

	Upstream		Downstream		Aggregate	
Rank	Application	Share	Application	Share	Application	Share
1	HTTP	14.31%	HTTP	20.57%	HTTP	19.96%
2	Facebook	13.24%	YouTube	19.86%	YouTube	18.39%
3	SSL	9.41%	MPEG - Other	11.46%	MPEG - Other	10.51%
4	BitTorrent	6.56%	Facebook	5.82%	Facebook	6.54%
5	Skype	5.15%	Wowza	3.84%	SSL	4.08%
6	YouTube	4.72%	SSL	3.51%	Wowza	3.58%
7	MPEG - Other	2.11%	iTunes	2.96%	iTunes	2.77%
8	Dropbox	2.00%	Youku	2.80%	Youku	2.57%
9	Instagram	1.62%	Instagram	2.65%	Instagram	2.56%
10	Whats App	1.60%	Google Market	2.58%	Google Market	2.40%
		60.72%		76.05%		73.36%

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Table 18 - Top 10 Peak Period Applications – Asia-Pacific, Mobile Access

In Asia-Pacific, the 1% of subscribers who make the heaviest use of the network's upstream resources account for 29.2% of upstream, 18.5% of downstream, and 18.7% of aggregate bytes each month. As observed in Europe, this high concentration of users is likely due to the presence of laptop air cards or the use of tethering which typically allows subscribers to consume significantly more data than a smartphone. This is supported by the regional behaviors: 1 GB monthly mean usage, BitTorrent share of 6.6% total upstream traffic during peak period, and applications typically not running on a smartphone or tablet. At the opposite end of the usage spectrum, the network's lightest 50% of users account for only 5.1% of total traffic.

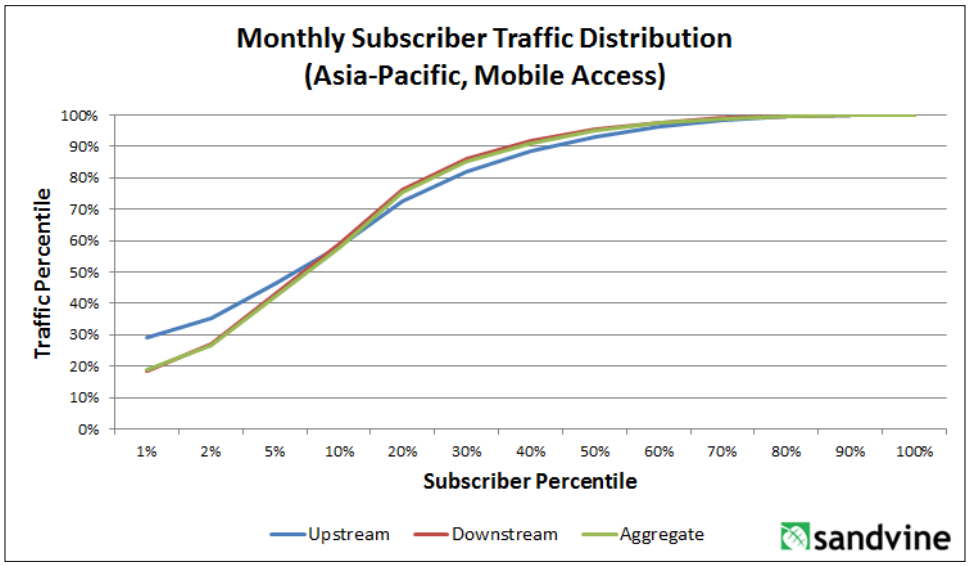

Figure 18 - Monthly Subscriber Traffic Distribution – Asia-Pacific, Mobile Access

Explanation of Traffic Categories

The table below describes each of the traffic categories used in the Global Internet Phenomena Report: 2H 2013

Traffic Category	Description	Examples
Storage	Large data transfers using the File Transfer Protocol or its derivatives. Services that provide file-hosting, network back-up, and one-click downloads	FTP, Rapidshare, Mozy, zShare, Carbonite, Dropbox
Gaming	Console and PC gaming, console download traffic, game updates	Nintendo Wii, Xbox Live, Playstation 2, Playstation 3, PC games
Marketplaces	Marketplaces where subscribers can purchase and download media including applications, music, movies, books, and software updates	Google Android Marketplace, Apple iTunes, Windows Update
Administration	Applications and services used to administer the network	DNS, ICMP, NTP, SNMP
Filesharing	Filesharing applications that use a peer-to-peer or Newsgroups as a distribution models	BitTorrent, eDonkey, Gnutella, Ares, Newsgroups
Communications	Applications, services and protocols that allow email, chat, voice, and video communications; information sharing (photos, status, etc) between users	Skype, WhatsApp, iMessage, FaceTime
Real-Time Entertainment	Applications and protocols that allow “on-demand” entertainment that is consumed (viewed or heard) as it arrives	Streamed or buffered audio and video (RTSP, RTP, RTMP, Flash, MPEG), peercasting (PPStream, Octoshape), specific streaming sites and services (Netflix, Hulu, YouTube, Spotify,)
Social Networking	Websites and services focused on enabling interaction (chat, communication) and information sharing (photos, status, etc) between users	Facebook, Twitter, Linkedin, Instagram
Tunneling	Protocols and services that allow remote access to network resources or mask application identity.	Remote Desktop, VNC, PC Anywhere, SSL, SSH,
Web Browsing	Web protocols and specific websites	HTTP, WAP browsing

Study Details

Sandvine's Global Internet Phenomena Reports examine a representative cross-section of the world's leading fixed and mobile communications service providers (CSPs) and are made possible by the voluntary participation of our customers. Collectively, Sandvine's customers provide Internet and data service to hundreds of millions of subscribers worldwide.

In the Global Internet Phenomena Report: 2H 2013, we examined five regions:

- Africa
- Asia-Pacific
- Europe
- Latin America
- North America

The data gathered for these reports was collected in September 2013 and is completely subscriber-anonymous. No information regarding specific content or personally-identifiable information (including, but not limited to, IP or MAC addresses and subscriber IDs) was collected during this study.

This study reflects the traffic profiles of real service providers, including the impact of any network management (for instance, congestion management and traffic optimization) policies that may be in place.

The data collected includes the bandwidth per second per protocol and the number of active hosts per protocol on the network at each hour. Data also includes the total transmitted (upstream) and received (downstream) bytes, from the subscriber's perspective, attributable to each subscriber for a period of 30 days.

The datasets were used to create a 24-hour profile of each network, normalized by the number of active subscribers at each hour in the day. These profiles were then aggregated hierarchically for each region with weightings based on subscriber counts and access technology market share.

The transmitted and received bytes per subscriber data sets were used to create ordinal rankings of all subscribers on a network based on a combination of data direction (upstream, downstream, aggregate) and data period (day, week, month), for a total of nine ranked lists ordered by total byte usage. These lists enabled consumption analysis based on percentile ranking and cast light on the widely varying data needs of individual subscribers.

In parts of the report we reference industry publications, analyst studies, media articles and other sources. As such, we are indebted to the collective work and wisdom of a large number of individuals and organizations and have endeavored to correctly cite all sources and to identify the original creator of referenced material.

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