

4.2 Bandwidth Consumption Trends

Editorial Note (to be removed prior to publication): This section should address the main application drivers for higher speed in the access, primarily from network operators, looking at existing and planned demand, perhaps based on existing speed and capacity projections

4.2.1 Bandwidth consumption – current situation

By the end of ~~H1 2013-2014~~ [sand], in North America, the median bandwidth usage (per subscriber) in the fixed access network is on the order of 17.4 GB downstream and 1.2-4 GB upstream per month, while the mean reaches almost ~~40-43.8~~ GB downstream and around 7.6 GB upstream. Top users (also sometimes referred to as *power users*) consistently exceeded 5 TB of monthly bandwidth usage, typically shared among multiple devices at home. Note that there is a steady bandwidth consumption growth of ~~around 20-~~more than 30% per year, observed by most of the service providers, irrespective of the access technology they use in their first mile networks. What is even more interesting is the fact that the large growth in the mean and median bandwidth consumption in fixed access networks (when compared with 2011 numbers as published by the same source) is mainly attributed to the growing use of Real-Time Entertainment (RTE) services RTE services are responsible for ~~more than~~about 65% of peak bandwidth consumption during busy hours [sand].

~~In NA (see Figure 7), Netflix continues to be the main contributor to downstream bandwidth consumption, accounting for more than 34% of downstream traffic during the peak period. Moreover, with the introduction of 4K Super HD content, Netflix continues to drive bandwidth consumption in the downstream and will likely continue to increase its overall share as 4K TVs become more popular. When combined with other similar services (YouTube, Amazon Video, and Hulu), more than 65% of downstream traffic is consumed by RTE services focused on video delivery.~~


The same source [sand] also provides numbers for bandwidth consumption in fixed access networks in Europe, Africa, Latin America, and APAC regions.

~~In Europe the median values are smaller than in NA (around 7.6 GB downstream and less than 1 GB upstream), with the mean values reaching roughly half of the bandwidth consumption reported for NA-based fixed access subscribers. This fact is mostly attributed to pervasive xDSL access in Europe, and slower adoption of higher-speed copper and fiber-based access technologies. Interestingly enough, these numbers for Latin America are only around 30% lower, indicating that local service providers are quickly closing the technology gap and migrating their customers to higher speed links. When compared with NA, the average bandwidth consumption in the APAC region is lower. It is also interesting to note that the upstream bandwidth consumption is larger, implying that more digital content is being created and shared online.~~

~~In NA (see Figure 7), Netflix continues to be the main contributor to downstream bandwidth consumption, accounting for 31.6% of downstream traffic during the peak period. Moreover, with the introduction of 4K Super HD content, it is expected that Netflix will continue to drive bandwidth consumption in the downstream, likely increasing its overall share as 4K TVs become more popular. When combined with other similar services~~

(YouTube, Amazon Video, and Hulu), more than 65% of downstream traffic is consumed by RTE services focused on video delivery. European countries with limited access to RTE content have typically higher volume of file-sharing traffic (see Figure 8), which has been observed before in NA, when the RTE services were at their infancy. It is expected that as Over The Top (OTT) RTE services become more generally accessible (both technically, as well as economically), the traffic distribution becomes more similar to the one observed in NA, decreasing the share of file sharing services and increasing the share of RTE services.

Rank	Upstream		Downstream		Aggregate	
	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%



Rank	Upstream		Downstream		Aggregate	
	Application	Share	Application	Share	Application	Share
1	BitTorrent	24.53%	Netflix	34.21%	Netflix	31.09%
2	HTTP	14.27%	YouTube	13.19%	YouTube	12.28%
3	SSL	6.54%	HTTP	11.65%	HTTP	11.84%
4	Netflix	6.44%	iTunes	3.64%	BitTorrent	5.96%
5	YouTube	5.52%	SSL	3.42%	SSL	3.80%
6	Skype	2.23%	BitTorrent	3.40%	iTunes	3.33%
7	Facebook	2.17%	MPEG	2.85%	MPEG	2.62%
8	FaceTime	1.50%	Facebook	1.99%	Facebook	1.83%
9	Dropbox	1.20%	Amazon Video	1.90%	Amazon Video	1.82%
10	iTunes	1.15%	Hulu	1.74%	Hulu	1.58%
		64.40%		76.24%		74.58%





Figure 1: Top 10 peak period applications - NA, fixed access [sand]

European countries with limited access to RTE content have typically higher volume of file sharing traffic (see Figure 8), which has been observed before in NA, when the RTE services were at their infancy. It is expected that as Over The Top (OTT) RTE services become more generally accessible (both technically, as well as economically), the traffic distribution becomes more similar to the one observed in NA, decreasing the share of file sharing services and increasing the share of RTE services.


Field Code Changed

Rank	Upstream		Downstream		Aggregate	
	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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Rank	Upstream		Downstream		Aggregate	
	Application	Share	Application	Share	Application	Share
1	BitTorrent	33.20%	YouTube	19.27%	YouTube	17.38%
2	HTTP	10.07%	HTTP	17.46%	HTTP	16.26%
3	YouTube	7.67%	BitTorrent	11.10%	BitTorrent	14.71%
4	SSL	5.63%	SSL	6.19%	SSL	6.10%
5	Skype	4.54%	Facebook	3.88%	Facebook	3.95%
6	Facebook	4.29%	RTMP	3.66%	RTMP	3.27%
7	eDonkey	3.64%	MPEG	3.54%	MPEG	3.21%
8	Dropbox	2.11%	Netflix	3.23%	Netflix	2.98%
9	MPEG	1.51%	Flash Video	2.37%	Flash Video	2.17%
10	iTunes	1.30%	iTunes	2.23%	iTunes	2.08%
		72.66%		70.69%		70.01%



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Figure 2: Top 10 peak period applications - Europe, fixed access [sand]

Interestingly enough, these numbers for Latin America are only around 25% lower, indicating that local service providers are quickly closing the technology gap and migrating their customers to higher speed links. When

compared with NA, the average bandwidth consumption in the APAC region is lower. It is also interesting to note that the upstream bandwidth consumption is larger, implying that more digital content is being created and shared online. Despite this lower overall bandwidth usage per subscriber, the habits of the digital content consumption in Latin America are very similar to that observed in NA and in Europe. Unsurprisingly, RTE services generate the majority of the downstream traffic during peak hours, while the share of web browsing and file sharing services is dropping continuously as RTE OTT services become more available and accessible to an average consumer. At this time YouTube dominates downstream bandwidth consumption. The recent emergence of proxy caches allowing Netflix streaming to areas without the official support for Netflix drove the large (5%) increase in Netflix traffic in Latin America, which was previously observed at <1% range as of the end of H1 2013.

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Rank	Upstream		Downstream		Aggregate	
	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%



Rank	Upstream		Downstream		Aggregate	
	Application	Share	Application	Share	Application	Share
1	BitTorrent	19.83%	YouTube	28.94%	YouTube	26.28%
2	YouTube	14.90%	HTTP	14.27%	HTTP	13.94%
3	HTTP	12.60%	SSL	10.97%	SSL	10.37%
4	Facebook	8.34%	BitTorrent	6.89%	BitTorrent	9.35%
5	SSL	7.82%	Facebook	5.60%	Facebook	6.12%
6	Ares	3.32%	Netflix	5.09%	Netflix	4.34%
7	MPEG	2.30%	MPEG	2.91%	MPEG	2.79%
8	Skype	1.79%	Flash Video	2.16%	Flash Video	1.99%
9	Flash Video	1.28%	RTMP	1.87%	RTMP	1.68%
10	Netflix	1.16%	Google Market	1.73%	Google Market	1.64%
		72.19%		78.69%		76.88%





Figure 3: Top 10 peak period applications – Latin America, fixed access [sand]

A unique characteristic of the APAC region is the popularity of peer casting applications, such as PPStream and QVoD that are not used anywhere else around the world at a similar scale. These applications allow users to stream live events. Simultaneously, users participate in distribution of other data streams to viewers, providing distributed caching capabilities. Both of these features of peer casting applications drive the observed high upstream bandwidth consumption. File sharing applications remain strong, especially in the upstream, contributing to roughly 30.45% of the volume of transmitted data. Similar to other regions, the lack of well-established OTT RTE services skews the traffic distribution towards free YouTube content and file sharing applications, providing access to video content not available through other digital channels.

Rank	Upstream		Downstream		Aggregate	
	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%



Rank	Upstream		Downstream		Aggregate	
	Application	Share	Application	Share	Application	Share
1	BitTorrent	45.74%	YouTube	27.01%	BitTorrent	26.95%
2	QVoD	10.98%	BitTorrent	18.80%	YouTube	20.49%
3	YouTube	5.51%	HTTP	10.22%	HTTP	7.96%
4	RTSP	3.97%	RTSP	6.56%	RTSP	5.77%
5	Thunder	3.16%	Facebook	3.49%	QVoD	5.55%
6	HTTP	2.76%	MPEG	3.31%	Facebook	2.89%
7	Skype	2.20%	QVoD	3.20%	MPEG	2.43%
8	Facebook	1.49%	RTMP	1.74%	Thunder	1.63%
9	SSL	1.12%	Flash Video	1.68%	SSL	1.36%
10	PPStream	1.02%	SSL	1.47%	RTMP	1.32%
		76.93%		76.02%		75.03%




Figure 4: Top 10 peak period applications – APAC, fixed access [sand]