

phenomena

THE GLOBAL INTERNET PHENOMENA REPORT JANUARY 2022

Growing app complexity: Paving the way for digital lifestyles and immersive experiences

What's driving the uptick in 1TB per month **power users** and "**excessive-use**" households?

The most popular applications globally and regionally

Global and regional upstream and downstream trends

How will **5G** change app and content usage compared with **4G**?

How are new protocols and encryption affecting networks?



A word from Sandvine CEO Lyn Cantor



Lyn Cantor
CEO Sandvine

Whether you are a major digital, communications or cloud service provider, application Quality of Experience (QoE) is becoming the most important part of your brand. Why? Because customers consume services through applications and care most about application performance.

In the nearly two years of COVID-influenced learning, working, entertaining, and engaging, we have come to depend on applications that underpin our digital lifestyles more than ever. This is driving increased investment in 5G and cloud infrastructure to support heavy app usage. The global average for app usage as of Q12021 was [4.2 hours per day](#), with [\\$32 billion](#) spent on in-app purchases across iOS and Google Play in that time period – a 40% increase from what was recorded in Q1 of 2020.

Not only has the time spent on apps increased, but our dependence on them has become clearer. Consider, for example, something as rudimentary as opening a car door, which becomes temporarily impossible when there's a [glitch in a Tesla app](#), or consider how a [Facebook social media outage](#) (and consequent DNS traffic surge) affected not only Facebook, Instagram, and WhatsApp, but also consumers, networks, businesses, influencers, advertisers, and other unrelated brands.

Even if these app providers recover from glitches that impact their customers' QoE, can we assume the same will be true for the brands of the underlying network

operators? In considering their networks and future business models, the CEOs of Deutsche Telekom, Vodafone, Telefonica and other major European telecoms made a joint [statement](#) about the need for big-tech players to invest in the networks on which their services and apps rely – a burden so far shouldered mainly by service providers. This call comes not long after SK Telecom raised concerns about [Netflix traffic surges](#) due to the impact of Squid Games.

Indeed, in our data for this report, we see that the top-6 app brands account for more than 56% of overall network traffic, the first time their share has exceeded all other traffic.

As consumers and enterprises depend more on applications, the sophistication of these apps is growing, with intricate mashups and combinations of videos, payments, maps, chat, and other features and functions that come together to provide seamless digital experiences.

This complexity is made more profound by the proliferation of multiplexed transport protocols like QUIC, increased use of encryption, and new internet privacy services like Apple iCloud Private Relay – all of which make network visibility and management by service providers all the more difficult and crucial.

The demands for service providers to support greater volumes of complex apps runs parallel to the demands for faster speeds and better network performance.

As service providers transition to 5G and advanced fiber and satellite networks, they'll have to rethink how they analyze, optimize and monetize apps in this more complex app environment. As apps become more important, app QoE and Network QoS will become inextricably tied.

They also have to rethink how "unlimited" they can go, as the data we examine in this report reveals a continued increase in Terabytes per month "power users" and heavy-use households. Has the time come to rethink unlimited plans?

Our data also reveal changes in downstream and upstream traffic, influenced by work-from-home behaviors and a pandemic-driven boom in smart homes and smart businesses.

These changes have driven upswings for the "Big 6" brands, whose vast ecosystems of services and apps continue to lead, though we also see massive momentum from some up-and-comers.

In identifying and analyzing these and other trends in this 2022 Global Internet Phenomena Report, we hope to help service providers inform current and future decisions about capacity planning, network optimization, customer experience, monetization, and security. 



App Quality of Experience is a critical part of service providers' brands, as consumers and enterprises care most about how their apps are performing. It is important to understand customers' perceptions of the network, which come through the lens of their favorite apps and how the experience makes them feel **Lyn Cantor, CEO, Sandvine**



Application QoE DEFINITION

App QoE [Definition]: The degree of delight or annoyance of application users resulting from their expectations regarding the utility/enjoyment of the application. It includes subjective and objective quality needs and experiences arising from the interaction of a user with applications in a particular context. It is based on human factors, such as demographics and behaviors; network factors, such as access type, bandwidth, speed, and latency; device factors, such as performance; and contextual factors, such as location, time of day, and frequency of use. ↻

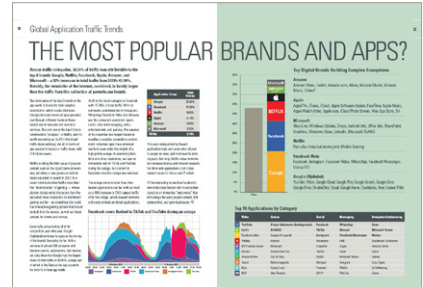
Global Internet Phenomena Report METHODOLOGY

Sandvine gathered data from about 160 Tier 1 and Tier 2 fixed and mobile service providers worldwide, representing an installed base of more than 2.5 billion internet subscribers. We measured total volume for 1H2021 across fixed, mobile, WiFi, and satellite networks, putting applications in the best-fit match category. It is important to note that as apps have become more complex, many categories like 'messaging' 'gaming' and 'social media' include video elements. We have also classified most traffic previously identified as "QUIC" and/or "http streaming" using sophisticated app classification techniques. It has become more important to understand and classify QUIC and http streaming traffic, as well as the apps that comprise it. By doing this service providers can better measure the application experiences of their subscribers. ↻

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APP COMPLEXITY IS ON THE RISE

Mashups, Multiplexing, QUIC, HTTP, and more

In examining industry trends and our customer data for this report, we found that the complexity of applications today is by far the biggest challenge in delivering high-quality app experiences. Because Application Data and Network Quality of Service (QoS) are intricately linked, it is crucial that network operators (NetOps) and security operations (SecOps) get more visibility into how one affects the other. Our optimizing networks while protecting privacy and security is now marred by a slew of more complicated challenges. Here we identify our 'top 5' trends, which we predict will accelerate over the next decade.

- 1. Traversal of Video**
Video-on-demand, live streaming, video sharing, video-assisted applications, and apps with embedded video such as Augmented and Virtual Reality (AR/VR) and Facial Recognition. When videos were primarily YouTube a few years ago, it's now a complex landscape of YouTube, Facebook, Disney + Amazon Prime + News + TV station apps.
- 2. App Growth and Complexity**
Apps are for more services, multitasking, polymorphic, multiplatform, obfuscated and encrypted than ever with embedded video, payments, chat, and other features. Multiplexing within single flows, for example, having video, chat and voice in a single flow, is increasingly used to reduce latency and improve performance. However, it introduces new implementation challenges. These complexities have led to a flood of "unknown" or "other" traffic on some networks that have traditionally relied on more basic techniques to identify app traffic.
- 3. More Efficient Traffic Protocols**
QUIC is increasingly being chosen over Transmission Control Protocol (TCP) or HTTP/2 by Google, Facebook, Apple, and others to create better customer experiences. These protocols are triggering a reevaluation of traffic that is causing efforts to classify applications that are in use. At the same time, other protocols like HTTP Live Streaming (HLS) maintain video quality but create latency issues when used for rapid live streaming.
- 4. New Age of Encryption**
Apple's new data protection service, iCloud Private Relay, encrypts http traffic and can cause network interoperability issues. Transport Layer Security (TLS) 1.3 encrypted traffic is a challenge to decrypt without substantial resources and time, and also requires adherence to privacy regulations.
- 5. Blending of Consumer and Enterprise Apps**
Increasingly popular apps like Microsoft Teams and Zoom are used for working, learning and social engagement from home. Right-work environments present unique security and "shadow IT" issues that must be addressed with more consistent cybersecurity measures to protect devices and networks.

Though there are volumes we could write on each of these areas in an increasingly complex app world, let us explore just a couple that are especially intriguing right now on the following pages. <

APP COMPLEXITY

Mashups, Multiplexing, QUIC, HTTP, and



Y IS ON THE RISE

more

In examining industry trends and our customer data for this report, we found that the complexity of applications today is by far the biggest challenge in delivering high-quality app experiences. Because Application QoE and Network Quality of Service (QoS) are intricately linked, it is crucial that network operations (NetOps) and security operations (SecOps) get more visibility into how one affects the other. But optimizing networks while protecting privacy and security is now marred by a slew of more complicated challenges. Here we identify our “top 5” trends, which we predict will accelerate over the next decade.

1. Tsunami of Video

Video-on-demand, live streaming, video sharing, video conferencing, video-supported applications, and apps with embedded video (e.g., Augmented/Virtual Reality and Facial Recognition). Where video was primarily YouTube a few years ago, it's now a complex tapestry of YouTube + Netflix + Disney + Amazon Prime + News + TV station apps. There is also more upstream video traffic due to video conferencing, social sharing, and security surveillance.

2. App Growth and Complexity

Apps are far more numerous, mashed up, polymorphic, multiplexed, obfuscated and encrypted than ever with embedded video, payments, chat, and other features. Multiplexing within single flows, for example, having video, chat and voice in a single flow, is increasingly used to reduce latency and improve performance. These complexities have led to a flood of “unknown” or “other” traffic on some networks that have traditionally relied on more basic techniques to identify app traffic.

3. More Efficient Traffic Protocols

QUIC is increasingly being chosen over Transmission Control Protocol (TCP) or HTTP/2 by Google, Facebook, Apple, and others to create better customer experiences. These protocols are triggering a firestorm of traffic that is clouding efforts to classify applications that are in use. At the same time, older protocols like HTTP Live Streaming (HLS) maximize video quality but create latency issues when used for rapid live streaming.

4. New Age of Encryption

Apple's new data protection service, iCloud Private Relay, encrypts http traffic. This can cause network incompatibility issues and make it more difficult to analyze and manage app QoE.

5. Blurring of Consumer and Enterprise Apps

Increasingly popular apps like Microsoft Teams and Zoom are used for working, learning and social engagement from home. These applications have increased upstream traffic volume. Hybrid work environments present unique security and “shadow IT” issues that must be addressed with more consistent cybersecurity measures to protect devices and networks.

Though there are volumes we could write on each of these areas in an increasingly complex app world, let us explore just a couple that are especially intriguing right now on the following pages. ↻

APP COMPLEXITY IS ON THE RISE (CONT'D)

Spotlight: 'M' is for Mashups, Multitasking, and Multiplexing

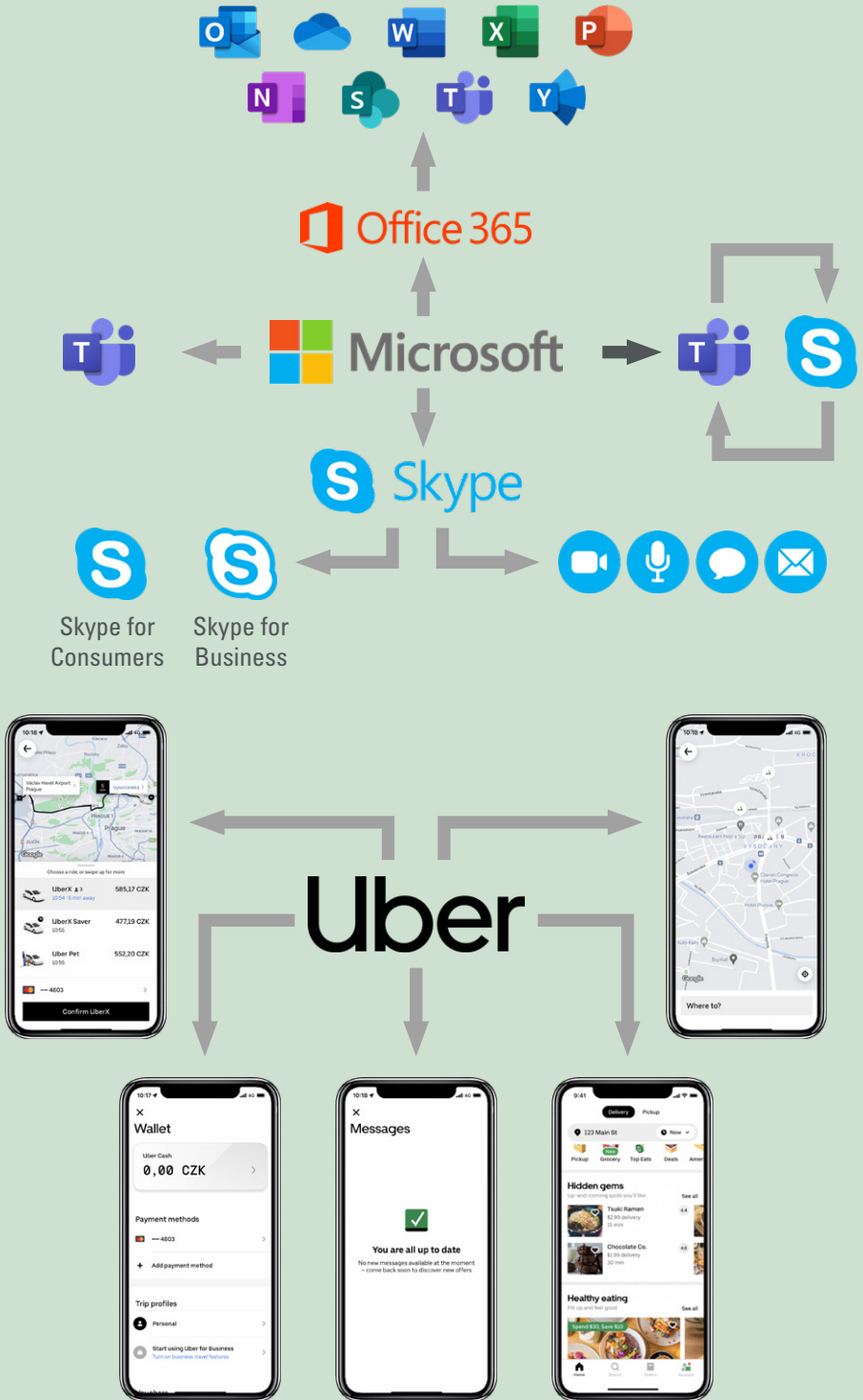
The digital future's rich, immersive app experiences will bring greater value to people and enterprises. However, it will also bring challenges in terms of app complexity and scalability. Apps are increasingly enmeshed. Mashups of mapping, payments, and chat (like in Uber), or multiplexing of video, voice, and text in a single flow (like in Microsoft TEAMS) make it difficult to ensure app QoE.

That complexity will only grow with 5G and the IoT, as more industrial apps will blend video, robotics, AI, sensors, AR/VR, and more. 5G network slicing will bring higher expectations for guaranteed service level agreements (SLAs) related to latency, responsiveness, and speed. Those expectations will span industrial settings in healthcare, automotive, manufacturing, transportation and logistics, retail, and more.

The work-from-home movement is another contributor to complexity. As we have learned in this second year of COVID-19, there will be a continued blurring of the lines between homes and enterprises as people multitask, and expectations for productivity from anywhere, anytime, over any device will only grow. The multifarious nature of intertwined home-and-enterprise networks will mean a much larger, and more complex universe of services, apps, and networks for service providers to manage.

The increased use of Multiplexing and HTTP/3 for improved performance and reduced latency will introduce new challenges. As the most popular services increasingly leverage HTTP/3, measuring app experiences will require the ability to see the app and to analyze customer experiences for specific services within the app.

Conquering this complexity requires a granular view of applications, networks, devices, things (sensors, monitors), users, and services in both the network or service operations centers of service providers.



Spotlight: QUIC is Quickly Taking Over



We examined Facebook, YouTube, Twitch and Instagram traffic from a few Tier 1 fixed service provider networks and found that the fully encrypted QUIC transport protocol already accounts for nearly 30% of traffic in EMEA and 16% in North America.

While Google developed QUIC to make the web faster and more efficient, its recognition by IETF has opened its use up to Facebook, Netflix, Snapchat, Apple, and others that are transitioning away from TCP and HTTP/2. As these big apps use QUIC and HTTP/3, there's inevitably an increase in app traffic that many analytics systems classify as "unknown" because their probes and gateways can't see underneath QUIC. More advanced techniques like QUIC parsing can classify most QUIC traffic into specific apps. It will be important for service providers to parse applications with greater granularly to avoid planning and operational problems with "unknown" downstream and upstream traffic on their networks.

Worth noting is the fact Facebook – who we examine in the "Top Apps" section – is embracing QUIC in combination with HTTP/3 across more than [75% of its traffic](#). That will create an enormous amount of QUIC traffic over networks. We believe many other apps will follow suit to improve customer experiences as [Facebook has reported](#) a 6% reduction in request errors, a 20% tail latency reduction, and a 5% reduction in response

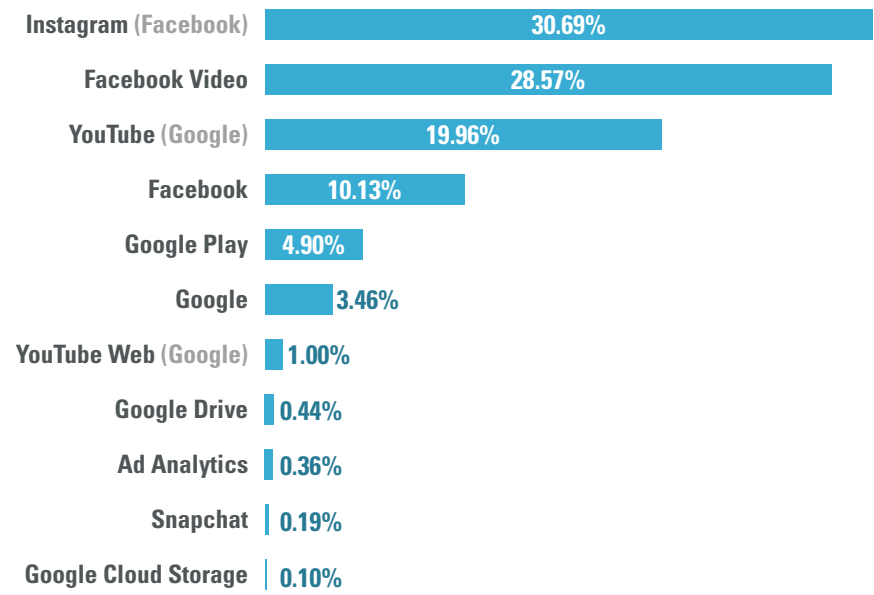
header size relative to HTTP/2 – as well as cascading effects on other QoE metrics.

In our data, we also see QUIC increases in relation to Apple's iCloud Private Relay. The privacy service leverages QUIC to protect users who want to avoid profiling, tracking, and tracing of their internet activities which is often monetized by advertising analytics providers.

These are just some of the reasons we see a firestorm of QUIC traffic brewing. Planning and operations teams will have to use sophisticated traffic classification and analytics to determine the applications' underlying QUIC traffic and reduce it to a more manageable 3-6% range.

Machine learning models will also be needed, as there are many versions of QUIC that have to be matched, or associated, with different apps. For example, if a service uses multiple versions of QUIC, application traffic classification must be capable of simultaneous recognition of different versions of QUIC flows to make the association with the correct application (i.e., Facebook or Google). [↻](#)

Applications using IETF QUIC





A TERABYTE
ISN'T WHAT IT USED TO BE
WE ARE ALL BECOMING **HEAVY USERS**

As a result of surging applications, it's no surprise that our data show a sharp increase in power users who consume more than 1 Terabyte (TB) per month. Global internet bandwidth usage spiked 34% from 2019 to 2020 and a further 29% in 2021 to 786 Terabits per Second (Tbps). We expect the average household to use as much as 650 - 750 Gigabytes (GB) per month by the end of 2021 driven by rapid growth in the digital economy, continued work-from-home trends, and more bandwidth-intensive applications that are fueling our digital lifestyles.

In a large Asia Pacific fixed network, heavy users consuming more than 1TB per month were primarily on TikTok, which was the number-one downstream and number-two upstream app on that network.

As this heavy usage trend builds, unlimited plans will continue to put pressure on service provider revenue models and increase challenges in delivering high-quality app experiences due to enormous traffic and app growth.

The question becomes one of how sustainable are "unlimited" plans? According to [recent IDC data](#), the global market for telecoms services (fixed and mobile) is set to grow 1% to hit \$1.55 Trillion in 2021, with minimal growth through 2025. Another IDC report "Application and Network Intelligence is [Critical to 5G Success](#)," stated that revenue-rich services involving edge computing and network slicing are predicted to be the best path for new revenue streams.

In order to monetize their substantial network and data center investments, service providers will need to tailor services to different users and applications across different industries – healthcare, smart cities, gaming, AR/VR, manufacturing, logistics, sports, and energy. They'll need increasingly sophisticated classification of over 95% of their application traffic if they are to dig into macro and micro trends across app categories and even deeper into individual apps. The visibility into app QoE will drive innovative services, and help monetize them according to what people actually experience and value. ↻

In fixed network data, we are seeing an increase in 1TB per Month power users. The heaviest users spent time on XBOX Live Video, Microsoft Outlook 365, Netflix, PS4 Games downloads, Discord, Twitch, and BitTorrent.

VIDEO IS EVERYWHERE

Our data show in the first half of 2021 bandwidth traffic was dominated by streaming video, accounting for 53.72% of overall traffic, with YouTube, Netflix, and Facebook video in the top three.

In 2021, the top categories in descending order were video, social, web, gaming, and messaging, whereas in 2019, top categories in descending order were: video, web, gaming, social, and file sharing. Social and messaging have moved up the ranks as more people turned to social networking and messaging to engage with their communities and work and learn from home.

Video has proven itself to be even more significant than last year, both as a standalone and as an embedded component of app mashups. The most popular video apps were Youtube at #1 with 14.61%, Netflix at #2 with 9.39%, Facebook Video at 4.20%, and TikTok at 4.00% of total app traffic. We also see Disney+ rapidly moving up the ranks at #15, surpassing Amazon Prime at #16. Video is everywhere – in messaging (WhatsApp, Zoom, Microsoft Teams, Messenger); in social media (e.g. YouTube in Twitter posts, Facebook Video); and in gaming. It's so

pervasive that it's influencing the categories in which traffic can be measured since "messaging," "gaming," and "social media" now all include video elements.

Video helped push social to the number-two spot, after a two-year climb from #4 in 2019, and #3 in 2020. With Facebook, TikTok, and Instagram growth, we expect usage for this category to ascend further in 2022. The combination of embedded video and cross-app usage (e.g. Twitter embedding YouTube videos, Facebook integrated with Messenger and Instagram) is contributing to this growth.

Web browsing also increasingly takes place via social platforms, which may be why it's dropped down to third place with 9.86% of total traffic. Gone are the days of typing in individual URLs, as ads and news feeds are tailored to users' interests by social apps like Facebook, Instagram, Snapchat, Slack, Twitter, Reddit, and others. While there's a lot of commentary out there about the effect of this disintermediation of content and news from the originating sources, the "bubbles" of ads, viewpoints and information are on the rise and not going anywhere in the foreseeable future.

Not only did people mollify feelings of isolation with more video and social media

during the past two years, but they also engaged more with online multiplayer and social gaming.

Despite a slight drop in percentage since its surge in popularity during 2020, when it held the #3 spot, the Games category has returned to its #4 spot with 5.67% of total traffic. Leading games include: PlayerUnknown's Battlegrounds, ROBLOX, League of Legends, Fortnite, and Minecraft, with the leading brands being PlayStation, Xbox Live, Steam, and Epic.

We believe that the growth of virtual worlds and simulations in the fledgling Metaverse will give rise to more free-to-play games with monetization of in-game successes through non-fungible tokens (NFTs) and open crypto. This will drive what Bloomberg Intelligence predicts will be an [\\$800 billion industry by 2024](#). With the Metaverse, gaming will further complexify with mashups of capabilities for messaging, video, and in-game spending.

Parallel to the evolution of the metaverse, trends in mobile gaming, eSports, AR in gaming, and cloud gaming will make this a steadily growing category in medium-growth regions like the United States and EMEA, and a very fast-growing category in still untapped markets like Africa and those with large



HERE!

populations, such as China and India. If COVID-19 continues to ebb and flow with periods of distancing and lockdowns, there will be corresponding surges in gaming.

Messaging takes 5th position, gaining two spots since 2019, with WhatsApp, Discord, Facebook Messenger, Line, Skype, Zoom, and Microsoft Teams at the top in terms of traffic. They've helped brands stay connected with customers, and have fostered communications with work-from-home trends. We also saw several messaging apps like Signal and Telegram move up the rankings as many users seek out more secure and private messaging platforms. With ongoing trends toward automation and mobile chat, it's expected messaging will become increasingly vital to enterprises and consumers.

Enterprise Conferencing was one of the categories most significantly impacted by the COVID-19 pandemic in 2020, and it continues to be a fast-growing category as people continue to work from home. Leaders include Zoom, Webex, Microsoft Teams, Blackboard Collaboration, and Amazon Chime. 🔄

CATEGORY TRAFFIC SHARE

TOTAL TRAFFIC

	Category	Total Volume
1	Video	53.72%
2	Social	12.69%
3	Web	9.86%
4	Gaming	5.67%
5	Messaging	5.35%
6	Marketplace	4.54%
7	File Sharing	3.74%
8	Cloud	2.73%
9	VPN	1.39%
10	Audio	0.31%

GLOBAL APP TRAFFIC SHARE

TOTAL TRAFFIC

	Category	Total Volume
1	YouTube	14.61%
2	Netflix	9.39%
3	Facebook	7.39%
4	Facebook video	4.20%
5	Tik Tok	4.00%
6	QUIC	3.98%
7	HTTP	3.58%
8	HTTP Media Stream	3.57%
9	BitTorrent	2.91%
10	Google	2.79%

GLOBAL APP TRAFFIC SHARE

DOWNSTREAM TRAFFIC ↓

	Category	Total Volume
1	YouTube	16.37%
2	Netflix	10.61%
3	Facebook	7.67%
4	Facebook video	4.83%
5	TikTok	4.48%
6	HTTP Media Stream	4.07%
7	Generic QUIC	4.03%
8	HTTP	2.63%
9	Playstation Download	2.27%
10	iTunes Store	2.12%

GLOBAL APP TRAFFIC SHARE

UPSTREAM TRAFFIC ↑

	Category	Total Volume
1	BitTorrent	9.70%
2	HTTP	9.05%
3	Google	8.02%
4	Facebook	5.77%
5	Wordpress	5.01%
6	YouTube	4.45%
7	iCloud	4.09%
8	Generic QUIC	3.70%
9	Netflix	3.00%
10	Facebook Messenger	2.37%



THE MOST POPULAR

Across traffic categories, 56.96% of traffic was attributable to the top-6 brands Google, Netflix, Facebook, Apple, Amazon, and Microsoft – a 33% increase in total traffic from 2019’s 43.10%. Notably, this is the first year where the traffic from this collection of powerhouses is larger than everyone else, combined.

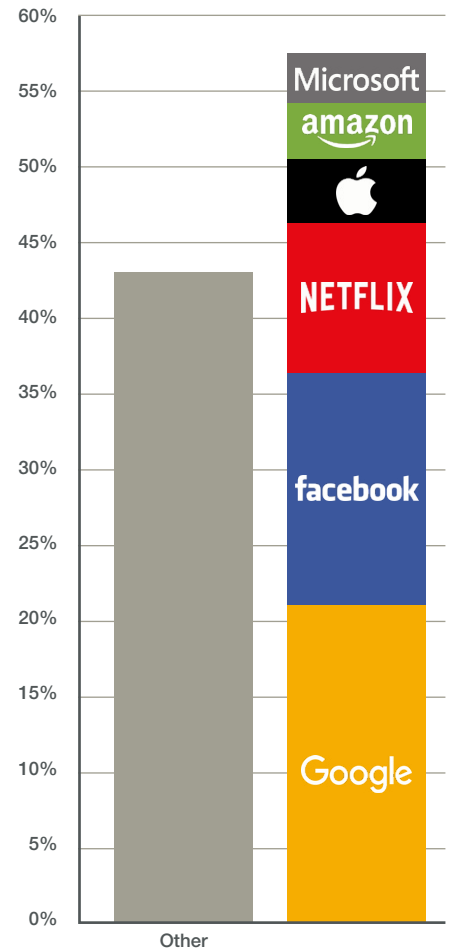
The dominance of the top-6 brands in the app world is fueled by their complex ecosystems, which create stickiness through intricate blends of apps personalized through different features these brands use to innovate and monetize services. The only one in the top-6 that is considered a “pureplay” is Netflix, and it’s worth examining as its #3 in the brand traffic share rankings, but #2 in terms of app popularity based on traffic share, with 214 million users.

Netflix is riding the tidal wave of popular content such as the Squid Game phenomena, including a new [games-on-mobile brand](#) expected to launch in 2022. In a recent [communication](#) Netflix described the “intentionality” of gaming – where players dictate what characters they like and what those characters do in different gaming worlds – as something that could fuel interactive gaming options that would be built into the service, as well as future content for shows and movies.

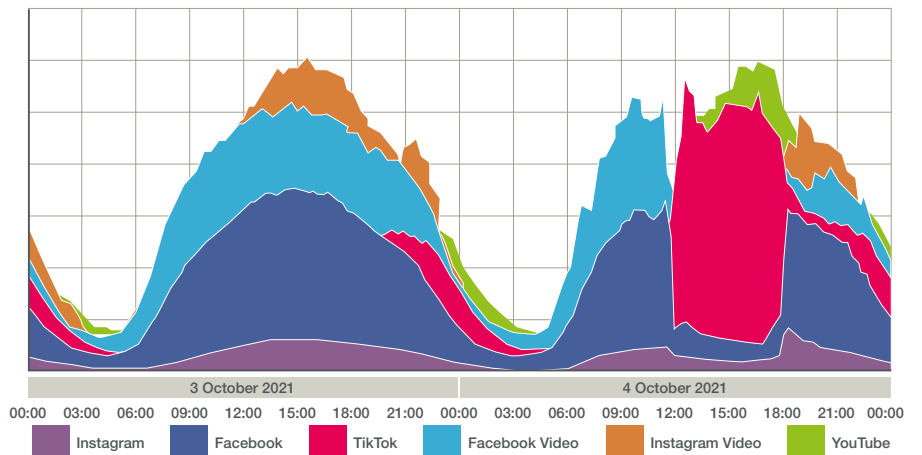
Essentially untouched by all of its competitors year after year, Google (Alphabet) continues to reign at the top of the brands’ hierarchy, by far. With a universe of almost [100 consumer and business search, applications, and devices](#), our data show that Google has the largest share of total traffic at 20.99%, a large part of which is YouTube as the app accounts for 14.61% of total app traffic.

At #2 in the brand category is Facebook with 15.39% of total traffic. With its namesake complemented by Instagram, WhatsApp, Facebook Video and Messenger, the company’s ecosystem spans social, chat and messaging, video, entertainment, and gaming. The expanse of its properties has helped Facebook weather a complex competitive environment. Individual apps have remained

	Application Group	Total Volume
1	Google	20.99%
2	Facebook	15.39%
3	Netflix	9.39%
4	Apple	4.18%
5	Amazon	3.68%
6	Microsoft	3.32%
	TOTAL	56.96%



Facebook users flocked to TikTok and YouTube during recent outage



BRANDS AND APPS

resilient, even under the weight of a high-profile outage. We saw an immediate rush to TikTok and YouTube during the outage, but a return to Facebook once the outage was resolved.

The outage demonstrated how intertwined applications can be, with as much as a 40% increase in DNS request traffic after the outage, which slowed networks and compromised unrelated applications.

This was compounded by flawed application logic and users who refused to accept an error, and continued to retry requests. Not only did this slow networks and increase latency and timeout requests for other web applications, but it also caused issues for Voice over IP callers.

It'll be interesting to see how Facebook's new meta brand factors into its ecosystem, touted as an immersive "metaverse" that will change the ways people connect, find communities, and grow businesses. 🔄

Top Digital Brands Building Complex Ecosystems

Amazon

Amazon Prime, Twitch, Amazon.com, Alexa, Amazon Glacier, Amazon Music, Chime?

Apple

AppleTV+, iTunes, iCloud, Apple Software Update, FaceTime, Apple Music, Apple Watch (40m). Apple.com, iCloud Photo Stream, Mac App Store, Siri

Microsoft

Xbox Live, Windows Update, Skype, Outlook 365, Office 365, SharePoint, OneDrive, Windows Store, LinkedIn, Microsoft TEAMS

Netflix

Pure play video but moving into Mobile Gaming

Facebook (Meta)

Facebook, Instagram, Facebook Video, WhatsApp, Facebook Messenger, Oculus Rift

Google (Alphabet)

YouTube, Waze, Google Cloud, Google Play, Google Search, Google Docs, Google Drive, DoubleClick, Gmail, Google Home, Crashlytics, Nest, Looker, Fitbit

Top 10 Applications by Category

	Video	Games	Social	Messaging	Enterprise Conferencing
1	YouTube	Player Unknown's Battlegrounds	Facebook	WhatsApp	Zoom
2	Netflix	ROBLOX	TikTok	Discord	Microsoft Teams
3	Facebook video	League of Legends	Instagram	Facebook Messenger	Webex
4	TikTok	Fortnite	Wordpress	LINE	Blackboard Collaborate
5	HTTP media stream	Minecraft	Snapchat	Skype	Amazon Chime
6	Disney+	Garena Free Fire	Twitter	Zoom	Canva
7	Amazon Prime	Call of Duty	Reddit	Microsoft Teams	Udemy
8	Twitch	Mobile Legends	Wattpad	Telegram	Cisco Spark
9	Hulu	Candy Crush	Pinterest	WebEx	GoToMeeting
10	HBO	War Thunder	GIPHY	WeChat	Steam

Spotlight: Mobile

We had a look at mobile traffic from about 40 service providers' networks during the second half of 2021.

When mobile data traffic is taken by itself, YouTube retains its #1 spot with Tik Tok at #4. Netflix drops out of the top 10 as people don't tend to watch feature-length, long-form videos on their phones.

Worth noting is the number-three spot for Apple iTunes Store downloads, with Google responsible for fewer downloads than iOS, possibly correlating to a higher number of video downloads over iOS versus Android. App Store traffic also includes software updates from the apps people download, which amounts to a significant volume of traffic.

Facebook and Facebook Video are lower in the mobile network rankings compared with what we see on combined fixed and mobile networks. And, Discord, an increasingly popular messaging and communications platform popular with gamers, makes the top 10 on mobile networks.

BitTorrent is also higher up in the rankings on mobile networks as it is increasingly being used to distribute updates to Facebook and Twitter servers as well as for transferring large files like video and music clips.

When it comes to the top video providers on mobile, it's adult content that takes three of the top 5 spots, something we didn't see in the combined fixed and mobile data traffic. That means people prefer to view this content on their phones, perhaps for privacy reasons. 🔄

MOBILE APP TRAFFIC SHARE

TOTAL TRAFFIC

	Application	Total Volume
1	YouTube	8.67%
2	Generic QUIC	7.88%
3	App Store	7.03%
4	TikTok	6.44%
5	BitTorrent	5.64%
6	Facebook	4.81%
7	iCloud	4.00%
8	Apple Software Update	3.94%
9	Facebook Video	3.71%
10	Discord Voice	3.69%
11	Google	3.37%
12	Facebook VoIP	2.70%
13	XVIDEOS	2.17%
14	Instagram	1.95%
15	XNXX	1.28%

MOBILE APP TRAFFIC SHARE

DOWNSTREAM TRAFFIC ↓

	Application	Total Volume
1	YouTube	9.41%
2	iTunes Store	8.57%
3	Generic QUIC	7.65%
4	TikTok	7.43%
5	BitTorrent	6.17%
6	Apple Software Update	4.80%
7	Facebook	4.48%
8	Facebook Video	4.47%
9	Discord Voice	2.83%
10	Google	2.66%

MOBILE APP TRAFFIC SHARE

UPSTREAM TRAFFIC ↑

	Application	Total Volume
1	iCloud	15.68%
2	Generic QUIC	12.81%
3	Discord Voice	7.19%
4	Facebook VoIP	6.70%
5	Google	6.27%
6	Facebook	6.18%
7	BitTorrent KRPC	3.49%
8	LINE Voice	2.71%
9	TikTok	2.43%
10	BitTorrent	2.24%

Spotlight: TikTok

Though ByteDance, TikTok’s developer, is not in the top-6 brands, TikTok – known in China as Douyin – is #5 in popular apps and moving up fast. As you’ll see in our “REGIONAL APPLICATION SHARE” section, TikTok is particularly hot in Southeast Asia, even without the inclusion of China or India in the data.

[TikTok has surpassed YouTube](#) in terms of the amount of time users spend every month watching content. While Google’s YouTube has more users with 2 billion, TikTok is expected to reach more than [1 billion users](#) by the end of 2021. About 66 percent of TikTok users globally are under the age of 30, with most falling between the ages of 16 and 24. TikTok stars earn hundreds if not thousands of dollars per branded video. Unlike other social apps, TikTok monetizes not only through ads, but also through users’ in-app “gifts” or “tips” for streamers they like. This positive feedback loop is expected to drive large traffic volumes, especially now that businesses are using TikTok in their [marketing efforts](#).

That is significant for service provider networks, since TikTok’s short-form, user-created videos eat up as much as 840 MB per hour. With [2.6 billion cumulative downloads](#) from 600 million users in 2020, TikTok users are contributing significantly to traffic growth. 🔄



While Google’s YouTube has more users with 2 billion, TikTok is expected to reach 1 billion by end of 2021, which is significant in terms of traffic given the fact that short-form videos can eat up as much as 840MB per hour



In 5G, the ‘Product’ is App QoE

As mentioned earlier, we’re all becoming “heavy users” with apps so integral to almost every aspect of our lives. Increasingly in proofs-of-concepts (POCs), we see that heavy users on 5G networks use twice as much data as those on 4G networks.

This is evident in data from one of the most mature 5G networks in the Asia Pacific region. It shows a 60% increase in monthly data usage per 5G device compared with 4G overall, and a 16% increase in data usage per device when comparing 5G to 4G unlimited plans. Understanding the impact of apps on your networks, and conversely the impact of networks on app experiences is going to be critical to competing with the largest digital players in the marketplace.

This trend is very important when engineering capacity, as people upgrading to 5G don’t care about the “G” but rather how well their apps work. Do they have more speed, more mobility, more responsiveness with the upgrade they are paying for? What is their perception of quality?

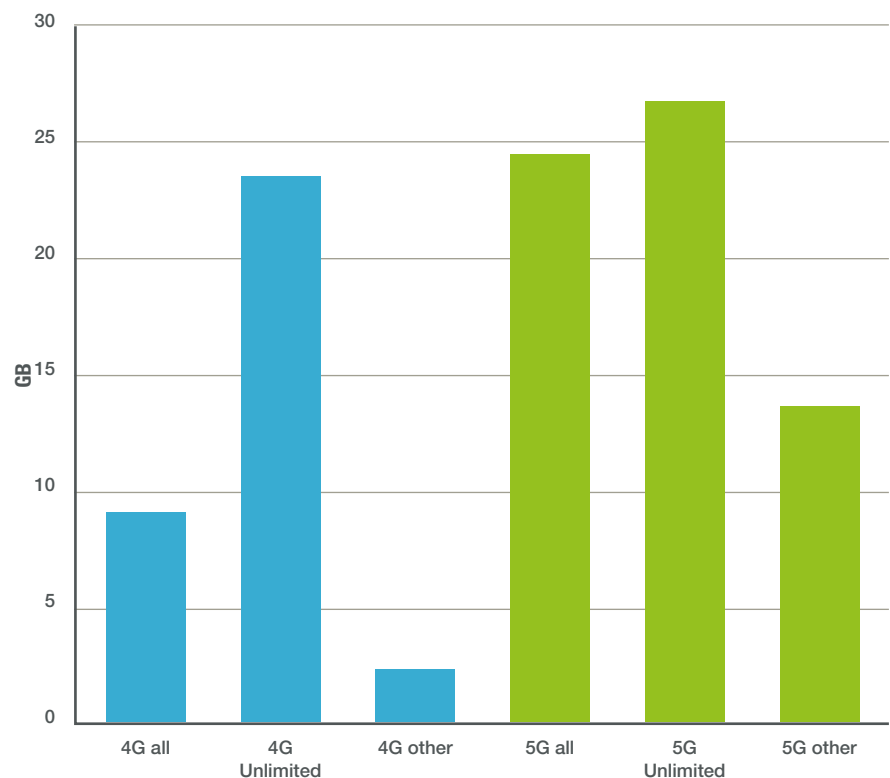
As outlined in IDC’s recent 5G Application and Network Intelligence [Spotlight](#), it’s important to understand:

- 5G device performance compared with 4G
- Subscriber experience in 4G and 5G networks
- Service continuity and experience assurance for “in session” connectivity as a mobile signal transitions between 5G Standalone and 4G or 5G Non-Standalone networks
- Fixed wireless access (FWA) deployment penetration and performance
- Application performance optimization for video, gaming, and more.

While QoE has always been important, it

now takes on a whole new level of importance in 5G networks as low-latency applications become more dominant and more integral to people’s lives, as well as businesses, governments, and societies as a whole. ↻

Mobile data usage per device – 4G versus 5G in an APAC Operator



Regional Application Popularity Trends: **Americas**

In this region, video reigns supreme, with Netflix, YouTube, and Facebook generating the most traffic. Disney+ shows up ahead of Amazon and Hulu, demonstrating their strengthening position with appealing content.

When it comes to original content, Netflix is making a huge push, with [S&P Global Market Intelligence](#) stating Netflix will spend \$13.6 billion on content in 2021, with predictions that the spend could hit \$18.9 billion by 2025. The push for more original content, like Squid Games, has thus far kept it at the top with a total traffic share of 19.85%, with 20.96% of Downstream and 6.53% of Upstream traffic.

It's notable that IPTV is in the top-10 in the Americas, as local service providers are providing TV streams over broadband. IPTV sometimes causes an increase in Upstream traffic because when a viewer pauses the content, the app constantly pings and updates until the session resumes.

YouTube is in second place with a total of 15.02% traffic share, representing

15.88% of Downstream and 3.50% of Upstream traffic. And though Facebook is third on the list, it's still a steep drop down at a total of 7.32% traffic share, with 7.76% Downstream.

It is also worth noting that Twitch is in the top 10, demonstrating how popular gaming is, with many young people watching games instead of YouTube or TV.

There are also lots of clouds in the Americas with iCloud, DropBox, and IPsec, which is increasingly used for corporate VPNs, showing up in the Upstream traffic. RTP, which is likely a combination of operator-delivered VoIP and video conferencing, such as Zoom and Microsoft TEAMS, is leading in Upstream with 15.46%. Nest shows up as well because of the uptick in security camera usage in smart homes and businesses. ↻

AMERICAS APP TRAFFIC SHARE		
TOTAL TRAFFIC		
	Application	Total Volume
1	Netflix	19.85%
2	YouTube	15.02%
3	Facebook	7.32%
4	Generic QUIC	6.50%
5	Disney+	3.62%
6	HTTP media stream	3.31%
7	Amazon Prime	2.71%
8	TikTok	2.67%
9	Twitch	2.13%
10	Steam	1.88%

AMERICAS APP TRAFFIC SHARE		
DOWNSTREAM TRAFFIC ↓		
	Application	Total Volume
1	Netflix	20.96%
2	YouTube	15.88%
3	Facebook	7.76%
4	Generic QUIC	6.91%
5	Disney+	3.81%
6	HTTP media stream	3.43%
7	Amazon Prime	2.89%
8	TikTok	2.80%
9	Twitch	2.25%
10	IPTV	1.97%

AMERICAS APP TRAFFIC SHARE		
UPSTREAM TRAFFIC ↑		
	Application	Total Volume
1	RTP	15.46%
2	IPTV	11.20%
3	Google	8.45%
4	Netflix	6.53%
5	BitTorrent transfer	6.37%
6	YouTube	3.50%
7	iCloud Photo Stream	4.93%
8	Dropbox	2.14%
9	Nest	2.13%
10	IPsec	1.90%

Regional Application Popularity Trends: **APAC**

In this region, social apps rather than video reign supreme, and since our data is mainly from Australia, Singapore, Japan, and Thailand, it is Facebook and Facebook Video that dominate, with over 36% of total traffic (18.80% and 17.37%, respectively). If China and India were included, we would most likely see WeChat, TikTok, and WhatsApp at the top.

Facebook and Facebook Video dominate Downstream traffic, with Facebook at 19.12% and Facebook video at 18.47%. In the Upstream, Facebook has 15.49% traffic share and Facebook Messenger ranks #2 with 10.11%, whereas Facebook Video doesn't account for as much Upstream with only 6.01% at #5 in the Upstream ranking.

APAC has several of the [largest Facebook populations](#) in the world, and as a result, many APAC countries use Facebook for targeted advertising, driving Facebook and Facebook video numbers higher here than anywhere else. Also, because of the regions we focus on in APAC, Facebook Messenger Traffic is high, possibly

because there is more mobile usage in APAC than other regions.

After Facebook and Facebook Video, YouTube came in third at 13.1% of total traffic, with TikTok almost tied at 12.86%. Byte Dance is focusing on Southeast Asia as a key growth area for the app and is quickly developing interconnected apps for live video streaming, messaging, and music.

Also worth noting is the fact that this data came in before the Squid Games-induced explosion of traffic from Netflix began, so we expect Netflix will rank higher in APAC in the next report. Additionally, this is the only region in which Snapchat appears in the top 10.

In terms of Upstream traffic, APAC is the only region in which Facebook Messenger appears in the Upstream top 10, indicating a split between Facebook Messenger, Instagram Direct Messages, and WhatsApp. Amazon Web Services (AWS) also makes an appearance in the APAC Upstream top 10. ↻

APAC APP TRAFFIC SHARE		
TOTAL TRAFFIC		
	Application	Total Volume
1	Facebook	18.80%
2	Facebook video	17.37%
3	YouTube	13.10%
4	TikTok	12.86%
5	Instagram	6.67%
6	Google	2.18%
7	HTTP media stream	1.90%
8	Generic QUIC	1.89%
9	Snapchat	1.53%
10	Netflix	1.41%

APAC APP TRAFFIC SHARE		
DOWNSTREAM TRAFFIC ↓		
	Application	Total Volume
1	Facebook	19.12%
2	Facebook video	18.47%
3	YouTube	13.62%
4	TikTok	13.44%
5	Instagram	6.80%
6	Generic QUIC	2.06%
7	HTTP media stream	2.03%
8	Google	1.54%
9	Netflix	1.47%
10	Snapchat	1.47%

APAC APP TRAFFIC SHARE		
UPSTREAM TRAFFIC ↑		
	Application	Total Volume
1	Facebook	15.49%
2	Facebook Messenger	10.11%
3	Google	8.72%
4	TikTok	6.90%
5	Facebook video	6.01%
6	Instagram	5.35%
7	Amazon AWS	4.76%
8	YouTube	7.72%
9	Snapchat	2.19%
10	Android Market	1.77%

Regional Application Popularity Trends: EMEA

Entertainment dominates this region, with Netflix at #1 with 16.10% of total traffic, and 17.02% of Downstream traffic. Netflix was not this high in EMEA in our past reports, so the fact that it has surged ahead of YouTube is a notable change.

YouTube is in second place with 12.75% of total traffic, and 13.33% of Downstream traffic. It also has a top 10 Upstream presence at 4.10%.

Here we again see Disney+ rising up to #5, as we saw in the Americas. Social media is also prevalent in EMEA, with Instagram, Facebook, and TikTok in the top 10.

Interestingly, BitTorrent transfers were #1 in Upstream traffic perhaps due to people accessing content from other countries on this platform? Since content rights are more complex in Europe, movie and TV show availability often come after U.S. launches, so pirating content might be the reason for BitTorrent's prominent placement on the list.

AWS is showing high on Upstream, perhaps because many apps use AWS for transport and hosting.

Gaming ranks highest in EMEA compared with other regions. Xbox Live updates came in at #3, with 7.41% of total traffic share, and PlayStation was next at 5.69%. Discord Voice has a good showing in Upstream traffic because it is the preferred chat app for gamers in this region.

Nest makes an appearance in Upstream traffic top 10 as well, showing that security cameras are becoming a Google strength in many regions around the world. 🔄

EMEA APP TRAFFIC SHARE		
TOTAL TRAFFIC		
	Application	Total Volume
1	Netflix	16.10%
2	YouTube	12.75%
3	Xbox Live update	7.41%
4	Playstation.net	5.69%
5	Disney+	5.37%
6	Amazon Prime	4.52%
7	HTTP media stream	4.12%
8	Facebook video	3.80%
9	TikTok	3.35%
10	Instagram	2.89%

EMEA APP TRAFFIC SHARE		
DOWNSTREAM TRAFFIC ↓		
	Application	Total Volume
1	Netflix	17.02%
2	YouTube	13.33%
3	Xbox Live update	7.81%
4	Playstation.net	5.93%
5	Disney+	5.63%
6	Amazon Prime	4.75%
7	HTTP media stream	4.32%
8	Facebook video	4.02%
9	TikTok	3.50%
10	Instagram	2.99%

EMEA APP TRAFFIC SHARE		
UPSTREAM TRAFFIC ↑		
	Application	Total Volume
1	BitTorrent transfer	11.65%
2	Amazon AWS	7.74%
3	FaceTime	4.81%
4	Google	4.16%
5	YouTube	4.10%
6	iCloud	3.80%
7	RTP	3.55%
8	Outlook 365	2.75%
9	Discord Voice	2.74%
10	Nest	2.35%

CONCLUSION: THE 'SO WHAT?'

For service provider teams in charge of capacity planning, engineering, big data, and operations, the uptick in “heavy users,” tsunami of video, social, and gaming, as well as new traffic and security protocols (i.e., QUIC, Apple Private Relay) is going to affect how to approach application QoE and SLA guarantees. As complex mashups of different app types and new protocols and encryption take shape, service providers have to rapidly measure and assure that networks are delivering high-quality customer app experiences.

[IDC recently](#) pointed out that customers care about how their application plays across a network connection rather than the connection itself, be it 4G, 5G, 5G/Mobile Edge Computing, Fixed or WiFi.

In addition to worrying about QoE, service providers have to assure SLAs, and conquer fraud and security, revenue leakage, regulatory requirements, and overall automation efforts.

Marketing and customer care teams have to make the strategic transition from pre-COVID “telco” to next-gen “digital service provider” in a much-accelerated time frame. They, too, can benefit from understanding where more megabytes and even terabytes are being consumed every month – by individual, by household, by business or institution – to better inform their decisions about current and future offerings, data caps and “unlimited plans.”

The information in this report can also help them in the debate about who should pay

for what – a question that is starting to emerge as service providers like [SK Telecom](#), and [Deutsche Telekom and Vodafone](#), among others question if now is the time for Google, Facebook, Netflix and others to help invest in networks. The scales have tipped with the majority of network traffic now attributable to these dominant digital brands. As they build out very elaborate ecosystems, their apps will have more functionality, more features, and more “cross pollination” with not only their own apps, but third party apps as well. There is a quest to deliver more innovative content and capabilities across all ages, demographics, and locations.


With people’s collective comfort and dependence on apps growing, so too will the sophistication and complexity of the apps and the traffic they produce Downstream and Upstream. Many legacy probes and gateways only scratch the surface of customers’ app behaviors and peak usage with generic categorizations of HTTP, SSL, or QUIC. Service provider teams need higher degrees of “application depth” if they are to answer crucial questions about:

- Customer and application QoE
- Macro trends of traffic across millions of subscribers
- Congestion and the health of the network
- Capacity planning


In this report, we offer a greater understanding about the impact of apps and mashups, multiplexing and new transport and security

protocols in order to help service providers plan for future service and capacity growth, and optimize QoE, while also protecting networks and users from malicious or criminal actors, and adhering to privacy and regulatory mandates.

We want service providers to be in the driver’s seat, and we’ve leveraged enriched “application and network intelligence” to dig up the trends that will help them analyze, optimize, and monetize applications to deliver high quality customer experiences.



Many legacy probes and gateways only scratch the surface of customers’ app behaviors and peak usage with generic categorizations of HTTP, SSL, or QUIC.



What next? **Contact Us**

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Sandvine's cloud-based Application and Network Intelligence portfolio helps customers deliver high quality, optimized experiences to consumers and enterprises. Customers use our solutions to analyze, optimize, and monetize application experiences using contextual machine learning-based insights and real-time actions. Market-leading classification of more than 95% of traffic across mobile and fixed networks by user, application, device, and location creates uniquely rich, real-time data that significantly enhances interactions between users and applications and drives revenues. For more information visit <http://www.sandvine.com> or follow Sandvine on Twitter @Sandvine.



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