

A hiker in a blue jacket and black backpack stands on a dirt path atop a mountain with vibrant, layered geological strata in shades of red, orange, yellow, and green. The hiker is using trekking poles and looking out over the landscape. The sky is a pale, overcast blue. The overall scene is a dramatic and colorful natural landscape.

The Mobile Internet Phenomena Report

February 2019

Welcome to the Mobile Phenomena Report

A word from Lyn Cantor, CEO, Sandvine

Mobile networks are changing as 4G proliferates and 5G networks begin to roll-out and raise user expectations. As this report shows, mobile networks are even more challenged than fixed networks to keep up with user demand and deliver a high quality of experience.

The most important asset that a mobile operator can have is a clear view of how their network is delivering services to their users. This clear understanding drives their entire business strategy: investments, service planning, product launches, and even technology strategies. Without a granular view, mobile operators are just hoping that best practices can get them where they want to be.

As 5G networks are deployed, this problem will become even more acute. Network slicing, massive Internet of Things (IoT) deployments, and higher expectations will be present from day 1 of network launch. With many 5G roll-outs targeting fixed-line replacement services, network congestion (especially from streaming video) can be expected from the very beginning.

Our goal with the Mobile Report is to inform the global community on the 'Internet Phenomena' we live in every day at Sandvine. Our focus on network intelligence ensures that we will continue to provide unique insights into the applications and content that drive internet traffic growth every day.

We hope you will enjoy the report. If you have any suggestions on how we can make this report better, we would appreciate your input. Please feel free to reach out to phenomena@sandvine.com.

Lyn Cantor, CEO, Sandvine

Welcome to the Mobile Phenomena Report



After the Global Internet Phenomena Report was released, I was bombarded with questions on how mobile networks were different from fixed networks. With

the sheer volume of fixed network traffic generally dominating mobile in the Global Internet Phenomena Report, I wanted to shine a light on the differences with a mobile-specific report.

This edition of the Phenomena Report will cover the global and regional micro views of the composition of traffic on the mobile internet. Sandvine's value proposition to our customers is the accuracy and granularity of our network intelligence. Therefore, we focus on identifying as many applications as we can, despite how the internet is becoming more encrypted.

Why is this important?

When networks get congested (and they **always** end up congested), the solution to the problem depends on the root cause. That sounds logical, but mobile operators in many parts of the world are limited today by both regulatory issues and a lack of visibility. They are struggling to retain the visibility that they

need to make the right network investments that deliver a high quality experience to their subscribers. Different applications require different network resources to achieve good quality, and without accurate visibility into network traffic composition, network operators cannot deliver a good experience for consumers.

5G is expected to relieve network congestion in the short-term, but that never seems to happen! As operators try to make their 4G networks last as long as possible, optimizing them to be as efficient as possible while still delivering quality will be critical.

The Mobile Internet Phenomena Report ranks applications based on their "traffic share." The fascinating data that fuels the report illustrates the disconnect between "market share" for companies defined by subscriber counts and how often subscribers use a service. Traffic share is defined as the percentage of network resources used by a specific application relative to other applications.

For global and regional overall reports, we rank all applications that Sandvine can see with our Active Network Intelligence Classification Engine. This list has well over 3,000 applications and grows on a weekly basis.

Cam Cullen, VP of Marketing, Sandvine

About the Mobile Internet Phenomena Data

The data in this edition of the Mobile Internet Phenomena Report is drawn from Sandvine's installed base of mobile operators worldwide. The report does not include significant data from either China or India, but the data represents a portion of Sandvine's 2.5B subscribers installed base, a statistically significant segment of the internet population.

This edition is solely focused on mobile data in order to provide a targeted model that mobile operators can draw from to begin their planning process.

Within each section, Sandvine measured the global traffic share for applications from several different perspectives:

- **Downstream:** This is the traffic volume downloaded from the internet. Examples would be a video stream, a file download, or an app download from Apple's App Store.
- **Upstream:** This is the traffic volume uploaded to the internet. It could be requests for content (i.e., browsing the Netflix library), an interactive messaging session, or a Twitch stream of a gaming session from a console.
- **Connections:** This represents the number of "conversations" occurring for an application. Some applications use a single connection for all traffic, others (like Netflix, BitTorrent, or Pokemon Go) use many connections to transfer data or video to the end user.

Section 1: Global News

HIGHLIGHTS IN THIS EDITION

A brief overview of some of key findings in this issue of the Global Internet Phenomena Report.

EXECUTIVE OVERVIEW

What are the phenomena that are dominating the mobile internet in 2019 and what marks mobile as different to fixed? One mobile app dwarfs even Netflix.

GLOBAL MOBILE APPLICATION TRAFFIC SHARE

What applications are the leading consumers of mobile internet bandwidth? And how much of that is a high definition version of social media?

Section 2: Regional News

NORTH AMERICA'S UPSTREAM AND DOWNSTREAM MOBILE TRAFFIC SHARE

Standalone web browsing in North America bucks the trends seen in other global regions by a considerable amount, as North American mobile users make use of Google and its family of applications.

LATIN AMERICA'S UPSTREAM AND DOWNSTREAM MOBILE TRAFFIC SHARE

Latin America's predominantly usage-based pre-paid mobile plans directly influence users' mobile applications-of-choice. But does this effect the popularity of the apps the dominate in other regions?

EUROPE'S UPSTREAM AND DOWNSTREAM MOBILE TRAFFIC SHARE

Some recent PR challenges for Facebook have pushed one social media platform up the mobile internet charts.

MIDDLE EAST'S UPSTREAM AND DOWNSTREAM MOBILE TRAFFIC SHARE

Regional demand for alternatives to SMS drive Snapchat to the number 1 (upstream) and number 2 (downstream) positions in the mobile charts for the Middle East.

ASIA PACIFIC'S UPSTREAM AND DOWNSTREAM MOBILE TRAFFIC SHARE

Facebook and YouTube continue to dominate in the Asia Pacific region as elsewhere but others are growing in popularity, not just regionally but globally too.

Section 3: Spotlights

SPOTLIGHT: QOE AND PACKET LOSS

Quality of Experience for users on mobile networks is often overlooked. We examine why mobile operators should care about QoE and delve into how we can help network operators can keep one eye on the QoE ball.

SPOTLIGHT: APPLICATION ENGAGEMENT

What percentage of devices connected to their network use a specific application? The higher the percentage, the more likely that the application is considered "important" to a user.

INFOGRAPHIC COLLECTION AND RESOURCES

Want to use some of this data? We have a handy collection of resources to simplify re-use of the data in the Phenomena report, as well as links to more information if you have questions for us.

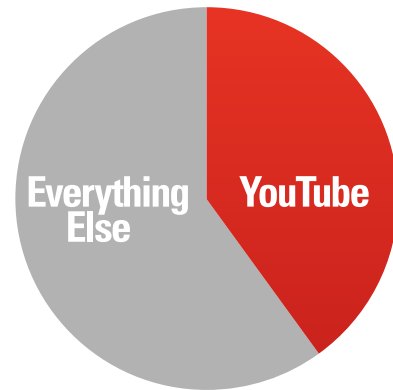
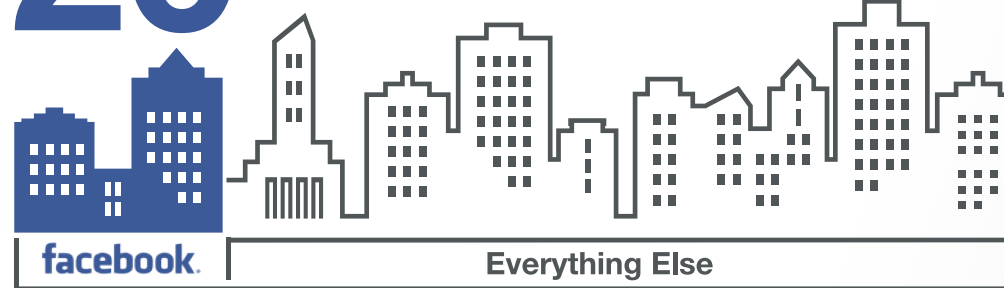


Tik Tok

is **#11** worldwide downstream usage and almost **1.5%** of worldwide mobile traffic

Facebook properties account for over

20% of worldwide mobile traffic



 **YouTube** is **35%** of worldwide mobile traffic

More than **80%** of users still use

Unencrypted HTTP



at least once a month



Snapchat



is application worldwide by overall mobile bandwidth usage

HIGHLIGHTS IN THIS EDITION

How is mobile different than fixed:

- YouTube rules the mobile roost: In the Global Phenomena Report, YouTube was not the largest overall application — in mobile, it is number one in every region.
- Social networking proliferates: Social networking appeared in the overall report, but it drives massive engagement on mobile, with Facebook, Instagram, and even Snapchat appearing as key applications.
- Messaging Apps replace SMS: WhatsApp, LINE, Facebook Messenger, and Snapchat all appear as key applications around the world.
- The “cloud” is pervasive: iCloud and Google Cloud appear as key applications on the upstream as mobiles transition to the main camera for nearly all users.
- Not everyone uses DNS: Interestingly enough, the impact of IoT and more network infrastructure is beginning to show up in the fact that DNS is NOT used by 100% of all users on the network.
- Advertising is everywhere: DoubleClick ranks highly for engagement with users, with over 80% of users in APAC using DoubleClick services (knowingly or not!).

YouTube is the Mobile King

The 2018 Global Internet Phenomena Report demonstrated how dominant video traffic is on networks around the world. It isn't a surprise then that video is also the leading traffic source on mobile, but the kingpin for mobile is different. YouTube is the global leader with over 35% of worldwide mobile traffic, dwarfing Netflix's 15% share in the Global Report.

YouTube was consistently the top source of traffic in each region surveyed. In APAC, it was a rout with over 38% of all downstream traffic attributed to YouTube. YouTube also appears on the upstream as a major driver of traffic, with users uploading and live streaming to the video sharing site.

Netflix does appear in the top 10 in most regions, but is not the driver it is on fixed networks. Netflix is streamed at lower resolutions on mobile networks and is more efficient than other video streaming services (as covered in the Global Report). In general, Netflix's long-form video is not something people do on mobile, as they use their peak hour binging on large screens. However, fixed mobile substitution service plan offerings, as we are likely to see with early 5G deployments, will have far more Netflix usage. In regions where Netflix is highly ranked, the plans are more likely to be unlimited, and the primary connection for the user to the internet.

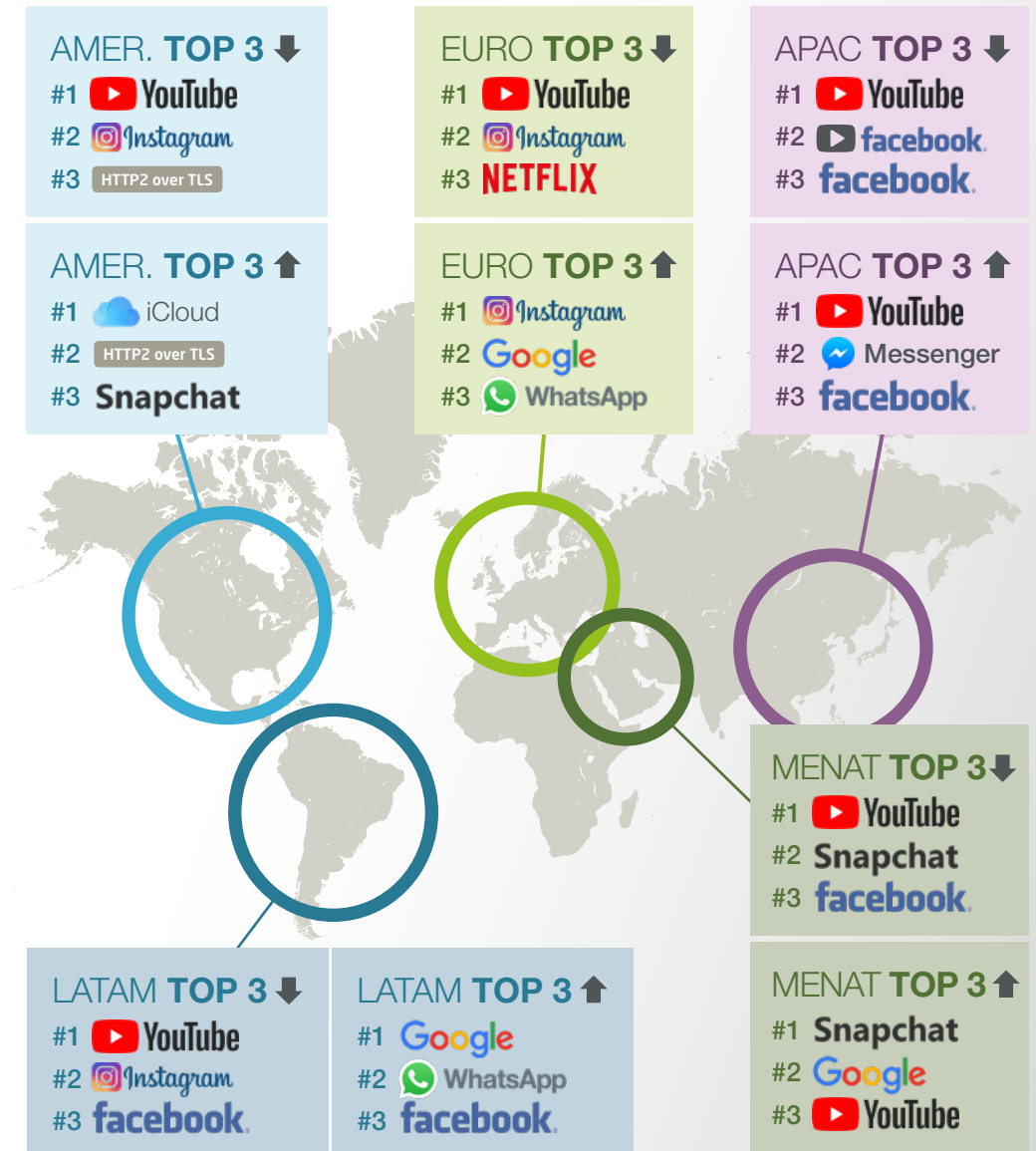
Speaking of Facebook and Instagram, both are top drivers in the mobile space from both a volume as well as an engagement point of view. Multiple Facebook properties (Instagram, Facebook, Messenger, and WhatsApp) appear as top 10 contributors to overall downstream and upstream traffic. In regions where we measured user engagement, Instagram and Facebook both hit over 70% of users engaging with the applications during the report period of one month; we all know the

people that can't go more than a few minutes without checking their social networks!

Messaging applications have continued to replace traditional SMS, with WhatsApp, LINE, Snapchat, and Facebook all hitting the top 10 lists. Different regions had messaging favourites, but their popularity in the top 10 was consistent. In the overall report, messaging apps only appeared on the upstream list as a few percentage points of volume. In the mobile report, messaging apps were significant players on both the upstream and the downstream.

Cloud traffic to iCloud, iCloud Photo Stream, and Google Cloud all make appearances, with iCloud generating more traffic than Google Cloud consistently in different regions. With mobile devices serving as the main cameras for users now, it is clear that photos are taken, stored in the cloud, and then posted on one (or multiple) social networks.

An interesting fact that came out of the data was that not all network devices use Domain Name Service (DNS). If your first thought is, “How is that possible?” you are not alone. What this means is that there is a small percentage of devices that just use hard coded IP addresses for specific services, or all of their DNS goes through IPsec VPNs. This might be an interesting Phenomena Spotlight for the future.



GLOBAL APPLICATION TRAFFIC SHARE

1	YOUTUBE	37.04% ↓	10.08% ↑
2	FACEBOOK	8.37% ↓	6.26% ↑
3	SNAPCHAT	8.29% ↓	10.44% ↑
4	INSTAGRAM	5.71% ↓	5.93% ↑
5	WEB BROWSING	4.55% ↓	4.15% ↑
6	WHATSAPP	3.68% ↓	3.5% ↑
7	FACEBOOK VIDEO	2.53% ↓	1.56% ↑
8	NETFLIX	2.44% ↓	0.46% ↑
9	APP STORE	2.12% ↓	0.95% ↑
10	GOOGLE PLAY	1.90% ↓	0.72% ↑

The Social Mobile Network (shown in HD)

YouTube is the commanding leader on the worldwide mobile internet; not by a little, by a lot, and interestingly enough, not just on the downstream, but on the upstream, too. Between YouTube (often considered a social network in its own right), Facebook, Instagram, and Snapchat, the mobile network is a window into the social lives of the world (being viewed in HD).

YouTube: YouTube is still the dominant video streaming application consumed on mobile. The sheer volume of YouTube consumed on the mobile internet even dwarfs the lead that Netflix has globally overall. There has been some shift in certain regions to Facebook Video, but YouTube is still #1.

Facebook: The social behemoth continues to dominate. It is important to notice that Facebook Video is a separate application below, but even if it was combined, Facebook would still lag versus YouTube.

Snapchat: A very noisy application that also showed well in the Global Report, the mobile usage of Snapchat overachieves based on its installed user base, and is #3 downstream, but #1 upstream and actually #2 overall worldwide.

Instagram: Instagram is a growing force on the mobile internet. As more users and brands push rich media Instagram posts over Facebook posts, Instagram will grow, likely catching Facebook in the near future.

Web browsing: Good old web browsing, done securely. Unlike the Global Report, unencrypted HTTP is not in the top 10, showing that more mobile sites are utilizing TLS to protect their connections. This is good for consumers and good for the internet.

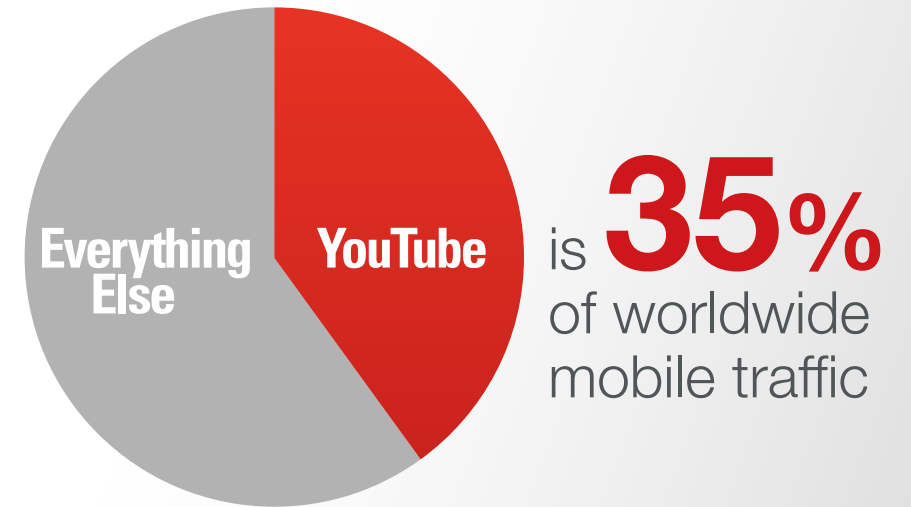
WhatsApp: Already a major contributor to mobile traffic, Facebook's move to combine multiple messaging platforms means that it is likely that this application will climb the charts next time we do a report on mobile networks.

Facebook Video: Called out as a separate application in Sandvine's analytics, Facebook Video is gaining popularity rather than embedded YouTube videos posted on Facebook.

Netflix: Netflix has actually grown quite a bit over the past few years on mobile. Although 2.44% is not the 15% that it holds on the Global Report, Netflix is gaining more users on mobile networks that want to binge while on the move.

App Store: Anyone that has an iPhone is not surprised by the fact that the App Store is in the top 10, even though many devices wait until they are on WiFi to download. The sheer volume of updates to every iOS device ensures that iTunes will be near the top of the charts.

Google Play: Just like the App Store, Google Play is also a significant application as users download apps and updates. With only a .22% difference between the two, the gap might be narrowing further in the future.



AMERICAS ↓ TRAFFIC SHARE TOP 10

- 1 YOUTUBE 15.29% ↓
- 2 INSTAGRAM 14.47% ↓
- 3 WEB BROWSING 11.25% ↓
- 4 FACEBOOK 7.39% ↓
- 5 FACEBOOK VIDEO 6.48% ↓
- 6 NETFLIX 5.63% ↓
- 7 SNAPCHAT 4.68% ↓
- 8 GOOGLE 4.25% ↓
- 9 APP STORE 2.59% ↓
- 10 ICLOUD 2.27% ↓

AMERICAS ↑ TRAFFIC SHARE TOP 10

- 1 ICLOUD 16.43% ↑
- 2 WEB BROWSING 12.77% ↑
- 3 SNAPCHAT 7.09% ↑
- 4 GOOGLE 7.03% ↑
- 5 INSTAGRAM 6.63% ↑
- 6 FACEBOOK 4.87% ↑
- 7 WHATSAPP 4.25% ↑
- 8 FACETIME 3.84% ↑
- 9 YOUTUBE 2.10% ↑
- 10 APP STORE 2.00% ↑

The standalone Web is relevant

The biggest difference in the North America traffic composition is how much web browsing is done outside the top 100 sites. Standalone web browsing is in the top applications on both the downstream and the upstream. Although web browsing is in the top 10 in other regions, it is the highest in the rankings in North America at #3.


What does this mean? It means that in North America, people use their standalone mobile web browsers more than other regions (by quite a margin), rather than always viewing the world through their social feeds and headlines alone. With Google also appearing in the top 10 on the upstream and downstream, it indicates that there is more mobile searching going on in North America as well.

As mentioned above, Google is in both the top 10 for upstream and downstream, even though Google Play is not in the top 10 in North America (it was actually at #11, knocking on the door!). Interestingly enough, Google Maps was #13 on the upstream, the highest it was worldwide, indicating the popularity of “Let Google guide me there!” for real-time navigation and even searching for things to do nearby.

iCloud being the top upstream traffic source at over 16% indicates the popularity of iOS devices in the region, and also the popularity of the iCloud storage offerings from Apple. In this specific instance, iCloud photo stream is combined with general iCloud traffic, so this is an aggregate of both services; the rankings of Snapchat, Facebook, and Instagram indicate that many photos are taken on devices, stored in iCloud,

then shared on social media (or multiple social channels!). In addition to iCloud, the App Store is also in the downstream and the upstream top 10, providing more evidence of the iOS lead in North America.

FaceTime also makes its only appearance in a top 10 list, further reinforcing the iOS advantage in North America. Despite recent bugs, FaceTime in North America takes usage away from other messaging applications like WhatsApp and Skype. Video conferencing over mobile is becoming more prevalent as the mobile network is capable of delivering better performance and clear video. In the past, video streaming over mobile was not a pleasant experience, but as 4G network speeds have become more commonplace and video codecs improve, more users are taking advantage of the ability of their high resolution cameras to not only video conference, but to stream live video from their handsets.

More than **80%** of users still use
Unencrypted HTTP 
at least once a month

LATAM ↓ TRAFFIC SHARE TOP 10

- 1 YOUTUBE 17.35% ↓
- 2 INSTAGRAM 14.70% ↓
- 3 FACEBOOK 12.95% ↓
- 4 WHATSAPP 11.87% ↓
- 5 FACEBOOK VIDEO 10.51% ↓
- 6 WEB BROWSING 8.19% ↓
- 7 GOOGLE 3.90% ↓
- 8 GOOGLE PLAY 2.76% ↓
- 9 NETFLIX 1.90% ↓
- 10 SPOTIFY 0.80% ↓

LATAM ↑ TRAFFIC SHARE TOP 10

- 1 GOOGLE 18.07% ↑
- 2 WHATSAPP 10.83% ↑
- 3 FACEBOOK 10.77% ↑
- 4 WEB BROWSING 7.73% ↑
- 5 INSTAGRAM 6.86% ↑
- 6 WHATSAPP 4.43% ↑
- 7 YOUTUBE 3.74% ↑
- 8 ICLOUD PHOTO STREAM 3.03% ↑
- 9 ICLOUD 2.71% ↑
- 10 FACEBOOK MESSENGER 2.62% ↑

Facebook properties dominate

Mobile networks in Latin America are dominated by usage-based prepaid service plans, and users are always looking to find ways to reduce their bills. Although YouTube is still #1 in the region, the percentage of traffic for YouTube is lower than in other regions, as cost has spread the application usage to be much more balanced than in other regions. The usage for networks in LATAM is a few orders of magnitude lower than other regions for each network, which means that the impact of their data in the global numbers is less than other regions.

Even with a focus on lower usage, the Facebook properties of Instagram, WhatsApp, Facebook, and Facebook Video are all over the leaderboard for LATAM mobile networks. Users interact and share via mobile networks, with WhatsApp specifically

being very popular in parts of LATAM (like Brazil). In 2016, when WhatsApp was blocked in Brazil due to regulatory concerns, it had a major impact on the country since many people used WhatsApp as their main communications tool. These numbers show that this is still the case, as WhatsApp is #4 on the downstream and #2 on the upstream. Facebook Video and Messenger also show well, illustrating the move to using Facebook as a primary sharing tool for users in the region, and likely taking share away from YouTube on the video front.

Netflix also being in the top 10 indicates the relatively poor penetration for high speed fixed-line infrastructure in the region, with users spending their valuable mobile usage allowances on long-form videos like you find on Netflix versus short-form videos on YouTube and Facebook Video. For

many users, their mobile connection is not only their primary connection, it is often the highest speed connection that they have into the regional broadband internet.

iCloud Photo Stream and iCloud are also in the top 10 on the upstream, showing the strength of iOS devices in the region as well as the high usage of photo sharing on social networking, a common theme in regions where social networking and iCloud are highly ranked.

Spotify makes its only top 10 appearance in the regional rankings in LATAM, with a #10 ranking on the downstream; interestingly, this demonstrates either the popularity of the service in LATAM or the low overall aggregate usage, as music streaming services are not usually top 10 applications.

Facebook properties account for over **20%** of worldwide mobile traffic



EUROPE ↓ APPLICATION TRAFFIC SHARE TOP 10

- 1 YOUTUBE 24.83% ↓
- 2 INSTAGRAM 8.16% ↓
- 3 NETFLIX 7.23% ↓
- 4 WEB BROWSING 6.24% ↓
- 5 FACEBOOK VIDEO 5.88% ↓
- 6 FACEBOOK 4.87% ↓
- 7 HTTP MEDIA STREAM 2.73% ↓
- 8 QUIC 2.41% ↓
- 9 SNAPCHAT 2.37% ↓
- 10 ITUNES STORE 1.94% ↓

EUROPE ↑ APPLICATION TRAFFIC SHARE TOP 10

- 1 INSTAGRAM 7.04% ↑
- 2 GOOGLE 6.67% ↑
- 3 WHATSAPP 5.81% ↑
- 4 FACEBOOK MESSENGER 4.76% ↑
- 5 SNAPCHAT 4.73% ↑
- 6 ICLOUD 4.65% ↑
- 7 WEB BROWSING 4.57% ↑
- 8 ICLOUD PHOTO STREAM 4.14% ↑
- 9 GOOGLE CLOUD STORAGE 4.07% ↑
- 10 YOUTUBE 3.82% ↑

The world according to Instagram

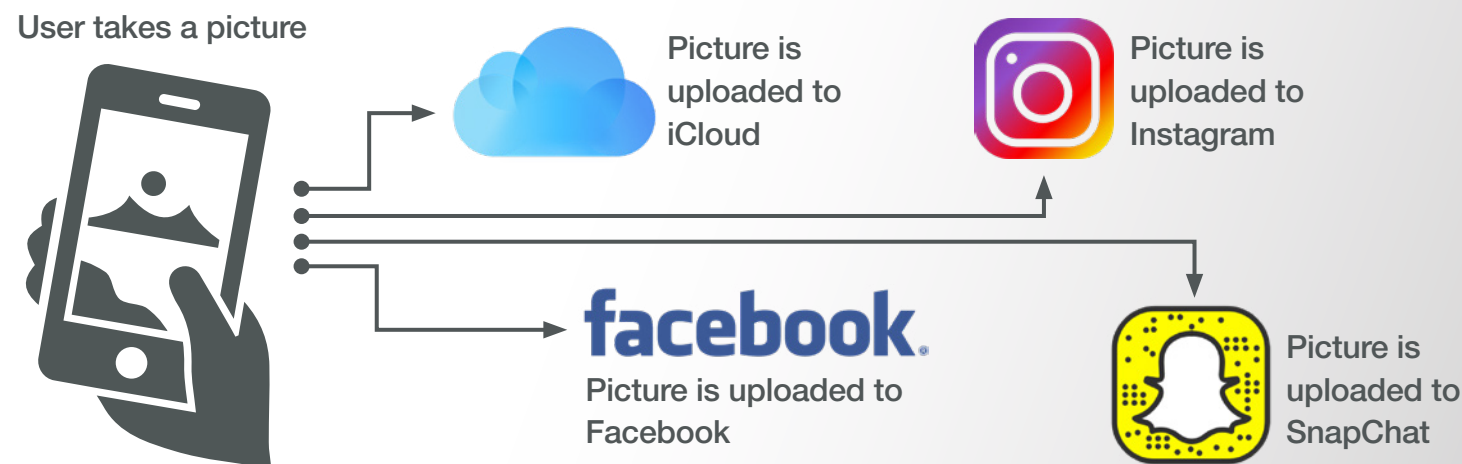
Instagram has over 1B users worldwide. According to the Mobile Phenomena Data, it is very significant in Europe as a main driver of traffic. Instagram was not in the top 10 in the Global Report for Europe, but it is #2 downstream and #1 upstream in the region.

Based on the traffic rankings in Europe, Instagram is clearly taking traffic from Facebook on mobile. From a user perspective, browsing an Instagram feed is definitely more visual and generally entertaining than Facebook; however, it is also highly leveraged by brands and promoters versus just friends, and promoters can be quite noisy on a daily basis with their stories on Instagram. With Facebook experiencing a bit of a crisis in several parts of the world with user trust, it would not be surprising if Instagram continued to gain traffic share worldwide.

Netflix lands its highest ranking worldwide with a #3 ranking in Europe on the downstream at 7.23%. There are quite a few countries in Europe that offer attractive Fixed Mobile Substitution plans for users, so this is a reflection of the success of that type of offering, especially when paired with an unlimited usage plan. In residential areas where congestion is not prevalent, or even where fixed-line is limited to DSL, mobile connections are a good option for households as their main connection. As 5G comes online, we are likely to see more and more of these offerings around the world, especially in markets where the initial 5G devices will be standalone modems targeted towards fixed-line replacement services. We plan to do 5G-specific reports once we start seeing enough deployments to make them statistically significant.

The cloud is also pervasive in the region, with both iCloud and Google Cloud Storage appearing on the top 10 list for upstream traffic. With Instagram and Facebook in the top 10 as well, this continues the trend on when Instagram rates highly overall, the cloud storage services do as well. With Europe being so picturesque and people wanting to share, it is not a big surprise!

The other unique result in Europe is the appearance of HTTP Media Streaming in the top 10. As reported in the Global Report, HTTP Media Streaming represents a generalized streaming video bucket when we have not specifically measured the content provider. This might be local channel streaming to mobile devices, or it could also be other streaming content that Sandvine is intentionally not classifying based on the site types.



MENAT ↓ APPLICATION TRAFFIC SHARE TOP 10

1	YOUTUBE	36.66% ↓
2	SNAPCHAT	10.61% ↓
3	FACEBOOK	7.80% ↓
4	INSTAGRAM	5.83% ↓
5	WHATSAPP	4.67 ↓
6	WEB BROWSING	2.98% ↓
7	NETFLIX	2.71% ↓
8	APP STORE	2.46% ↓
9	PLAYSTATION DOWNLOAD	2.41% ↓
10	TIK TOK	1.56% ↓

MENAT ↑ APPLICATION TRAFFIC SHARE TOP 10

1	SNAPCHAT	11.53% ↑
2	GOOGLE	8.69% ↑
3	YOUTUBE	9.37% ↑
4	INSTAGRAM	6.05% ↑
5	WHATSAPP	4.06% ↑
6	WEB BROWSING	3.53% ↑
7	FACEBOOK	4.42% ↑
8	IPSEC VPN	1.59% ↑
9	APP STORE	1.51% ↑
10	PLAYTATION DOWNLOAD	0.93% ↑

Mobile Chat, anyone?

Messaging and security applications supplement the expected YouTube/social network dichotomy for the mobile traffic in the Middle East. Snapchat makes its strongest showing in a region, and IPsec VPNs appear on the list for the first time.

Snapchat scores its first #1 (and #2 actually) position in a regional top 10, which is one of the big drivers for why it was the #3 application worldwide for downstream and #1 for upstream. The application showed strongly in each region, which has built up a solid base for its overall worldwide position. With demand for messaging applications very strong in the Middle East as an SMS replacement, having both Snapchat and WhatsApp in the top 10 both in upstream and downstream is not a surprise. As mentioned in the overview section, Snapchat users are very “noisy” (aka active) in the application, and share pictures and videos regularly, so this is what drives the usage up so high.

WhatsApp is also very popular in the region, complementing the position of Facebook/Instagram as the leading social platforms. Unlike some of the other regions where Facebook Video shows up, the Middle East appears to be sticking to sharing YouTube clips at this time. Some of the other Facebook messaging tools are further down the list in the region. Therefore, just as in other regions, Facebook’s impending combination of their messaging platforms will likely change the mobile traffic dynamic in the region once this happens.

Just as in Europe, Netflix makes a decent showing, and the likely reason is revealed in #9 on the list – the PlayStation Download. Anytime we see this in the top 10 list for mobile, it means that some users are leveraging their mobile connection as the primary broadband connection, as few people try and play PlayStation games on mobile just for the heck of it, and certainly not enough to propel it into the top 10. As was discussed in the Global Report, the size of game downloads has grown drastically, reaching over 100GB in some cases, so the assumption is that people must have some unlimited plans to make this economical, especially if you add Netflix on top of gaming!

The last interesting bit from the Middle East is that IPsec VPNs make their only appearance in the top 10 anywhere in the world. With users potentially seeking to evade some of the regional content restrictions, the use of VPNs illustrates that many users are taking advantage of the technology to access regionally restricted content.



Snapchat



is application worldwide by overall mobile bandwidth usage

APAC ↓ APPLICATION TRAFFIC SHARE TOP 10

1	YOUTUBE	38.37% ↓
2	FACEBOOK VIDEO	11.30% ↓
3	FACEBOOK	10.55% ↓
4	WEB BROWSING	6.29% ↓
5	INSTAGRAM	4.47% ↓
6	LINE	2.81 ↓
7	QUIC	2.61% ↓
8	GOOGLE PLAY	2.04% ↓
9	TIK TOK	1.24% ↓
10	HTTP MEDIA STREAM	1.15% ↓

APAC ↑ APPLICATION TRAFFIC SHARE TOP 10

1	YOUTUBE	12.84% ↑
2	FACEBOOK MESSENGER	12.30% ↑
3	FACEBOOK	9.27% ↑
4	INSTAGRAM	8.37% ↑
5	LINE VOICE	7.48% ↑
6	GOOGLE	5.74% ↑
7	FACEBOOK VIDEO	4.48% ↑
8	ICLOUD PHOTO STREAM	4.26% ↑
9	LINE	4.01% ↑
10	WEB BROWSING	3.52% ↑

YouTube and Facebook dominate

It is not a surprise that YouTube is #1 and Facebook (of many varieties) is all throughout the top 10 in APAC. Asia has historically been the most active region in the world for Facebook, especially Thailand (Bangkok often ranks top in the world of users in a single city), so traffic stats would back that up.

YouTube is also #1 on the upstream in the region, indicating either a larger population of live streamers, or simply more users uploading via a mobile device rather than a desktop (which is what the Global Report hinted at). Videos are shared via social media quite frequently in APAC, and this trend is illustrated both by the YouTube statistic as well as the next one – Facebook Video.

The rise of both Facebook Video as well as Facebook VoIP illustrates that Facebook has become a hub for daily social interaction in the region. Facebook Video places higher in APAC than anywhere else in the world, even with YouTube being such a high percentage of traffic. These results likely indicate that videos previously shared on YouTube in the region are now being shared with Facebook, which we have not seen in other regions at this level yet.

In aggregate, Facebook properties account for over 25% of downstream traffic and over 30% of upstream traffic in the region, the largest showing by Facebook worldwide, where the total of all Facebook traffic is closer to 10% on the downstream and even less on the upstream. With Instagram also growing in popularity in the region, Facebook is a major player in the region that drives traffic, encouraging operators to ensure that the Facebook CDN gets plenty of bandwidth and caching is used to deliver high QoE!

Several other applications make their first appearance in the top 10 lists for APAC, that may indicate a growing presence worldwide.

Tik Tok ranks #9 in APAC for downstream, after just barely missing out on the worldwide top 10. Tik Tok, which added Music.ly to its portfolio last year, is a rapidly growing service that is spiking in many countries worldwide. The service is similar to YouTube, but their stated mission reflects a mobile and social focus: “Tik Tok is a destination for short-form mobile videos. Our mission is to capture and present the world’s creativity, knowledge, and precious life moments, directly from the mobile phone. Tik Tok enables everyone to be a creator, and encourages users to share their passion and creative expression through their videos.” This is a hot mobile application, and one that mobile operators should pay more attention to in the coming months.

The final note on APAC traffic is that there is more diversity in the region due to the many localized applications present throughout the region. Just as in the Global Report, APAC registered over 2,200 active mobile signatures, more than any other region in the report. As previously mentioned, we are not reporting on mobile traffic from China, but many applications common in the region are Chinese language and are fully supported by Sandvine.



Tik Tok

is **#11** worldwide downstream usage and almost **1.5%** of worldwide mobile traffic

Impact of bad QoE on networks

An overlooked metric on many mobile networks is the actual QoE delivered to users. A network that has a high throughput may not meet the needs of a user that is interested in gaming or voice applications, as they require low latency and low packet loss.

To offer visibility into delivered QoE, Sandvine innovated with a solution offering called ScoreCard. ScoreCard measures the three most important factors in a consumer's experience at sub-second intervals:

- **Throughput** Measured at all times and scored at peak times; not a instantaneous "Speed Test" that can be affected by congestion or other network policies
- **Latency** Measured for each connection to detect the round-trip time (RTT) for delay-sensitive applications like gaming and voice applications
- **Packet Loss** Measured to determine the efficiency of networks and any impact on loss-sensitive applications like interactive audio and video

The scoring methodology is updated yearly to account for changes in broadband technology and in application behavior. Encryption has no effect on scoring, as the same metrics apply to traffic whether it is encrypted or not, and Sandvine has advanced heuristics to identify applications using encryption technology. A network score is comparable anywhere in the world, and comparable between fixed and mobile networks, enabling a consumer to assess if a mobile connection can meet their needs to replace a fixed-line connection for their preferred

applications. Network operators using ScoreCard will be able to maximize the ROI for improving the subscriber experience.

In this version of the Mobile Phenomena Report, we measured some of the applications in different regions that experienced bad QoE in networks. Let's look at how these QoE metrics would affect the applications.

YY VoIP (APAC): On one network, YY VoIP saw 75% packet loss and a latency of over two seconds during the report cycle. For a voice application, experiencing 75% loss and a high latency would be disastrous. Fortunately, less than 1% of subscribers used this application, but those that did not have a good experience.

Benchbee Speed Test (Europe): This is a pretty ironic result for bad QoE. Benchbee is a mobile application designed to test network speed (like Ookla Speedtest). The European network in this case had 18% packet loss and a latency of over 500ms total as an average for the report period. Ookla (on the same network) showed 8ms latency and .08% packet loss. Sometimes speed test applications may not accurately represent QoE, so be careful!

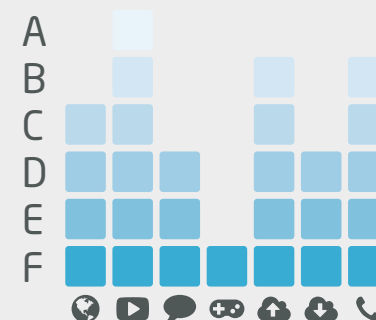
Mortal Kombat X (Americas): Gaming generally wants low latency and low packet loss, without the need for a lot of bandwidth. On this network, Mortal Kombat experienced a latency of only 50ms, but a packet loss of 26.04%, resulting in a likely bad experience for the user.

What QoE is your network capable of delivering?

Example ScoreCard Application Breakdown

ScoreCard rates the experience that an operator's network is capable of delivering in categories that matter to subscribers.

Improve the subscriber experience and prioritize investments for maximum ROI. Break down analytics by device, location, and subscriber tier with ScoreCard.



Web Surfing
Scores C. Experience is impacted by network quality. Did you know 3% packet loss doubles page load times?

Streaming Video
Scores A. With very high throughput available, this network is ready for HD and even 4K streaming.

Social Media
Scores D. Latency is severely affecting the interactive experience of social messaging applications.

Real Time Gaming
Scores F. Due to the high latency, gaming is not viable. Fixed is better than mobile for real-time gaming.

Upload
Scores B. With continuous good throughput, large email attachments are sent in a snap. Did you know the average smartphone photo is 6 MB?

Download
Scores C. Expectations are higher and simultaneous downloads happen more frequently than uploads.

Voice Applications
Scores B. Great conversation quality. Modern voice applications benefit from a stable, consistent latency.

APAC APPLICATION ENGAGEMENT TOP 10

- 1 DNS 96.98%
- 2 HTTP (TLS) 91.23%
- 3 GOOGLE 89.97%
- 4 FACEBOOK 88.08%
- 5 ICMP 87.64%
- 6 HTTP 86.75%
- 7 INSTAGRAM 85.86%
- 8 YOUTUBE 82.82%
- 9 LINE 80.64%
- 10 DOUBLECLICK 80.31%

Application Engagement

Sandvine's engagement numbers reflect what percentage of devices connected to their network use a specific application. The higher the percentage, the more likely that the application is considered "important" to a user (or at least the specific device that they are using).

This statistic takes every device connected to the network and determines what applications are used – a 100% rate would indicate that all devices that connect to the network use that application. Some applications on this list are generally viewed as mandatory for networking usage, DNS and ICMP are the primary infrastructure protocols that appear on both the Europe and APAC top 10. Others are voluntary, and a high engagement number means that your user base considers it to be an integral part of their mobile experience, with Google, Facebook, and Instagram ranking highly in this category. The third category is applications that you have no idea are being interacted with on a daily basis, but are a fundamental part of your mobile experience. DoubleClick (advertising), Google Analytics (web), and Crashlytics (application reporting) are all examples of this type of application

Top of the list for both Europe and APAC is Domain Name Service (DNS). DNS is the foundation of the internet; when I type www.sandvine.com, DNS translates that to a specific address. DNS is a popular attack point for DDOS attacks, since without it the internet is essentially unreachable for most systems. The interesting statistic is that this

number is not 100%, which means that there are likely IoT devices or network equipment that only contact fixed addresses and do not use DNS.

HTTP (TLS) is #2 in both regions, which is a great sign, as the more security that is used on the internet, the better. The fact that ~10% of devices do not use HTTP (TLS) at all is almost as interesting as those that do not use DNS, as it indicates that those devices/users are either very application-specific (like just using Amazon Alexa) or are so old that they don't use web traffic at all! Unencrypted HTTP also make an appearance in both regions, even though neither region showed it as a top 10 application, it is still used by more than 80% of users; let's hope that this number goes down over time.

Google is #3 in both regions, and this once again demonstrates the dominance of Google as a portal to the world. Facebook and Instagram are also highly rated in both regions, echoing the results from the traffic share reports for each region.

LINE's dominance in APAC is reflected in the statistic that over 80% of users interact with the application at least once a month. Since LINE also showed up in the traffic share reports, LINE has done a great job in not only having their application as a background activity for users, but a vibrant experience that they regularly interact with.

Some of the more interesting data sits in both regions with the prevalence of DoubleClick at

80% in APAC and 69% in Europe. DoubleClick is Google's advertising arm, and the fact that so many users are interacting with it on a daily basis demonstrates why their revenue is so high. Google Analytics is not exactly advertising, but in Europe appears in the top 10 and is used by websites to track how users interact with their sites, so its appearance reflects how pervasive Google's reach is to track users.

In the same vein is Crashlytics, which we covered in the Global Report. Crashlytics is used by many applications for reporting of crash events to enable application developers to debug their software. This application was 40% overall in the number of connections on the Global Report, and the fact that 65% of mobile users in Europe send data to Crashlytics on a monthly basis confirms that there are still too many application crashes on mobile devices!

EUROPE APPLICATION ENGAGEMENT TOP 10

- 1 DNS 98.92%
- 2 HTTP (TLS) 87.63%
- 3 GOOGLE 86.63%
- 4 ICMP 82.14%
- 5 HTTP 80.82%
- 6 FACEBOOK 79.31%
- 7 INSTAGRAM 76.88%
- 8 GOOGLE ANALYTICS 70.04%
- 9 DOUBLECLICK 69.63%
- 10 CRASHLYTICS 65.31%

Infographic links

GRAPH PACK

Top 10 lists for all sections if you want to show the traffic share for any specific geography or class of application.

[CLICK HERE](#)

INFOGRAPHICS PACK

What application categories are the leading consumers of mobile internet bandwidth? The real question is, how much traffic on the internet is video (hint: a whole lot)?

[CLICK HERE](#)

SANDVINE LOGO PACK

Need Sandvine logos for attribution?

[CLICK HERE](#)

Want to know more about Sandvine?

ACTIVE NETWORK INTELLIGENCE

Visit www.sandvine.com to learn about our Active Network Intelligence solutions.

ACTIONABLE DATA

How can the Global Internet Phenomena data become actionable in your network?

Check out our Use Case Book to find out!

<https://www.sandvine.com/use-case-ebook>

RESOURCES

Come see our Resources page for a wide range of videos, webinars, and whitepapers:

www.sandvine.com/resources

Phenomena Roadmap

WHERE TO NEXT?

We plan to issue a full Global Internet Phenomena Report in the middle of the year, and continue to release several spotlight reports when the data speaks to us.

DO YOU HAVE REQUESTS FOR INSIGHTS?

Although putting out the Phenomena report is only one of our contributions to the market, we love inbound requests for data from our customers, prospects, industry analysts, and press. Many of the topics we cover in the Phenomena report cross boundaries from tech into entertainment, and we welcome inquiries where we can help give clarity to the market. If you have questions, please reach out to Sandvine at phenomena@sandvine.com

WANT US TO LOOK AT YOUR DATA?

We are happy to work with operators to do a profile of your network to see how it matches up to the global and regional data that we see around the world. If you have any interest, please reach out to Sandvine at phenomena@sandvine.com

We will also blog regularly, come to Sandvine's blog at www.sandvine.com/blog