SANDVINE

# phenomena

THE **GLOBAL** INTERNET PHENOMENA REPORT **JANUARY 2023**

## Networks, Digital platforms and Apps got us through COVID. WHAT NOW?

How have the past two years **changed us?**

The **'Big 6'** now led by Netflix

Video **permeates**, streaming **dominates**

The Rise of the **'Super App'**

Mobile is **reshaping** app usage

Telecom reaching **inflection** point

### SPOTLIGHTS

QUIC is **here to stay**

FIFA World Cup: are sports the **next frontier** for streaming?

# A word from Sandvine CEO Lyn Cantor

**Lyn Cantor**
CEO Sandvine

**Apps have become extensions of ourselves, helping us navigate all aspects of life, whether our connections to others, our health, our education, our work, our happiness through escapism and entertainment. The average person spends as much as 5 hours per day on mobile apps, in addition to those they use at work or in learning, which can bring the total time on apps to as much as 7 or 8 hours per day.**

Applications are therefore becoming a manifestation of all that operators do to build and optimize their networks. Customer satisfaction is inextricably tied to application quality of experience (App QoE). This is why we are committed to App QoE, becoming Sandvine, the App QoE company.

For the purposes of this report, we tap into what makes us the App QoE experts: advanced heuristics and machine learning to classify network traffic by application, as well as by the content within those applications (as you'll see on pages 10-15). By calculating throughput at 250ms intervals, we "score" App QoE through the lens of 10 app categories, which we stratify on pages 12-14 and in our regional trends, starting on page 27.

By examining the volumetric trends within each category, we reveal which individual applications are exerting the most pressure on networks. We can see that this year, in H1 2022, eight of the top-10 apps by volume are based on video, and we further identify the biggest culprits, such as Netflix, YouTube (and its QUIC traffic), Disney, TikTok and others. We even glance at the impact HD and UHD devices may have, motivating streaming platforms to create 4K plans that promise high picture quality and QoE (mind you, without any input from the operators over whose networks the app traffic will travel).

Additionally, we take a closer look at the meteoric rise of individual content creators over short-form video phenomena like TikTok, YouTube Shorts, and Instagram Reels, and how different categories of apps, like social networking and messaging, are trying to capitalize on that fervor to make up for now-flailing engagement, as the younger generation continues to move away from apps they view as staid and stodgy.

As you read through the different sections of the report, you'll see what's behind the 24% increase in video traffic, and the 23% increase in overall internet traffic – despite the fact people in most regions have returned to in-person socializing, learning, and working. We put context around those trends on page 6, where we explain how the pandemic accelerated digitization, catalyzing the momentum toward new digital behavior and app usage.

In our Spotlights on pages 25 and 32, we take a closer look at the impact the 2022 FIFA World Cup may have on streaming video, and at the growing volume of QUIC traffic obfuscating views into traffic worldwide.

On page 22, you'll see how the growing penetration of smartphones worldwide, and the higher comfort levels with consumption

and creation of content over mobile devices have had a profound impact on overall traffic, as well as on downstream and upstream traffic.

Whether COVID, or large sporting events, or natural disasters, or even war, almost every vicissitude life has to offer now affects fixed and mobile networks. Because apps are so central to who we are and what we do, operators are expected to deliver the highest level of App QoE. With a greater magnitude of volumetric pressure on their networks, operators try to scale with huge investments in infrastructure. But continuously building networks around network tonnage is proving unsustainable, with profit margins already squeezed and profitable growth difficult to achieve. On page 20, we look at how constant capital-intensive investments will fail to keep up with unrelenting app and traffic growth, and what's being done to foster more equitable business models.

This Report is just a taste of the in-depth analyses we do for individual customers. We encourage service providers that want customized reports on their network traffic to contact us for a one-on-one meetings with our subject matter experts. We can help build customized use cases for CTOs, network planners, big data teams, marketing, and customer care.

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>
> **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's 260+ Tier 1 and Tier 2 customers represent an installed base of more than 2.5 billion Internet subscribers around the world. For the purposes of this 2023 Global Internet Phenomena Report, we've analyzed First Half 2022 data from 177 customers representing almost 300 million subscribers across access types (Fixed, Mobile, cable, and Satellite) and regions (Americas, Asia Pacific, Europe, Middle East, and Africa).

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## In this Report






WHAT JUST HAPPENED?!

# ONE GIANT LEAP

## BLINDSIDED BY COVID IN 2020 AND 2021, TELECOM ROSE TO THE CHALLENGE

Here, we examine the past to see what may lie ahead.

SANDVINE The App QoE Company

**No event since Neil Armstrong stepped foot on the moon has accelerated technological advancement the way COVID-19 did (and continues to do). Millions of people around the world instantly changed the way they lived, worked, and learned to protect themselves and loved ones, and to buy time for frontline workers and scientists early in the pandemic.**

For most people around the world, COVID drove changes to how they used technology. For the millions of people without digital access, the digital divide widened between the "haves" and the "have-nots," with digitization crucial to connecting, working, and learning during not only the pandemic, but 2020 and 2021's upheavals from social unrest, climate change, and even war.

For fixed and mobile networks, unpredictable traffic caused gigabyte surges. This forced operators to rapidly engineer what they had to better utilize preexisting capacity. To deliver pre-COVID reliability, many expedited capital expenditures for optical fiber, 5G, 5G Ultra Wideband, virtual private networks, and mobile cell sites.

For enterprises, COVID accelerated digitization by several years. For example, a McKinsey Global survey of 899 C-level executives and senior managers in APAC, Europe and North America found that digital and digitally enabled products in portfolios accelerated by as much as 7 years, and digitization in customer and supply-chain interactions and internal operations by about 3 to 4 years.

These rapid changes supported the surging popularity of video streaming, enterprise conferencing, gaming, social media, messaging and chat, and other categories of traffic we examined in our 2020 and 2021 Global Internet Phenomena Reports.

This year, with COVID becoming more endemic in many parts of the world, we see a change in overall traffic trends as people go back to work and school.

Our data show that traffic volume is 23% higher in 2022 than it was in 2021, due to significant increases in video (streaming, download, and short-form) as well as encrypted traffic and operators' growing menu of OTT services and TV content.

The sudden surges of 2020 and the moderate but steady bumps of 2021 had a significant impact on internet traffic over fixed broadband, mobile, and WiFi networks (see "Netflix and Big MAMAA Rule the Internet" on Page 10).

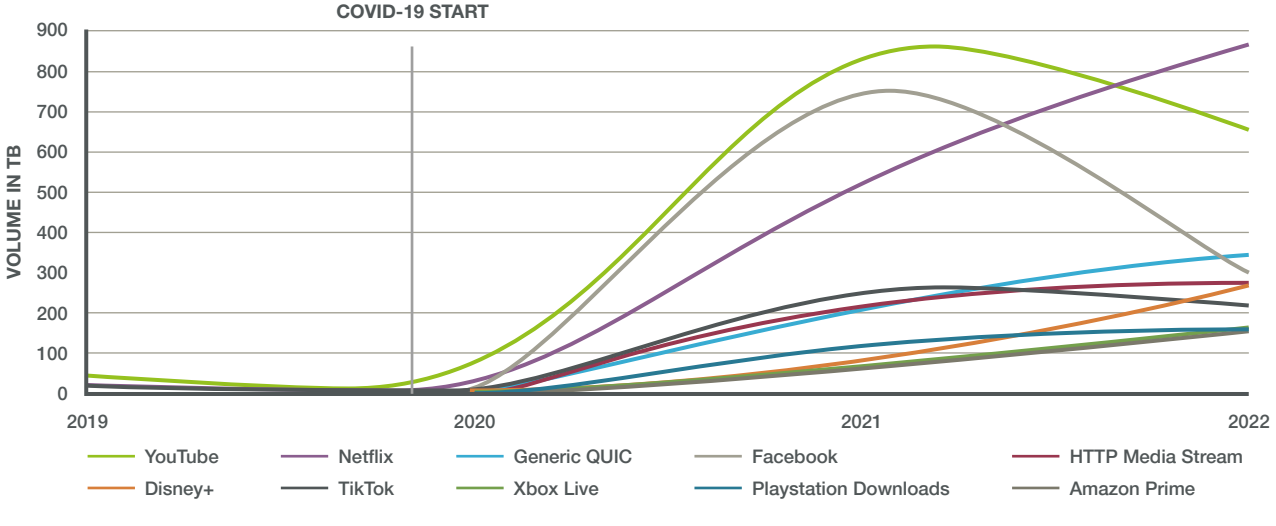
**How big were Internet traffic surges during COVID?**

Reporting by operators around the world the past two years indicates that fixed broadband increases ranged from about 20% to 50%, and mobile increases ranged from about 15% to 35%. People and businesses with reliable ISP services used fixed broadband for key applications and services throughout 2020 and 2021, while those without reliable fixed broadband relied more heavily on mobile.

In some regions, fixed data traffic increased by a greater percentage in the first month of the pandemic than in the previous 12 months. For example, in Italy and Spain during the Spring of 2020, operators reported surges of up to 50%, with

**Data Volume for Apps Before, During and "Post" COVID**

**Source:** Sandvine



# One Giant Leap (Cont'd)

average increases of about 35%-40%. Telefónica's Movistar, Orange, Vodafone, Masmovil, and Euskaltel all reported increases of about 40% in their networks' traffic, while BT reported a range of 35% to 60% for daytime weekday fixed broadband usage.

Also interesting, Orange noted an explosion of data over transatlantic links, with 80% of the traffic generated by French internet users going to the USA for Facebook, YouTube, Netflix, Messenger, and WhatsApp.

During the first two years of the pandemic, there were also upstream and downstream pattern shifts. Vodafone, for one, saw upstream increases as high as 100%, which it attributed to cloud video conferencing services, with downstream increases of about 44% primarily due mostly to streaming video.

In North America, the increases were also significant. In March 2020, Verizon reported a 20% increase in Web traffic, and a whopping 75% increase in online gaming, along with a 34% increase for VPN traffic (by May that increased to 52%), and a 12% increase in streaming video.

AT&T reported a similar 20% increase of traffic across its core network traffic – which includes business, home broadband and wireless usage – which amounted to 391.8 petabytes of data traffic on an average day. That increased 40% year-over-year to 468 petabytes by 2021.

In Japan and Asia Pacific, NTT reported a 30 to 40% increase of data usage, while South Korean operators saw increases of 13%.

It's astonishing these increases took place within weeks, not months or years, as would have been the case under normal circumstances. One Sandvine customer, a cable operator, deployed 18 months of planned capacity in four months during Covid. This expansion of broadband among cable cos, telcos, fiber providers, and satellite companies is helping to support the current increases in demand for more high-speed and high-quality services.

**What impact was there on 'heavy usage' during the pandemic?**
We showed in our 2021 Global Internet Phenomena Report that per-household usage during 2021 increased. In Q1 2022, we saw this heavy usage trend continue, as you can see in the table "Volume Usage by Subscriber Type." There, you see approximately 8% of users are "excessive," responsible for approximately 55% of the volume, and just over 12% are "heavy" users responsible for more than 20% of the volume. We believe that with the continued spike in video, gaming and other categories of bandwidth-intensive apps, per-household usage will continue to climb.

In addition to significant volume increases during 2020 and 2021, operators also saw a shift of when "peak usage" and "congestion" took place, with usage more evenly spread out during weekdays – resembling what had traditionally been "weekend" or "holiday" patterns.

The origins and destinations of traffic also changed with everyone at home. A report from the Internet Architecture Board (IAB) notes congestion that used to characterize interconnect points and last-mile networks diminished, with a decrease in download throughput to certain cloud regions, perhaps because of the increased use of cloud services.

**Is our current 'normal' the 'new normal'?**
When looking at World Health Organization interpretation of the current world situation around COVID-19, many countries are at a better point now than they were this time last year. However, globally, we are not out of the woods. Most people around the world have returned to varying degrees of in-person social engagement, as well as in-person and hybrid work and learning.

In this year's data, we see internet traffic steadily rising year over year, which we explain in the next section. What we see is not so much a "lingering" of COVID-induced behaviors, but rather permanent habits people grew into, and the comfort level developed with certain apps that have now become commonplace around the world:

- Online Grocery Shopping and Food Boxes
- Online shopping and home delivery of... everything (clothing, electronics, shoes, toys, pet supplies/meds, etc.)
- Marketplace apps for investing online
- Health Checks and digital communications via Telehealth apps
- Grandparents and relatives Zooming in for regular family check-ins
- Online college education still growing
- K-12 schools increasingly integrating digital apps into in-person instruction
- Work-from-home becoming permanent or a hybrid with enterprise apps
- Government process for Drivers Licenses, Professional Licenses, Social Security, Employment Eligibility, Passports, etc
- Entertainment through streaming, live and downloaded video services
- Growing Content Creator market (TikTok, YouTube, YouTube Shorts, Instagram)
- Gaming online, in the cloud, mobile

The continuation of these behaviors has contributed to a 23% increase in traffic volume, which we cover in the next section. In general, what was "high" pre-COVID is "normal" now. Back-to-work and school means the consumption might be happening at different times of the day this year than was the case the past two years, but it doesn't mean a reduction in that consumption. It's just happening at different times, in different places, over different networks (at home, office, or while commuting).

One thing that will not change is the perception people have about the internet as an essential part of day-to-day life in terms of individual, local, and global economies.

**Old-Fashioned Voice Calls Became 'Cool' Again!**

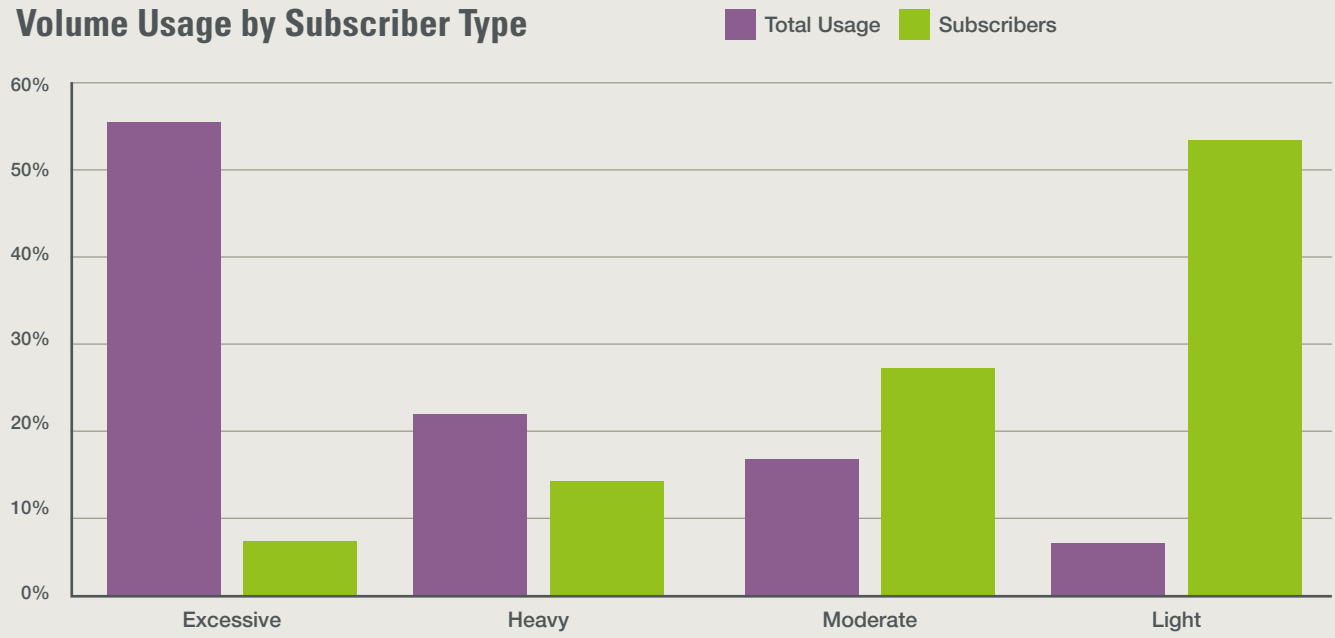
In the first two months of the pandemic, people wanted to hear their loved one's voices, making voice the preferred channel for keeping in touch initially. There was a 184% increase in voice call traffic, a 3x increase over pre-pandemic numbers.

Operators across the board reported approximately 30% to 35% increases in voice, with many also reporting longer durations of the calls. Verizon, for instance, reported 800 million wireless calls per day, and a 33% increase in the duration of calls .

Into 2022, with hybrid work models and now-engrained habits and behaviors, voice continues to be more popular than it was pre-pandemic. Today, this once "obsolete" technology is more popular than it was pre-pandemic.

**In the table below, we show that over several networks in APAC, approximately 8% of the users are responsible for 55% of volume, and 12% are "heavy" users responsible for more than 20% of volume. As heavy usage grows, it will further complicate resource planning, service profitability, service running cost, ROI, and quality of experience for the greater whole of customers.**

## Volume Usage by Subscriber Type



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## WHEN NETFLIX AND "MAN

**Netflix + MAMAA (Microsoft, Alphabet, Meta, Amazon, Apple) generate 48% of growing internet traffic, but their percentage contribution has gone down amid data surges from new app categories and new apps.**

"MAMAA" is a widely used acronym coined to represent the five large-cap technology giants, but when talking about terabytes, gigabytes, and petabytes traversing the internet, we cannot exclude Netflix, whose 45% growth in internet volume during H1 2022 moves it into the top spot for traffic generated by an individual application in what we call the "Big 6" (MAMAA + Netflix). As you'll see in the charts on the next page, the Big 6 generated nearly 48% of internet traffic in H1 2022. Though these companies still generate a substantial amount of overall internet traffic, there's a 9% decline in terms of their percentage contribution to total internet volume. This means their traffic is now couched amid an expanding number of app categories and greater number of apps, which are producing more data overall. This is contributing to the 23% increase in overall traffic volume we saw in our H1 2022 data, which we mention in the previous section.

| | Brand | 2021 | 2022 |
|---|---|---|---|
| 1 | Google | 20.99% | 13.85% |
| 2 | Netflix | 9.39% | 13.74% |
| 3 | Facebook | 15.11% | 6.45% |
| 4 | Microsoft | 3.32% | 5.11% |
| 5 | Apple | 4.18% | 4.59% |
| 6 | Amazon | 3.36% | 4.24% |
| TOTAL | | 56.35% | 47.98% |

The role of video in this overall surge cannot be overstated, as video from not only the Big 6, but also up-and-comers like TikTok and Disney+, is contributing a sizable volume of traffic (something we explore in the next section, "Video Permeates, Streaming Dominates" on page 14).

It's this gluttony of video that now sets Netflix apart from MAMAA, as a video pure play that accounts for 13.74% of total internet volume, and for 8.78% of

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## MAA" RULE THE INTERNET

upstream volume, and 14.93% downstream. This is how Netflix has taken the throne from Google's YouTube, whose percentage of total internet volume declined in H1 2022.

The power of Netflix's streaming content has enabled the company to claw its way back from its highly publicized subscriber losses of Q1 2022. The billions-of-dollars Netflix invested in video content seems to be paying off, with titles like the Queen's Gambit, The Crown, and renewals like Squid Games helping it beat even its own expectations. With a gain of 2.41 million subscribers in Q3 of 2022, Netflix has replenished much of what it lost in Q1 and Q2.

**But, Google still reigns supreme!**
Even with Netflix's substantial volumetric growth, it languishes in the number-two spot in terms of volume "by brand" (as opposed to individual application). In H1 2022, Alphabet's Google was responsible for 13.85% of Internet traffic, despite a decline from what we saw this time last year. Google's continued dominance is attributable primarily to YouTube, but also traffic generated by a growing empire of platforms and services including: YouTube Shorts, Google Web Apps, Android Market, Ad Analytics, Google Analytics, Google Cloud Storage, Google Docs, Google Drive, Gmail, Google Maps, Google Cloud Messaging, Google Maps, YouTube TV, Waze, Fitbit, and Nest.

Amid these vast properties, YouTube is the biggest bandwidth hog at nearly 11%. YouTube remains a tour de force in the "creator economy," which Forbes now estimates is worth $100 billion, globally. To put it in perspective, YouTube's biggest content creator, T-Series, earns $450 Million US Dollars (Rupees 3,590 Crore), boasting 186 million subscribers (as of Q3 2022).

In the Downstream chart on the next page, YouTube's 11.62% is a decline from last year during the same period, in part because of returns to in-person, but also because of growing interest in viewing TikTok and other short-form videos.

To counter the losses, Google has hitched itself to the TikTok-inspired short-form video craze with YouTube Shorts, which by Q3 2022 reached 5 trillion all-time views. Google plans to monetize that momentum with a 45% revenue split for creators, incentivizing anyone with at least 1,000 subscribers and 10 million Shorts views over 90 days. That will raise the ante in its competition with not only TikTok, but also Pinterest and Instagram Reels – all of which are vying for more views and engagement to attract more video ads.

We think that this aggressive jockeying for position in video and short-form video will mean Google traffic will exert significant volumetric pressure on networks the rest of this year.

We also need to note a significant portion of YouTube traffic is encrypted QUIC (Quick UDP Internet Connections), which in our H1 2022 data is the third-biggest contributor to volume at 5.41%, an increase from 2021.

Google's platforms aren't the only ones using QUIC, as we see many big platforms using QUIC for more stable, fast, and encrypted video content-based applications, as we explore in "QUIC Is Here to Stay," on page 34.

Conspicuously, you will see Facebook dropped from its number two position to number three in the overall "Brands" chart on page 10. It's no secret that in early 2022, Facebook's Daily Active Users started to decline for the first time in 18 years. Other social platforms, like Twitter, have had their own share of challenges due to many factors. For one, there's the disappearance of pandemic consumption habits, as during COVID, Facebook saw huge increases in Messenger group video calls, Facebook Live, Instagram Live, and WhatsApp – especially in places hardest hit by lockdowns and social distancing. It's not surprising that back to school and back to work means less reliance on group video calls and messaging, and hence, a drop in that type of traffic.

Additionally, advertisers are spending less on social platforms, recognizing that a bigger percentage of younger audiences find rival platforms like TikTok and YouTube more appealing, which we cover below.

Another challenge has been an increasing desire for user privacy, as evidenced by the use of Apple's App Tracking Transparency policy, which empowers users to limit how much of their information can be shared with advertisers.

**But what about social networking as a category?**

Though we see a drop in social networking traffic as a percentage of total traffic volume, as short-form videos rise in popularity, social networking is still a significant contributor.

However, there is a movement away from social media by younger people.They are a demographic craving less depth, more variety, more lightheartedness, and more personalization and engagement through personalized feeds. TikTok satisfies that desire with a "For You" feed of clips that are based on the viewer's usage and habits.

Some Instagram content creators are trying to do more with Reels to see if video can bring the platform back some of its bygone luster, but some digital marketing studies blame ads and bombardment by influencers for the loss of reach.

With the writing possibly on the wall for traditional social networking, Mark Zuckerberg is going "all in" with Metaverse and social virtual reality, investing $100 Billion in RealityLabs for the creation of 3D virtual spaces.

There's been no shortage of criticism by pundits, who question whether doing so now will pay off fast enough amid Meta's first-ever revenue declines in H1 2022, and market forces like inflation driving

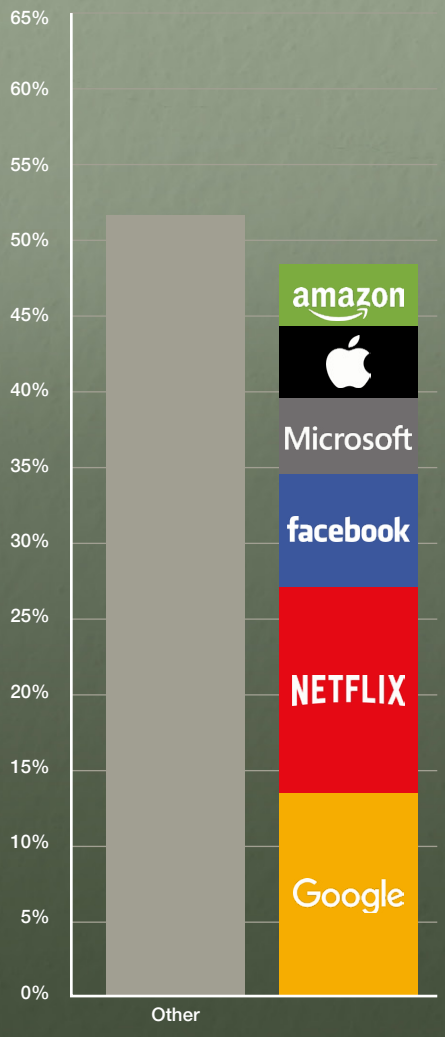
## Global Top 10 Applications by Category

| | Video | Games | Social | Messaging |
|---|---|---|---|---|
| 1 | Netflix | Playstation Downloads | Facebook | Generic Messaging |
| 2 | YouTube | Steam | Twitch | WhatsApp |
| 3 | Generic QUIC | ROBLOX | Instagram | Facebook |
| 4 | HTTP Media Stream | Epic Games Launcher | Snapchat | Discord Voice |
| 5 | Disney+ | Nintendo Online | Reddit | Wattpad |
| 6 | Tik Tok | Xbox Live TLS | Wordpress | Telegram |
| 7 | Amazon Prime | Steam Client | Pinterest | Discord |
| 8 | Hulu | Kayo Sports | Twitter | Microsoft Teams |
| 9 | Facebook Video | Generic Gaming | VK | WeChat |
| 10 | Operator Content | League of Legends | LinkedIn | LINE |

down ad revenues over platforms like Facebook and Instagram. For now, Zuckerberg expects WhatsApp and Messenger to tide Meta over with sales growth, until Metaverse takes off in what he predicts will be the "2030s."

Despite the tribulations, Facebook is still the dominant social network worldwide, with 2.96 billion monthly active users as of the third quarter of 2022. And Meta is making video a bigger component of its platforms to try and improve interest and engagement. As reported by the Evolution of Facebook Watch, 1.25 billion people visit Facebook to watch videos every month, and Facebook's partnership with Ray-Ban for smart glasses may mean more videos and photos (rolled up into Facebook View). As we mention in the next section, Meta is striving to close some of the generational divide by encouraging shorter, more frequent postings on Facebook Video, as well as Facebook video chat. It seems though the popularity of instant messaging and videoing friends might have been popular during COVID, but is less so now. To make up some of its momentum, Facebook is offering video-on-demand for Facebook users who want to stream premium content. Time will tell if these efforts will be fruitful enough to stave off its first-ever drop in the Nasdaq index and financial losses.

## The Big 6, 2022




## APP TOTAL VOLUME 2022

| | Application | Total Volume |
|---|---|---|
| 1 | Netflix | 13.74% |
| 2 | YouTube | 10.51% |
| 3 | Generic QUIC | 5.41% |
| 4 | HTTP Media Stream | 4.33% |
| 5 | Disney+ | 4.20% |
| 6 | Tik Tok | 3.55% |
| 7 | Facebook | 2.83% |
| 8 | Xbox Live | 2.71% |
| 9 | Playstation Downloads | 2.70% |
| 10 | Amazon Prime | 2.67% |

## TOP APPS 2022

### DOWNSTREAM TRAFFIC

| | Application | Total Volume |
|---|---|---|
| 1 | Netflix | 14.93% |
| 2 | YouTube | 11.62% |
| 3 | Generic QUIC | 5.88% |
| 4 | Disney+ | 4.49% |
| 5 | TikTok | 3.93% |
| 6 | HTTP Media Stream | 3.72% |
| 7 | Playstation Downloads | 2.95% |
| 8 | Xbox Live | 2.91% |
| 9 | Facebook | 2.87% |
| 10 | Amazon Prime | 2.83% |

## TOP APPS 2022

### UPSTREAM TRAFFIC

| | Application | Total Volume |
|---|---|---|
| 1 | Netflix | 8.78% |
| 2 | HTTP Media Stream | 6.89% |
| 3 | YouTube | 5.90% |
| 4 | Generic Web Browsing | 3.85% |
| 5 | HTTP download | 3.70% |
| 6 | Generic QUIC | 3.43% |
| 7 | Generic Messaging | 3.17% |
| 8 | Disney+ | 2.98% |
| 9 | Hulu | 2.79% |
| 10 | Facebook | 2.67% |

# Video Permeates, Streaming Dominates

## APP CATEGORY TOTAL VOLUME

| | 2022 Categories | Total Volume |
|---|---|---|
| 1 | Video | 65.93% |
| 2 | Marketplace | 5.83% |
| 3 | Gaming | 5.58% |
| 4 | Social Networking | 5.26% |
| 5 | Cloud | 4.98% |
| 6 | Web Browsing | 4.63% |
| 7 | File Sharing | 3.39% |
| 8 | Messaging | 2.30% |
| 9 | VPN | 1.13% |
| 10 | Audio | 0.95% |

Demand for video content is soaring, so most platforms are embedding and spreading video within apps to increase views and engagement. Our data show in first half of 2022, video accounted for a hefty 65.93% of total volume over the Internet. That's a 24% increase over H1 2021. "Video" includes TV, video, and streaming download, but with video and other categories becoming more complex (see "The Rise of the Super App," page 16), we will, in subsequent reports, have more granular stratification of not only the video category, but also gaming, video conferencing, and others that have significant impacts on mobile and fixed networks.

### Netflix race against Disney+ and other streamers

Netflix's 223 million paid subscribers are putting a lot of pressure on networks, as they watch 1 billion hours of content per week. With increasingly popular HD plans, subscribers can use as much as 3GB data per hour, and for 4K resolution, as much as 7GB per hour. Multiplied across 223 million subscribers, and you get an idea of what's to come in the next couple years. Check out the sidebar in this section, "HD and UHD Impact on Networks."

Netflix has said it is spending $13.6 billion USD on content, as it is feeling the heat from fast-encroaching Disney+ (4.20% of traffic); Amazon Prime, which still registers in the top-10 in terms of total volume (at 2.67%); and HBO Max, which did not make the top-10 in terms of internet volume.

### Family Friendly Disney+ packs a powerful bandwidth punch

Not to be outdone in terms of spending, Disney+ is reportedly spending $33 billion on content in 2022. In H1 2022, Disney+ content comprised 4.20% of volume, a 199% increase over last year. Boasting the "best stories in one place," Disney+ is propelling Walt Disney into the future with Star Wars, Marvel, Pixar, National Geographic, and Disney. Building a reputation for family-friendly films and franchises, it has rapidly grown to 164.2 million subscribers, or, 235 million subscribers if you include Hulu and ESPN+, which are also part of Disney+.

### TikTok makes short-form video-sharing the next 'big thing'

TikTok fell one spot in the total-volume ranking, but its decline is probably due to the other-worldly increases it had during 2021, something that we did not expect would be sustained once its subscriber base – primarily younger people – went back to school. With 3.55% of total volume, TikTok is also dealiing more with the encroachment of competitors that took notice of TikTok's meteoric rise last year. As younger people increasingly consider social networking and messaging relics for adults, YouTube Shorts and Instagrams Reels are jockeying for position in this fairly new market. So far, TikTok's "For You" feeds, AR features, and green-screen options are making it the most downloaded app in the world, with more than 1 billion active monthly users (or should we say very active users with 83% of TikTokers posting video, and 52 minutes of average viewing time, with heavier users going as high as 80 to 90 minutes of viewing time per day)!

### HTTP Media Stream – What is it and why it shouldn't be ignored?

If we're going to talk about what's hot on the Internet and generating more traffic, we have to address the "HTTP Media Stream" category, which takes the #4 spot for top video app volume (at 4.3%). We see in our data that some of this traffic is adult content, which during COVID, the consumption of which increased substantially. As much as one-quarter to one-third of online searches during the pandemic pertained to pornography, and consumers in this category generally want new content regularly. That demand leads to supply, in the form of thousands of new pages, daily. Compounded over tens of millions of visitors per day, there's a disproportionate upstream jump as compared to downstream, which decreased 18%. That may be due to the fact people are back to in-person socializing, work and school. Other contributors to upstream traffic can be apps like OnlyFans, TikTok and You Tube Shorts, all of which encourage content creation for engagement and monetization purposes. As they grow in popularity, slow or choppy uploads of live or prerecorded content become less tolerable.

### Can video save social networking and messaging?

As we mentioned in the previous section "Netflix and MAMAA Rule the Internet," and as we confirm in the "Top Apps by Volume" chart, Facebook is in 7th place, a drop from last year, because the generational divide is widening. Younger people are, for the most part, fleeing social networking and messaging platforms for more quirky, short, algorithmically personalized video content, which they get on TikTok, Instagram Reels., and YouTube Shorts.

As we show in the table on the right, App Category Total Volume, Social networking accounts for 5.26% of app category volume, representing a 61% drop from last year. We do think part of the drop is due to a normalization of the extraordinary surges that came with COVID-driven behaviors of 2020 and 2021, especially for messaging and chat platforms like Facebook Video and Facebook Video Chat. With 1.3 billion people still logging onto Facebook every day, Meta may gain some ground by embedding and spreading of video within its , as we're sure we will see across all platforms and categories.

**HD and UHD Impact on Networks**

Netflix and other streaming platforms are starting to offer "picture quality options" as subscribers start to buy hardware capable of Ultra High Def of 4K and even 8K now becoming available.

According to Cisco's Annual Internet Report, one Internet-enabled HD television streaming for two or three hours can generate as much Internet traffic as an entire household in a day. UHD bit rates will be double HD rates, and 9x greater than SD. Cisco estimates that 66% of flat-panel TV sets will be UHD in 2023, with average global fixed broadband speed going from 46 Mbps in 2022 to 110 Mbps in 2023.

The average 5G speed will be 575 mbps or 13x faster than the average mobile connection.

When considering what HD requires, it amounts to approx. 3GB/hour, with Ultra-High Def requiring about 7GB/hour.

For mobile, SD at 480p uses 700MB/hour; HD at 2K requires 3GB/hour; and Ultra-high Def at 4K requires 7.2GB/hour.

As people move beyond just voice calls and texting on mobile devices, with AR/VR and UHD video becoming more popular, we expect there will be tremendous growth in demand and traffic.

## TOP 10 VIDEO APPS 2022

### TOTAL TRAFFIC

| | Application | Total Volume |
|---|---|---|
| 1 | Netflix | 13.74% |
| 2 | YouTube | 10.51% |
| 3 | Generic QUIC | 5.41% |
| 4 | HTTP Video Stream | 4.33% |
| 5 | Disney+ | 4.20% |
| 6 | Tik Tok | 3.55% |
| 7 | Amazon Prime | 2.67% |
| 8 | Hulu | 2.50% |
| 9 | Facebook Video | 1.98% |
| 10 | Operator Content | 1.91% |
| | Total Traffic Volume | 50.74% |

## TOP VIDEO APPS 2022

### UPSTREAM TRAFFIC

| | Application | Total Volume |
|---|---|---|
| 1 | Netflix | 8.91% |
| 2 | HTTP Media Stream | 6.98% |
| 3 | YouTube | 5.98% |
| 4 | Generic QUIC | 3.48% |
| 5 | Disney+ | 3.02% |
| 6 | Hulu | 2.83% |
| 7 | Amazon Prime | 2.04% |
| 8 | Tik Tok | 1.99% |
| 9 | FaceTime | 1.71% |
| 10 | HBO MAX | 1.64% |
| | Total Traffic Volume | 38.57% |

## TOP VIDEO APPS 2022

### DOWNSTREAM TRAFFIC

| | Application | Total Volume |
|---|---|---|
| 1 | Netflix | 14.92% |
| 2 | YouTube | 11.61% |
| 3 | Generic QUIC | 5.87% |
| 4 | Disney+ | 4.49% |
| 5 | Tik Tok | 3.92% |
| 6 | HTTP Media Stream | 3.72% |
| 7 | Amazon Prime | 2.83% |
| 8 | Hulu | 2.44% |
| 9 | Facebook Video | 2.23% |
| 10 | Operator Content | 2.18% |
| | Total Traffic Volume | 54.20% |


## Does More 'Simplicity' for the User Mean More Complexity for the Operator?

**In H1 2022, we see App Complexity not only continuing, but accelerating. The number of applications has increased, and applications have become magnitudes more intricate, defined by mashups and fusions of previously distinct content. This is leading to the demise of the Web Browser, as everything is becoming a Web App, containing multiple web pages, feeds and functions – all within a single app.**

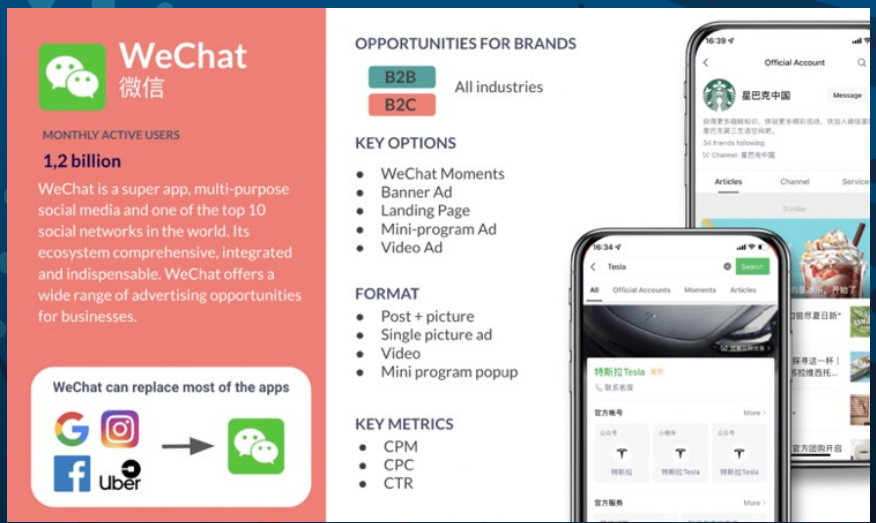
Within one app, you might have video, voice, chat, and gaming content all in the same flow. For example, Uber is not a single app but rather a series of apps, such as Uber, Uber Eats, Uber Freight, Uber Same-Day Package Delivery, Google Maps, 3rd-party geolocation services, GPS tracking, and payment services.

As the delivery of quality of experience becomes more of a differentiator, network operators will have to be able to see within the app to know what parts of the content are latency sensitive, and which are not. For example, for a gaming users, gaming quality would be prioritized over voice and video, or someone watching a streaming video. Someone attending a Zoom would want visual fidelity, so video packets would have the same priority as voice packets.

To take a closer look, consider the intricate blends of capabilities and content now prevalent in messaging and Chat apps, particularly WhatsApp, Facebook Messenger, and Weixin/WeChat (see image "What's in an App?" on the next page). All are becoming complex composites of voice, video calling, videos, texts, photos, files, payments, and advertisements.

# E OF THE R APP

As people become more comfortable with messaging and chat, both consumers and businesses seek more frictionless digital engagement. As a result, these apps are building functionality to enable people to seamlessly transition from simple messaging to audio and video, when needed. This is converting once-simple "messaging apps" into sophisticated ecosystems, within which people and businesses are engaging across many applications and platforms – and all from one place.




One of the prime examples of this is Tencent's WeChat, which is the #1 home screen for 1.26 billion active users across China, Hong Kong SAR, Taiwan, India, United States, and Indonesia. It's not shy about saying it wants to be a "super app" with multipurpose capabilities, building

# The Rise of the Super App (cont'd)

## Apps no longer deal with just one type of traffic


**3.5 million** app-driven "miniprograms" intended to create all-encompassing experiences for individuals and businesses alike. Just some of what it offers consumers are messaging and calling, location sharing, search, QR codes, eWallet, money transfers, and news feeds. For businesses, it offers payment services, CRM, paid blogs and tiered content, advertising services around targeted content, flash sales, promotions and giveaway campaigns, as well as partnership programs with local influencers who run pay-per-click campaigns.

Similarly, Meta is quickly expanding what it offers individuals and businesses through its Facebook Messenger, Meta for Business, and WhatsApp platforms. Facebook Messenger, at 100 billion messages per day, and WhatsApp at 65 billion messages per day, are promoting seamless transitions from chat, to audio, to video so that businesses can improve user experiences with customers that prefer online engagement to in-store interactions. They are also doing more to incorporate payments and debit card transactions. And, they too are doing more to integrate gaming and location features into individual and group messages so people can initiate multiplayer gaming through individual and group messages.

Another category in which content diversification and scaling up is taking place is video conferencing and collaboration. Platforms like Zoom, Microsoft Teams, Cisco Webex, GoToMeeting, Skype, and Google Meet have the staples of VoIP, video, chat, and screen sharing, but also a slew of new features like virtual whiteboards, live transcription, clip-and-share, app market-places, customized and immersive backgrounds, as well as enhanced privacy features. And if you look at how Microsoft Teams allows in-app access to Office 365, you see an expansion of capabilities within Teams that others may follow.

Even the "pure" single-category app in the top 6, Netflix, is morphing into an amalgam of different content categories. Primarily a streaming video platform since 2018, the rapid rise of Squid Games made Netflix a global phenomena early on in the pandemic. It accounted for 15% of the world's internet bandwidth, with an exponential increase that caused traffic over South Korea's ISP networks to soar from 50 Gigabits-per-second in May 2018 to 1,200 Gbps by September of 2021.

But toward the end of 2021, Netflix had highly publicized subscriber losses and oncoming heat from competitors like Disney+, HBO Max, Amazon Prime and others (see Most Popular Apps on page 26). In November 2021, the company launched Netflix Games, including a couple of Stranger Things-based games intended to help customers immerse themselves in the characters and stories of the popular series. By combining streaming and gaming content, the company managed to add 2.4 million subscribers in Q1 2022.

This and the previous examples illustrate how multiple streams of content within applications can increase engagement and stickiness through more compelling and comprehensive user experiences. While this benefits the application provider, it means more volume and complexity for the network operator. It will affect how operators manage capacity, and the ease with which they can see what's happening for the sake of

network optimization, revenue assurance, regulatory compliance, troubleshooting, customer care, and monetization.

To ensure optimal performance even amid the groundswell of content and hence data generated by different applications, there's going to be a greater need to see the composition of the traffic and to more intelligently prioritize latency-sensitive content within apps, like transmitting VoIP traffic before content or chat in a video conferencing app. Or, choosing a network connection with lower ping and lower bandwidth for more urgent data. The ability to recognize a live streaming event that can tolerate delay of 20 to 120 seconds without mitigating the user experience. With a streaming a video, users would need a minimum of 4 Mbps to 7 Mbps for standard quality, but for 4K experiences as much as 25 Mbps.

The ability to rapidly assess and manage traffic will become all the more important when performance ties directly to safety or even life and death. For example, in the IoT, 5 to 10 millisecond speeds will be needed for sensors, actuators and machine learning systems in autonomous car and smart machine applications.

Once autonomous, IoT, 5G and 5G slicing are more the norm than exception, operators will have to find ways to improve the experience for the most people across the most applications and platforms. They'll have to classify different categories of applications and see what within each application is mission-critical and in what way. Is it latency, throughput, or bandwidth that matters, and which is the optimal "order" of the traffic to preserve the quality of experience for the performance-sensitive and less performance-sensitive traffic across the most users, devices, and access types?

## What's in an App?

- Video (streaming, live, download, P2P)
- Audio
- Voice
- Chat (video and/or voice chat)
- Messaging
- Location services (maps, GPS, navigation etc.)
- Rich messaging (message + multimedia content, such as pictures, audio, videos, contacts, and other rich forms of media)
- Purchases and Payments (can include crypto, in app/microtransactions, browser based, mobile, contactless)
- Encryption (symmetric, asymmetric)
- Privacy services (Apple Private Relay)
- Advertisements

This higher degree of application and network intelligence will be fueled by sophisticated analysis and visibility into the what, when, where, how, and why of what's affecting networks. That will drive service providers' use cases to analyze, optimize, and monetize what's happening over their networks.

**As we showed in section 2 of this report, the "Big 6" application giants exerting more volumetric pressure on networks than everyone else, combined (this year at 47.98% of total internet traffic). Alphabet (Google), Meta (Facebook), Netflix, Amazon, Apple, and Microsoft are expecting to redefine user experiences, and to do it without any input from or payment to those who own the networks on top of which those user experiences will be fulfilled.**

# TELECOM IS REACHING AN INFLECTION POINT

Their contribution is just part of what's making the Internet grow so rapidly. According to statistics from Cisco Systems, global average Internet traffic will have increased 3.2-fold from 2018 to 2021 (with a compound annual growth rate of 26%).

Various industry stats estimate that by the end of 2023, between 63% and 66% of the global population will be using the Internet. As revealed during the two past years of COVID, digitization was accelerated and the digital divide widened by the pandemic. It became very clear that people, businesses, institutions, and government can rapidly increase their digital comfort levels, engagement, and acumen once the technologies are there to use. As 5G, IoT, Metaverse, and AI come into their own, shared customers of telecom and big tech will have increasingly high expectations about how applications and services should perform, and network operators will be expected to do what's necessary to fuel the optimal application experience.

**THIS IS THE INFLECTION POINT.** With innovation, everyone will inevitably want more…of everything. And commensurate with the growing demand for bandwidth, throughput, and latency will be a flood of Internet traffic across networks. Today, operators throw as much CAPEX as they can at their networks, and squeeze out more efficiency to the detriment of their own bottomline and sustainability. They operate under fairly slim net profit margins (approximately 12 to 13% in 2022), with extremely high expenses mitigating their gross profits.

In 2020, CAPEX was $79.4 billion for U.S. operators, bringing the cumulative total to $1.9 trillion in communications CAPEX since the Telecommunications Act was passed in 1996.

In 2021, telcos in Europe spent 52.5 billion euros ($59.4 billion) in 2021 for investments in networks, 5G trials, licenses, planning, and deployment. It was recently predicted by Omdia that monthly ARPU combined across both mobile and fixed broadband will fall by 4.2% from €7.48 in 2022 to €7.16 in 2027.

Even with aggressive fiber rollouts, telcos can't expect any big changes to their profit margins under current rules. They either have to continue building out capacity in perpetuity, or try to push back with proof points they deliver to regulators and policymakers that help them secure their own sustainability and place in world markets going forward.

There is still time to balance currently unchecked actions of those riding on top of networks by developing profit-sharing and ROI models that help operators reinvest in their networks.

Regulators and policymakers in the United States, Europe, and Asia (Singapore, South Korea, Japan, India) are reevaluating current net-neutrality regulations in the context of what happened with COVID. The digital need, and digital divide, revealed how expected and unexpected catastrophes (pandemics, weather calamities, wars) – as well as day-to-day usage and special events (sports, music, entertainment) –require enormous resilience and adaptability.

The World Economic Forum predicts democratization of computing with high-speed Internet worldwide can unleash trillions-of-dollars in economic gains and tens-of-millions of jobs. Networks will be the lifeblood of those gains, but only with massive broadband and wireless investment. Those building the infrastructure have to get a return on investment to make continuous innovation possible, and to ensure adaptability, performance, and resilience going forward.

In 2021, the leaders of 12 telecom service providers put out a joint statement about the need for big tech to help fund network costs. Stating that the current situation is not sustainable, Vodafone CEO Nick Read joined CEO Timotheus Höttges of Deutsche Telekom (DT), former chairman and CEO of Orange Stéphane Richard, Chairman and CEO of Telefónica José María Álvarez-Pallete and eight others.

In 2022, AT&T and Verizon put out their own statement, urging the FCC to use money from the "broader Internet economy" to prop up the flailing Universal Service Fund.

Currently, the European Commission and the Body of European Regulators for Electronic Communications (BEREC) are reviewing how the Netflix, Meta, Alphabet, Microsoft, Apple, and Amazon use telecom operators' bandwidth, and a consultation is open with OfCom about current usage and future usage with metaverse and other innovations.

In the United States, there is some investment from the federal government through the Inflation Reduction Act (P.L.117-18) and the Infrastructure Investment and Jobs Act (P.L.117-58), which include billions-of-dollars for broadband investment and tax breaks to push communications innovations.

In automotive, manufacturing, and healthcare, there will be amalgamations of video, robotics, AI, sensors, AR/VR, and more. More performance-dependent applications will exert even more pressure on operators' networks in terms of latency, responsiveness, and speed.

The time has come for network operators and service providers in telecom to be unshackled from outdated rules and regulations so that networks can keep pace with the trajectory of innovation that is coming.

As that happens, it will be imperative that operators up their game with data quality and data accuracy, and more sophisticated machine learning, heuristics, and application content classification. As we covered in section four in "Rise of the Super App," applications will be magnitudes more demanding and complex, and a greater degree of application and network intelligence will be needed to ensure the best application quality of experience for the most customers of fixed and mobile networks.

# Mobile is the Way to Go

**Smartphone usage is reshaping app usage and internet traffic around the world.**

**In 2028, all growth in mobile data traffic will come from 5G, according to Ericsson, which expects total mobile network traffic to reach approximately 115 EB per month by the end of 2022, and to 453 EB per month by the end of 2028 (that's including fixed wireless access, FWA).**

We see that time spent on mobile apps has grown from about three hours pre-pandemic to a global average of about 5 hours per day, currently. People used their mobiles for things they had not previously used them for: viewing longer videos, video conferencing, file sharing, remote learning, delivery apps (groceries, goods, etc.), gaming, and more.

In 1H 2022, with people on the go again, some COVID habits linger on, with video-watching and uploading content growing as people leave their homes and do more on the move. Video traffic now accounts for a whopping 67.60% of volume.

YouTube is the main driver of video traffic over mobile, with 16.24% of total volume, and 17.17% of downstream. If we were to combine Facebook and Facebook Video (which we separate in our rankings), Facebook would be the #1 culprit for total and downstream volume over mobile. As you see below, Facebook is the biggest "brand" when it comes to traffic, with Google 2nd because of its YouTube traffic.

| | Application Group | Total Volume |
|---|---|---|
| 1 | Facebook | 27.82% |
| 2 | Google | 19.09% |
| 3 | TikTok | 13.76% |
| 4 | Netflix | 2.41% |
| 5 | Microsoft | 1.96% |
| 6 | Apple | 1.51% |
| 7 | Amazon | 0.38% |
| TOTAL | | 66.93% |

TikTok moves to 3rd in both the brands ranking of traffic and ranking of volume by app. It also makes a big move in upstream traffic from 9th place last year to 2nd this year, which we cover later in this section. Further down in the ranking, we see Netflix creeping into the top-10 for both total traffic (9th place), and downstream traffic (8th place). That is a change from last year, when Netflix traffic did not show up in the top 15 apps for mobile traffic. This means more people are viewing Netflix content on mobile, as opposed to just watching and binging at home on bigger screens.

We also see that social networking ranks higher for traffic volume over mobile, with 12.16%, as compared to the global traffic ranking, where it holds fourth place at 5.26%. A large part of that volume is attributable to Facebook Video, which has made a rapid rise from 8th place last year to 2nd, with 14.37% of total traffic. This popularity on mobile indicates people are using Facebook Video for posting and viewing videos and one-to-one video chats on their mobiles. To further drive interest in the platform, Meta announced in Q1 2022 that creators could receive a 20% revenue share (a share of in-stream ad revenue) for eligible videos that use licensed music. This is part of a broader initiative to help Facebook users monetize short-form and longer videos, expanding eligibility to a

## Global Mobile Application Category Volume Totals

### TOTAL MOBILE VOLUME

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 67.60% |
| 2 | Social Networking | 12.16% |
| 3 | Messaging | 5.89% |
| 4 | Web Browsing | 4.51% |
| 5 | Marketplace | 2.77% |
| 6 | Gaming | 2.41% |
| 7 | File Sharing | 1.97% |
| 8 | Cloud | 1.79% |
| 9 | VPN | 0.79% |
| 10 | Audio | 0.11% |

### DOWNSTREAM VOLUME

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 70.35% |
| 2 | Social Networking | 12.27% |
| 3 | Messaging | 4.78% |
| 4 | Web Browsing | 3.83% |
| 5 | Marketplace | 2.86% |
| 6 | Gaming | 2.43% |
| 7 | File Sharing | 1.77% |
| 8 | Cloud | 1.06% |
| 9 | VPN | 0.53% |
| 10 | Audio | 0.12% |

### UPSTREAM VOLUME

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 37.11% |
| 2 | Messaging | 18.23% |
| 3 | Web Browsing | 11.95% |
| 4 | Social Networking | 10.96% |
| 5 | Cloud | 9.81% |
| 6 | File Sharing | 4.27% |
| 7 | VPN | 3.65% |
| 8 | Gaming | 2.11% |
| 9 | Marketplace | 1.82% |
| 10 | Audio | 0.10% |

greater number of content creators, and allowing creators to earn money from viewer contributions.

Another Meta property, Instagram, appears in 6th place for total volume and downstream volume, and 7th place for upstream. With 1.21 billion active users, Instagram has become more popular among celebrities and brands that have celebrities and people promoting their products. During the World Cup, Instagram got global attention when Lionel Messi's photo montage of his experience became the most-liked ever, with 57 million likes (see FIFA World Cup spotlight on Page 32).

We also want to point out that short-form video is represented in the top-10 for the video category, with third-place TikTok doubling its mobile traffic since last year, now with 14% of the total volume and about the same for downstream. Though TikTok traffic decreased as a percentage of total internet volume, it continues to drive significant mobile traffic. This makes sense, since younger people are its base, and they tend to rely on mobile more for viewing and uploading content.

Also worth mentioning is another short-form specialist, a newcomer in terms of our traffic ranking: Kwai, a Chinese-originated and San Paolo-based short-form video platform that is becoming very popular in Latin America. Appealing to a younger base of 379 million active users, the platform is trying to reach a potential market of 600 million people by taking what it calls a more "democratic" and "community building" approach in the way it ranks followers.

myCanal is yet another new name in our ranking, whose "anytime, anywhere" feature of CANAL+ pay TV service allows people to watch movies and series on their mobiles. (Note: in the 2023 Global Internet Phenomena Report, rankings will parse out TV, streaming and download video in a more granular way to further distinguish and categorize "video" traffic.)

Before examining upstream and downstream trends, we want to touch on the messaging category, which includes apps like WeChat, WhatsApp, Wattpad, Slack, Google Chat, Telegram, Discord, as well as generic ones like WebRTC and RTP. As these apps incorporate more audio and video capabilities, their volume contribution will increase. Right now, messaging is in 3rd place for mobile traffic (a contrast to its 8th place ranking in global networks, which include fixed, mobile, satellite, cable, etc).

**Upstream and Downstream**

When looking at upstream trends, we see that TikTok has gone from 9th place last year to 2nd place this year, with little more than a percentage point separating it from Facebook traffic. Downstream, TikTok traffic has almost doubled from last year in the same time period, with 14.30% of the traffic – not far behind the leaders of YouTube and Facebook Video at 17.17% and 15.44%, respectively. Short-form video like TikTok could be regarded as the new guard in terms of "heavy usage" that can impact operators' expansions, much like peer-to-peer (P2P) did in the early 2000s.

Here we also see QUIC traffic holding a prominent position, with Google, Meta, Facebook, Netflix, Snapchat, Apple, and

# Global Mobile Application Volume Totals

## TOTAL MOBILE VOLUME

| | Application | Total Volume |
|---|---|---|
| 1 | YouTube | 16.24% |
| 2 | Facebook Video | 14.37% |
| 3 | TikTok | 13.76% |
| 4 | Generic QUIC | 9.49% |
| 5 | Facebook | 5.94% |
| 6 | Instagram | 4.82% |
| 7 | HTTP Media Stream | 4.09% |
| 8 | WhatsApp | 2.68% |
| 9 | Netflix | 2.41% |
| 10 | Snapchat | 1.60% |

## DOWNSTREAM VOLUME

| | Application | Total Volume |
|---|---|---|
| 1 | YouTube | 17.17% |
| 2 | Facebook Video | 15.44% |
| 3 | TikTok | 14.30% |
| 4 | Generic QUIC | 9.89% |
| 5 | Facebook | 5.65% |
| 6 | Instagram | 4.80% |
| 7 | HTTP Media Stream | 4.35% |
| 8 | Netflix | 2.58% |
| 9 | WhatsApp | 2.48% |
| 10 | Snapchat | 1.62% |

## UPSTREAM VOLUME

| | Application | Total Volume |
|---|---|---|
| 1 | Facebook | 9.15% |
| 2 | TikTok | 7.68% |
| 3 | Generic Messaging | 6.83% |
| 4 | myCanal | 6.04% |
| 5 | Google | 6.00% |
| 6 | YouTube | 5.86% |
| 7 | Instagram | 5.12% |
| 8 | Generic QUIC | 5.07% |
| 9 | WhatsApp | 4.84% |
| 10 | Amazon AWS | 3.25% |

# Mobile is the Way to Go (Cont'd)

other big platforms increasingly employing QUIC to improve QoE metrics. As they do so, app traffic increases, obfuscating visibility for less-sophisticated analytics systems, which then classify it as "unknown." This makes it more difficult for network planning and operations to see what's happening in downstream and upstream traffic.

**Devices Matter**

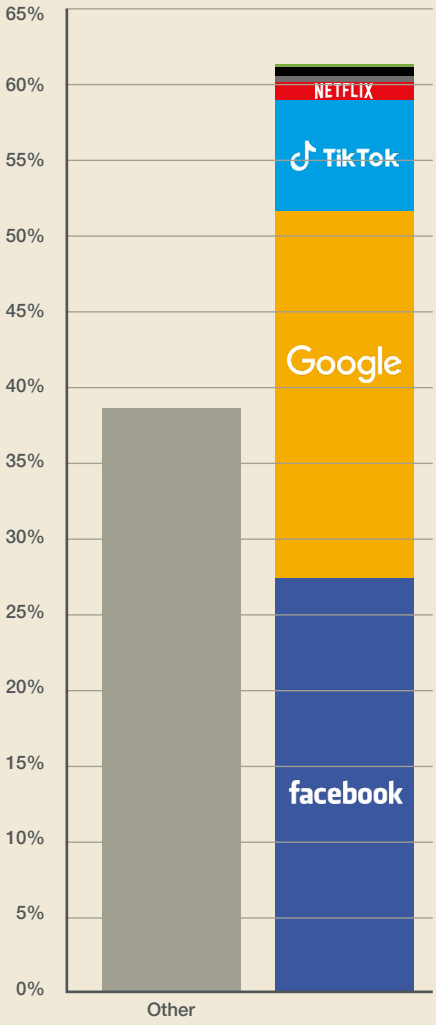
When talking about mobile traffic and the apps driving that traffic, it's important to understand the devices over which people are consuming or creating video, or engaging in conversations either with voice or messaging, chat, or text. Approximately 70% of the global population will have mobile connectivity by 2023, with 5G devices and connections becoming possible for over 10% of global mobile devices and connections by end of 2023, according to Cisco.

Of those devices, Android is the predominant OS worldwide, with 3 billion active Android devices, 75% market share, and 85% market share in Brazil, India, Indonesia, Turkey and Vietnam.

But interestingly, we see Apple is making up some ground. It was the only smartphone company that saw growth in H1 2022, even though global smartphone shipments fell 11% in Q1 2022 and 9% in Q2. Apple also achieved a record revenue of $124 billion for Q1 and $97.3 billion for Q2 (9% YoY growth), despite supply chain issues and production woes during COVID recovery.

Apple also boasted an all-time high in terms of installed base, which hit 2 billion devices in Q3. Of those 2 billion devices, approximately 1.2 billion are iPhones. With saturation in its mainstay markets like Japan and the United States, Apple did attract new users in Europe, Middle East and Africa – even though there was market contraction in all of those regions the past year.

Some speculate Apple's focus on making its iPhones from series 12 on "5G compatible" might drive further growth, with the iPhone acting as a driver to other Apple devices (i.e., Airpods, Mac, iPad, Wearables, Home and Accessories, and Services). Apple may be approaching what some feel is a "supercycle," as supply chain issues that affected iPhone 14 Pro, Pro Max, and Apple Watch Ultra shipments become less of an issue going into 2023.




## Global Top 10 Mobile Applications by Category

| | Video | Games | Social | Messaging |
|---|---|---|---|---|
| 1 | YouTube | Playstation Downloads | Facebook | WhatsApp |
| 2 | Facebook Video | Steam | Instagram | Generic Messaging |
| 3 | TikTok | PUBG | Snapchat | Telegram |
| 4 | Generic QUIC | ROBLOX | VK | Facebook |
| 5 | HTTP Media Stream | Garena Free Fire | Twitch | Discord Voice |
| 6 | Netflix | Epic Games Launcher | Twitter Broadcast | Wattpad |
| 7 | Kwai Video | Media Fire | Pinterest | Agora.io |
| 8 | myCanal | Steam Client | Twitter | Microsoft Teams |
| 9 | XNXX | Generic Gaming | GIPHY | Skype |
| 10 | Disney+ | MEGA | Reddit | Google Generic Call |

# Spotlight: **QUIC Is Here to Stay**


**QUIC (Quick UDP Internet Connections) traffic is almost as high as TCP in today's networks (though major high bandwidth applications still continue to migrate to TLS 1.3). As you'll see in our "total volume" chart on Page 13, where we talk about the Big-brands that dominate internet traffic, QUIC is a prominent driver of traffic volume: it holds the #3 position in total volume, #6 position in upstream traffic, and #3 in downstream.**

Indeed, privacy and security are extremely salient to both application developers and users, and this is driving more investments in encryption technologies like SSL v3, TLS for TCP, and QUIC for UDP traffic.

YouTube is the biggest user of QUIC, understandably, as Google did create QUIC for better performance (i.e., less packet loss, faster Web browsing, reduced page loading times), and YouTube is its biggest driver of internet traffic volume. QUIC is used in more than half of all connections from its Chrome web browser to Google servers.

Once IETF QUIC came into being, Facebook used it to achieve better QoE for video content-based applications and as much as 75% of its traffic uses QUIC.

Apps from Apple, TikTok, HBO Max, Amazon Prime, and others are now following suite for more stable, fast, and encrypted connections. Microsoft Edge (a derivative of the open-source Chromium browser) and Firefox support it. Safari implements the protocol, however it is not enabled by default.

Additionally, VPNs and communication and conferencing applications are also making more use of QUIC.

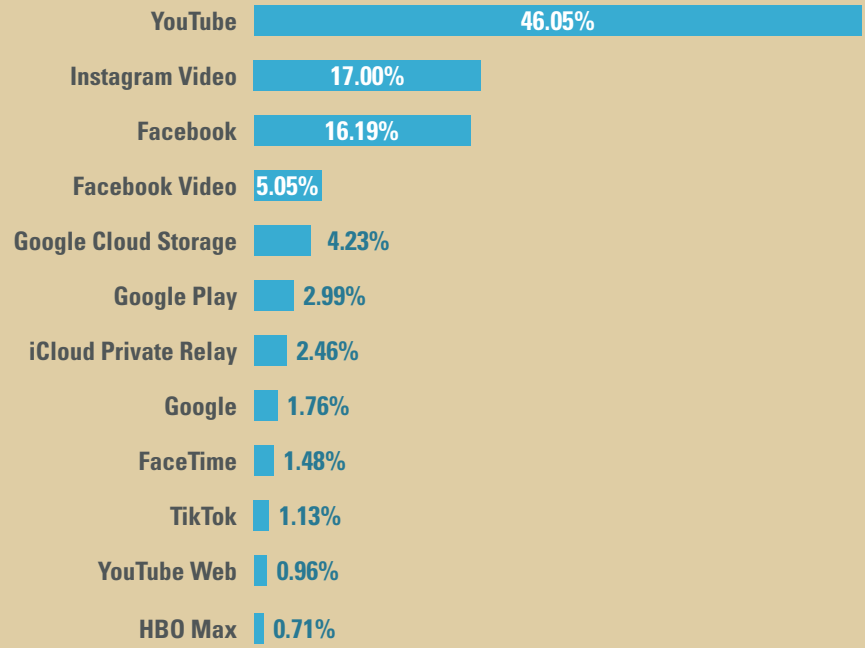
In examining data from several networks, below we show a breakdown of what we see in terms of QUIC volumes for Google, Meta, FaceTime, TikTok, and HBO Max.

**Does video QoE have to mean a visibility tradeoff?**

The answer is "no." The challenge for operators is that QUIC and obfuscate what's happening on networks. That's true overall with the rise in encryption(i.e., Apple iCloud Private Relay), QUIC, and HTTP/3 traffic, all of which leads to a flood of "unknown" or "other" traffic, especially on networks that rely on more basic techniques to identify app traffic.

Using increasingly sophisticated app classification techniques, it is possible to classify "unknown" traffic to gauge what's happening on networks and measure the application experiences of subscribers.

## Applications using IETF QUIC



# Regional Application Popularity Trends

## Netflix is King in Americas and APAC, but YouTube retains the crown in EMEA

**While video dominates traffic in all regions, don't discount the impact gaming, marketplace, social networking, and cloud storage services are having on total traffic and upstream/downstream symmetry**

The volume exerted by video over fixed and mobile networks is quite obvious in our regional charts, as video is by far the top traffic category in all regions, with the Americas seeing the largest composition of total video traffic at 73.74%, APAC at 66.11%, and EMEA at 62.46%. As we saw in our rankings on page 13, Netflix dethroned YouTube as king in terms of total volume, and that trend holds true in America and APAC, where Netflix comprises 22% and 20% of traffic, respectively. It also is responsible for the most downstream traffic at 23% in Americas, and 22% in APAC.

In EMEA, however, it's still YouTube that reigns, with 18% of the total, 19% downstream, 11% upstream. Netflix is in 5th place for total and downstream traffic, with Facebook Video and Facebook social networking apps generating the most internet traffic.

Below is a closer look at a few key trends that will drive up internet traffic:

**Netflix is streaming king in Americas and APAC**

We believe Netflix traffic will continue to grow in volume as it expands beyond its previously American-centric view into other regions of the world. Netflix has indicated it has runway to spend as much as $50 billion on content to appeal to different geographies and cultures. Some recent examples include dozens of anime titles, Korean content that is increasingly appealing to U.S. and U.K. audiences, local-language content, and original films, series, and games tailored to different languages and countries.

As it expands, Netflix recognizes it has to extend its reach to mobile-first developing markets in Asia & Oceania, EMEA, Latin America & the Caribbean, where fixed-network penetration averages about 60%, and mobile about 80%. It is starting off by offering some free or low-cost content over Android and iOS apps, even offering a mobile-only plan as an experiment in India at 250 rupees/$3.63/month.

The impact of its heavy content acquisition and production will be more traffic over fixed and mobile networks around the world. Whether it will be Netflix in the number-one spot next year remains to be seen, as Disney surpassed Netflix in terms of subscribers with 221.1 million subscribers in Q3, surpassing Netflix's 220.7 million. But Disney is still far behind in revenue, and in traffic volume. That could change. Time will tell.

**More Gaming… on the Go!**

Americas and APAC are similar in that the #2 category is gaming for both total and downstream traffic, whereas EMEA sees social networking in the 2nd spot for total and downstream (with messaging 2nd for upstream). APAC, however, represents the world's largest gaming market. In China, for instance, there are between 685 million and 720 million gamers.

India also is a huge gaming market, with 507 million gamers and a market valued at $2.6 billion. Because of the large youth population with disposable income, that number is expected to quadruple by 2027.

Other regions that have seen gaming take off during and after COVID are Japan the Republic of Korea, Malaysia, Thailand, Vietnam, Singapore and the Philippines.

It seems that in most regions, mobile games are growing at a faster rate than PC online and console games, namely because of the value mobility/portability brings. With MMORPGs offering online versions, and mobile device RAM improving all the time, people are increasingly willing to forego graphical advances and 4K resolution while on the move. While PC and console gaming aren't going anywhere, we do believe that online gaming will continue to climb, and hence, traffic from mobile devices will steadily increase.

Worldwide, mobile gaming is expected to advance at a CAGR of 12.3% and reach USD 338 billion by 2030. That growth will be driven not only in APAC (particularly Southeast Asia), but also Latin and South Americas, where smartphone penetration is high across Brazil, Chile, Argentina, and Mexico (geographically Central America). In these countries, eSports are proving to be a big driver of online gaming, thanks to the popularity of fútbol, the South American Games (XII Juegos Suramericanos Asunción 2022), and massively multiplayer online role playing games (MMORPGs). Approximately 274 million people play mobile games in Latin America, so it represents a huge untapped market thanks to the sheer size of the population and the mobile-first mindset of people there.

In Europe, about there are 330 million gamers, with 201 million of them on mobile – a figure set to rise to 218 million by 2023, with the United Kingdom and Germany representing two of the biggest markets.

In North America, there are approximately 304 million mobile gamers, with the average gameplay time at 8 hours per week. Overall average weekly play time has increased 27% despite out-of-home activities

## Regional Category Traffic Share Total

### AMERICAS CATEGORY SHARE

TOTAL TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 73.74% |
| 2 | Gaming | 5.77% |
| 3 | Marketplace | 4.19% |
| 4 | Social Networking | 3.77% |
| 5 | Cloud | 3.52% |
| 6 | Web Browsing | 3.34% |
| 7 | Messaging | 2.48% |
| 8 | File Sharing | 1.43% |
| 9 | Audio | 0.92% |
| 10 | VPN | 0.83% |

### APAC CATEGORY SHARE

TOTAL TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 66.11% |
| 2 | Gaming | 7.33% |
| 3 | Marketplace | 7.19% |
| 4 | Cloud | 5.11% |
| 5 | File Sharing | 3.37% |
| 6 | Social Networking | 3.30% |
| 7 | Web Browsing | 2.90% |
| 8 | Messaging | 2.25% |
| 9 | VPN | 1.62% |
| 10 | Audio | 0.80% |

### EMEA CATEGORY SHARE

TOTAL TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 62.46% |
| 2 | Social Networking | 14.22% |
| 3 | Messaging | 4.94% |
| 4 | Web Browsing | 4.38% |
| 5 | Marketplace | 4.20% |
| 6 | Gaming | 3.01% |
| 7 | File Sharing | 2.59% |
| 8 | Cloud | 2.58% |
| 9 | VPN | 1.33% |
| 10 | Audio | 0.30% |

## Regional Application Traffic Share Total

### AMERICAS APP SHARE

TOTAL TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Netflix | 22.19% |
| 2 | YouTube | 15.69% |
| 3 | Generic QUIC | 13.56% |
| 4 | Disney+ | 3.37% |
| 5 | Playstation Downloads | 3.03% |
| 6 | Amazon Prime | 2.79% |
| 7 | HTTP Media Stream | 2.62% |
| 8 | Xbox Live | 1.74% |
| 9 | Hulu | 1.57% |
| 10 | HbbTV | 1.51% |

### APAC APP SHARE

TOTAL TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Netflix | 20.10% |
| 2 | YouTube | 10.77% |
| 3 | Generic QUIC | 10.50% |
| 4 | Disney+ | 6.22% |
| 5 | Akamai CDN | 4.25% |
| 6 | Playstation Downloads | 3.66% |
| 7 | Xbox Live | 3.59% |
| 8 | Amazon Prime | 2.25% |
| 9 | iTunes Store | 1.81% |
| 10 | HTTP Media Stream | 1.69% |

### EMEA APP SHARE

TOTAL TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | YouTube | 18.30% |
| 2 | Facebook Video | 11.68% |
| 3 | Facebook | 10.58% |
| 4 | Generic QUIC | 9.09% |
| 5 | Netflix | 5.50% |
| 6 | Instagram | 5.09% |
| 7 | HTTP Media Stream | 3.79% |
| 8 | WhatsApp | 2.80% |
| 9 | Android Market | 1.58% |
| 10 | Google | 1.50% |

# Regional Application Popularity Trends (cont'd)

resuming after the first two years of COVID, and players are contributing 16% more revenue than they did in 2020. In the United States, smartphone penetration is expected to reach 86% by 2025 (328 million mobile phones), so that fact combined with 5G will further drive interest.

**Marketplaces are Booming**

Global online sales reached 4.29 trillion in 2020, and in 2021, digital, third-party marketplaces grew 81% with some predicting this market will reach 6.5 Trillion dollars in sales by 2023. In our data, we see marketplace apps are generating more traffic, as people find them a safe, convenient way to shop for goods and services. Some popular marketplaces people access over iOS and Android App Stores include: Amazon, eBay, Rakuten, AliExpress, Etsy, Alibaba, eBay, Taobao, Tmall, Groupon, Uber Eats, DoorDash – to name just a few. This category is flourishing and even luxury brands are taking note, as with italist, Farfetch, Luxify, and James Edition.

Also popular are stock market apps from Fidelity, TD Ameritrade, Robinhood, and SoFi appeal to neophytes and pros alike.

As people get more comfortable, we also see more niche marketplaces emerging. For example, Docplanner connects patients to medical professionals; Upwork connects freelancers and specialists with employers; Startupmatcher is a Nordic marketplace for connecting developers to start-ups.

**Cloud services driving increase in upstream volume**

Upstream cloud traffic has increased 20% in Americas, 23% in APAC, and 11% in EMEA, perhaps because people are doing more posting of files and media to cloud storage services (Dropbox, Google Drive, OneDrive, Media Fire, Microsoft Azure, Oracle Cloud, Amazon AWS, Tencent Cloud, etc), while also creating more content for upload to social media, blogging, and video sites.

Traditionally, upstream capacity wasn't a big concern, but now with more performance-sensitive videoconferencing requiring two -way communications, and with more video and content being uploaded to the cloud, there may be more network asymmetry.

Though upstream traffic was markedly higher during 2020 and 2021, with increases as high as 56% to 96%, even more subtle increases of 5% to 10% could impact symmetrical downstream/upstream speeds. To avoid network asymmetry, operators may have to change how they view upstream capacity and choose to add more fiber or virtualization and automation technologies.

**Social networking traffic still a top category in EMEA, despite drop elsewhere**

In this category, Europe would be where Netflix traffic would be highest, especially in four key markets Netflix targets: Belgium, Romania, Spain, and Sweden, but it's diluted by traffic trends from other regions. For example, the Middle East has been more complex for Netflix (as well as Disney and other streamers) in terms of creating and offering content appropriate to the norms and regulations of various Middle Eastern countries. And in Africa, streaming platforms are dealing with the fact South Africa, Nigeria, Kenya and other developing nations are still in the throes of building out stable internet.

For these reasons, YouTube and Facebook Video remain prominent in the traffic ranking. You'll also see QUIC is high in the ranking for total and downstream traffic, as QUIC goes hand-in-hand with YouTube and Facebook traffic because both Google and Meta are big users of QUIC. For more on that, check out "QUIC is Here to Stay" page 35.

Also prominent in EMEA is traffic from Meta's Instagram for photo and video sharing and WhatsApp for messaging. While these platforms have seen drops among younger people in more developed regions like North America and Europe (as people flock to Netflix and TikTok, for example), they still remain popular in areas where reliable broadband and internet is in early stages.

## Regional Category Traffic Share Downstream

### AMERICAS CATEGORY SHARE

DOWNSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 76.43% |
| 2 | Gaming | 5.99% |
| 3 | Marketplace | 4.27% |
| 4 | Social Networking | 3.83% |
| 5 | Web Browsing | 2.67% |
| 6 | Cloud | 2.18% |
| 7 | Messaging | 1.93% |
| 8 | File Sharing | 1.19% |
| 9 | Audio | 0.95% |
| 10 | VPN | 0.55% |

### APAC CATEGORY SHARE

DOWNSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 69.45% |
| 2 | Gaming | 7.72% |
| 3 | Marketplace | 7.57% |
| 4 | Cloud | 3.37% |
| 5 | Social Networking | 3.31% |
| 6 | Web Browsing | 2.48% |
| 7 | File Sharing | 2.35% |
| 8 | Messaging | 1.59% |
| 9 | VPN | 1.32% |
| 10 | Audio | 0.85% |

### EMEA CATEGORY SHARE

DOWNSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 65.29% |
| 2 | Social Networking | 14.76% |
| 3 | Marketplace | 4.04% |
| 4 | Messaging | 4.01% |
| 5 | Web Browsing | 3.77% |
| 6 | Gaming | 3.14% |
| 7 | File Sharing | 2.23% |
| 8 | Cloud | 1.57% |
| 9 | VPN | 0.89% |
| 10 | Audio | 0.31% |

## Regional Application Traffic Share Downstream

### AMERICAS APP SHARE

DOWNSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Netflix | 23.48% |
| 2 | YouTube | 16.57% |
| 3 | Generic QUIC | 13.88% |
| 4 | Disney+ | 3.53% |
| 5 | Playstation Downloads | 3.20% |
| 6 | Amazon Prime | 2.93% |
| 7 | HTTP Media Stream | 2.79% |
| 8 | Xbox Live | 1.84% |
| 9 | Hulu | 1.65% |
| 10 | HbbTV | 1.62% |

### APAC APP SHARE

DOWNSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Netflix | 21.72% |
| 2 | YouTube | 11.51% |
| 3 | Generic QUIC | 11.02% |
| 4 | Disney+ | 6.65% |
| 5 | Akamai CDN | 4.56% |
| 6 | Playstation Downloads | 3.87% |
| 7 | Xbox Live | 3.85% |
| 8 | Amazon Prime | 2.42% |
| 9 | iTunes Store | 1.93% |
| 10 | Steam | 1.59% |

### EMEA APP SHARE

DOWNSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | YouTube | 19.22% |
| 2 | Facebook Video | 12.68% |
| 3 | Facebook | 10.71% |
| 4 | Generic QUIC | 9.62% |
| 5 | Netflix | 5.71% |
| 6 | Instagram | 5.32% |
| 7 | HTTP Media Stream | 4.16% |
| 8 | WhatsApp | 2.44% |
| 9 | Generic Web Browsing | 1.43% |
| 10 | Android Market | 1.30% |

# Regional Application Popularity Trends (cont'd)

## Regional Category Traffic Share Upstream

### AMERICAS CATEGORY SHARE

UPSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 39.96% |
| 2 | Cloud | 20.39% |
| 3 | Web Browsing | 11.76% |
| 4 | Messaging | 9.39% |
| 5 | File Sharing | 4.45% |
| 6 | VPN | 4.39% |
| 7 | Marketplace | 3.19% |
| 8 | Gaming | 3.03% |
| 9 | Social Networking | 2.91% |
| 10 | Audio | 0.53% |

### APAC CATEGORY SHARE

UPSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 31.91% |
| 2 | Cloud | 22.97% |
| 3 | File Sharing | 13.90% |
| 4 | Messaging | 9.09% |
| 5 | Web Browsing | 7.24% |
| 6 | VPN | 4.73% |
| 7 | Gaming | 3.35% |
| 8 | Marketplace | 3.31% |
| 9 | Social Networking | 3.16% |
| 10 | Audio | 0.35% |

### EMEA CATEGORY SHARE

UPSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Video | 39.65% |
| 2 | Messaging | 12.40% |
| 3 | Cloud | 10.64% |
| 4 | Social Networking | 9.93% |
| 5 | Web Browsing | 9.30% |
| 6 | Marketplace | 5.47% |
| 7 | File Sharing | 5.45% |
| 8 | VPN | 4.95% |
| 9 | Gaming | 1.96% |
| 10 | Audio | 0.26% |

## Regional Application Traffic Share Upstream

### AMERICAS APP SHARE

UPSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | Generic QUIC | 9.49% |
| 2 | Google | 8.19% |
| 3 | Amazon AWS | 6.62% |
| 4 | Netflix | 6.17% |
| 5 | FaceTime | 5.89% |
| 6 | iCloud | 5.52% |
| 7 | YouTube | 4.78% |
| 8 | Google Cloud Storage | 3.26% |
| 9 | Generic Messaging | 3.07% |
| 10 | WhatsApp | 2.99% |

### APAC APP SHARE

UPSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | iCloud | 10.41% |
| 2 | Generic QUIC | 5.23% |
| 3 | BitTorrent transfer | 4.98% |
| 4 | Generic Messaging | 4.04% |
| 5 | Netflix | 3.59% |
| 6 | BitTorrent KRPC | 3.54% |
| 7 | Google | 3.52% |
| 8 | Microsoft Teams | 3.41% |
| 9 | YouTube | 3.32% |
| 10 | Generic File Sharing | 3.04% |

### EMEA APP SHARE

UPSTREAM TRAFFIC

| | Category | Total Volume |
|---|---|---|
| 1 | YouTube | 11.39% |
| 2 | Facebook | 9.61% |
| 3 | WhatsApp | 5.59% |
| 4 | Google | 5.34% |
| 5 | Generic QUIC | 5.10% |
| 6 | Facebook Video | 4.07% |
| 7 | Netflix | 3.89% |
| 8 | Android Market | 3.73% |
| 9 | Instagram | 3.42% |
| 10 | Generic Messaging | 3.09% |

## Americas Top 10 Applications by Category

| | Video | Games | Social | Messaging |
|---|---|---|---|---|
| 1 | Netflix | Playstation Downloads | Twitch | WhatsApp |
| 2 | YouTube | Steam | Facebook | Generic Messaging |
| 3 | Generic QUIC | ROBLOX | Instagram | Discord Voice |
| 4 | Tik Tok | Epic Games Launcher | Snapchat | Telegram |
| 5 | Disney+ | Steam Client | Reddit | Wattpad |
| 6 | Amazon Prime | Nintendo Online | Pinterest | Facebook |
| 7 | HTTP Media Stream | Xbox Live TLS | Twitter | WeChat |
| 8 | Hulu | MediaFire | Baidu | WeChat voice |
| 9 | HbbTV | League of Legends | QQ | Google Generic Call |
| 10 | HBO MAX | MEGA | LinkedIn | Discord |

## APAC Top 10 Applications by Category

| | Video | Games | Social | Messaging |
|---|---|---|---|---|
| 1 | Netflix | Playstation Downloads | Twitch | Generic Messaging |
| 2 | YouTube | Steam | Facebook | Wattpad |
| 3 | Generic QUIC | Epic Games Launcher | Snapchat | WhatsApp |
| 4 | Disney+ | ROBLOX | Reddit | LINE |
| 5 | Akamai CDN | Nintendo Online | Instagram | Discord Voice |
| 6 | Tik Tok | Steam Client | Naver | Facebook |
| 7 | Amazon Prime | MEGA | Pinterest | Telegram |
| 8 | HTTP Media Stream | League of Legends | Twitter | Discord |
| 9 | CloudFront CDN | Generic Gaming | Baidu | WeChat |
| 10 | Foxtel Now | EA Game | QQ | WeChat voice |

## EMEA Top 10 Applications by Category

| | Video | Games | Social | Messaging |
|---|---|---|---|---|
| 1 | YouTube | Playstation Downloads | Facebook | WhatsApp |
| 2 | Tik Tok | Steam | Instagram | Facebook |
| 3 | Facebook Video | Epic Games Launcher | Snapchat | Telegram |
| 4 | Generic QUIC | ROBLOX | Twitch | Generic Messaging |
| 5 | Netflix | PUBG | VK | Discord Voice |
| 6 | HTTP Media Stream | Garena Free Fire | Pinterest | Wattpad |
| 7 | Instagram | Steam Client | Twitter Broadcast | Microsoft Teams |
| 8 | XNXX | League of Legends | Twitter | Agora.io |
| 9 | Kwai Video | MediaFire | Reddit | Skype |
| 10 | Disney+ | Xbox Live TLS | LinkedIn | Google Generic Call |

# Spotlight: **FIFA World Cup – Is Sport the Next Frontier of Str**

**The epic final led by Argentina's Lionel Messi and France's Kylian Mbappé was one of the most dramatic and most viewed sporting events ever, generating unprecedented internet traffic volumes worldwide for an individual sporting event. Is it a harbinger of what's to come?**

Sports and sports fandom are the modern-day "tribes" through which people unite in a common purpose. Playing, viewing, debating, betting – it all feeds a human need for excitement and solidarity. Combine the passion for sports with the passion for digital access anytime, anywhere, and you've got a new frontier. With younger, more digitally native audiences craving new experiences and formats for sports, the 2022 FIFA World Cup in Qatar became a case study of how apps and streaming services could bring the type of mobility, flexibility, and engagement traditional TV could not.

FIFA President Gianni Infantino had predicted the World Cup in Qatar would be watched by at least 5 billion people around the world. That's not hard to fathom, given the growing popularity of the sport worldwide (particularly in huge markets like India, for instance) and growing penetration of mobile devices and digital platforms worldwide. Once completed, FIFA data for 2022 may shatter previous records set in 2018, when 3.575 billion people watched the World Cup, and 1.12 billion tuned in for France's final with Croatia.

To get an idea of what the impact of increased streaming and VoD might have been, let's look at our own data from a few networks around the world:

Overall, in Figures 1 and 2, you see volumes more than double after the kickoff on 21 November. In Figure 3, we show how one major operator in EMEA experienced 7x normal traffic from end of November to beginning of December, when semi-final and final matches took place.

Not only were there significant increases in streaming VOD and live streaming during matches, but surges of traffic within matches as digital engagement was triggered by goals, yellow cards, and penalties. In Figure 4, a North American Cable Operator sees traffic steadily climb in each 10-minute increments of the Argentina-France final, reflective of the excitement generated by each goal and each yellow card as the match grew more contentious, and as the urgency of the situation was conveyed across digital platforms (messaging, social networks, chat).

We saw, for example, a network on which Twitter traffic surged from about 60 GB to 130 GB once the World Cup starts. These upticks in internet traffic volume are not surprising when one considers what was being widely reported about record-breaking viewing on TV, VoD, and streaming platforms country by country. In the United States, the showdown between Argentina and France became the most-streamed and most-watched match in U.S. history, averaged approximately 26 million viewers across Fox and Telemundo (including Peacock) channels, a 158% increase in streaming since the 2018 World Cup.

Figure 1: North America (NA) Trends

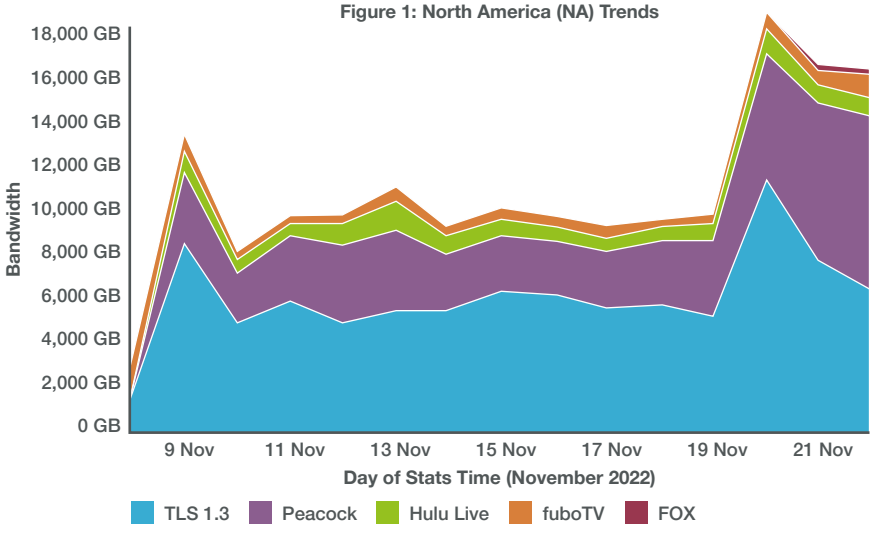
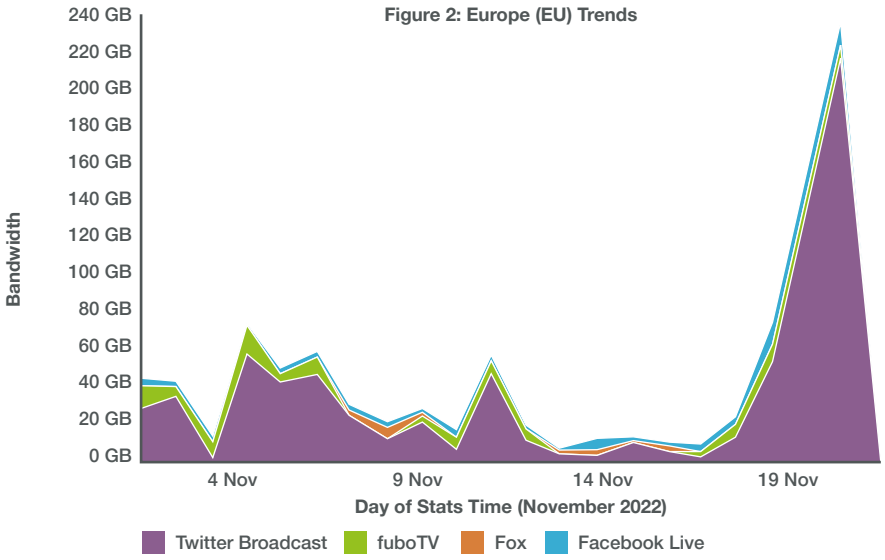



Figure 2: Europe (EU) Trends



# reaming?

In Japan, youth-focused streamer Abema procured streaming rights for all FIFA World Cup games in Japan, it didn't realize each match Japan won would spur more interest for the next match, growing from 10 million to 30 million active daily viewers by the time Japan was playing Croatia at the end of November. To keep up, Abema engineers reportedly had to temporarily restrict access, which caused a flood of Twitter complaints from its younger viewers

In Spain, France, and the United Kingdom, viewership ranged from 14 million to almost 30 million, with about one-third to one-half streaming the content.

In Mexico, viewership peaked with 20.96 million viewers, about 67.9% of the viewing population, watching the Mexico-Argentina match, which also became the largest FIFA World Cup Group Stage match in Spanish-language history when televised by Telemundo in the United States.

These trends are just some of what's driving Amazon, Apple, Walt Disney Co. (and ESPN and streaming app ESPN+), as well as other big platforms, to jockey for rights to the 2030 World Cup. It'll be interesting to see just how much streaming and VOD viewing increases by the time the Cup gets to the Uruguayan capital of Montevideo, and how much more internet traffic volumes will grow by then!

**Figure 3: EMEA Major Operator Traffic**

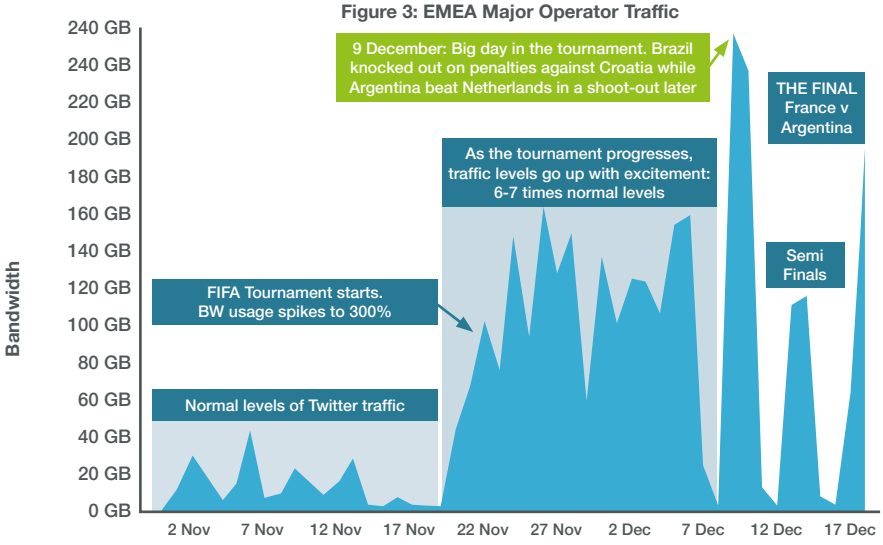
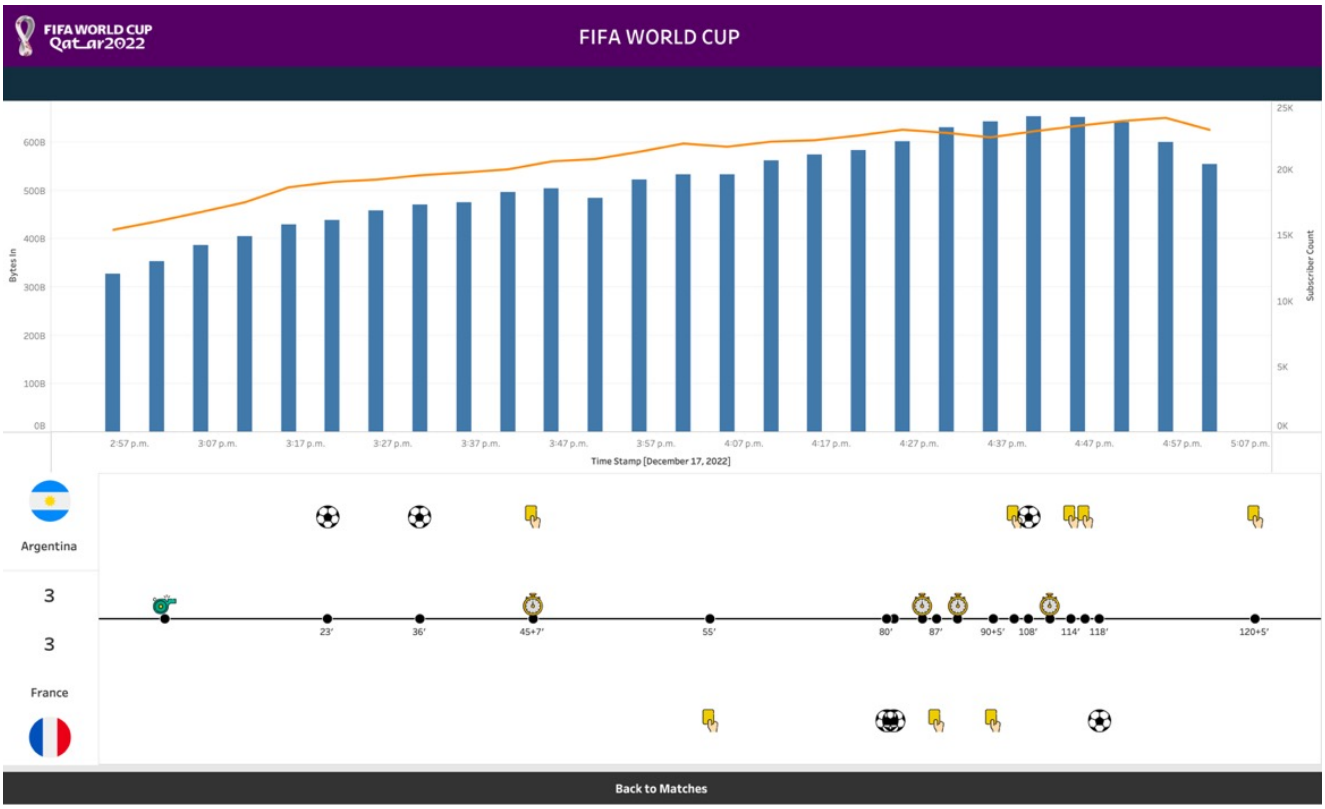



**Figure 4: North American Operator traffic climb during FIFA World Cup Final**



# CONCLUSION: THE 'SO WHAT?'

## Telecom is Reaching an Inflection Point

**As we showed in section 2 of this report, the "Big 6" application giants exerting more volumetric pressure on networks than everyone else, combined (this year at 47.98% of total internet traffic). Alphabet (Google), Meta (Facebook), Netflix, Amazon, Apple, and Microsoft are expecting to redefine user experiences, and to do it without any input from or payment to those who own the networks on top of which those user experiences will be fulfilled.**

Their contribution is just part of what's making the Internet grow so rapidly. According to statistics from Cisco Systems, global average Internet traffic will have increased 3.2-fold from 2018 to 2021 (with a compound annual growth rate of 26%).

Various industry stats estimate that by the end of 2023, between 63% and 66% of the global population will be using the Internet. As revealed during the two past years of COVID, digitization was accelerated and the digital divide widened by the pandemic. It became very clear that people, businesses, institutions, and government can rapidly increase their digital comfort levels, engagement, and acumen once the technologies are there to use. As 5G, IoT, Metaverse, and AI come into their own, shared customers of telecom and big tech will have increasingly high expectations about how applications and services should perform, and network operators will be expected to do what's necessary to fuel the optimal application experience.

This is the inflection point.

With innovation, everyone will inevitably want more… of everything. And commensurate with the growing demand for bandwidth, throughput, and latency will be a flood of Internet traffic across networks. Today, operators throw as much CAPEX as they can at their networks, and squeeze out more efficiency to the detriment of their own bottomline and sustainability. They operate under fairly slim net profit margins (approximately 12 to 13% in 2022), with extremely high expenses mitigating their gross profits.

In 2020, CAPEX was $79.4 billion for U.S. operators, bringing the cumulative total to $1.9 trillion in communications CAPEX since the Telecommunications Act was passed in 1996.

In 2021, telcos in Europe spent 52.5 billion euros ($59.4 billion) in 2021 for investments in networks, 5G trials, licenses, planning, and deployment. It was recently predicted by Omdia that monthly ARPU combined across both mobile and fixed broadband will fall by 4.2% from €7.48 in 2022 to €7.16 in 2027.

Even with aggressive fiber rollouts, telcos can't expect any big changes to their profit margins under current rules. They either have to continue building out capacity in perpetuity, or try to push back with proof points they deliver to regulators and policymakers that help them secure their own sustainability and place in world markets going forward.

There is still time to balance currently unchecked actions of those riding on top of networks by developing profit-sharing and ROI models that help operators reinvest in their networks.

Regulators and policymakers in the United States, Europe, and Asia (Singapore, South Korea, Japan, India) are reevaluating current net-neutrality regulations in the context of what happened with COVID. The digital need, and digital divide, revealed how expected and unexpected catastrophes (pandemics, weather calamities, wars) – as well as day-to-day usage and special events (sports, music, entertainment) –require enormous resilience and adaptability.

The World Economic Forum predicts democratization of computing with high-speed Internet worldwide can unleash trillions-of-dollars in economic gains and tens-of-millions of jobs. Networks will be the lifeblood of those gains, but only with massive broadband and wireless investment. Those building the infrastructure have to get a return on investment to make continuous innovation possible, and to ensure adaptability, performance, and resilience going forward.

In 2021, the leaders of 13 telecom service providers put out a joint statement about the need for big tech to help fund network costs. Stating that the current situation is not sustainable, Vodafone CEO Nick Read joined CEO Timotheus Höttges of Deutsche Telekom (DT), former chairman and CEO of

Orange Stéphane Richard, Chairman and CEO of Telefónica José María Álvarez-Pallete and eight others.

In 2022, AT&T and Verizon put out their own statement, urging the FCC to use money from the "broader Internet economy" to prop up the flailing Universal Service Fund.

Currently, the European Commission and the Body of European Regulators for Electronic Communications (BEREC) are reviewing how the Netflix, Meta, Alphabet, Microsoft, Apple, and Amazon use telecom operators' bandwidth, and a consultation is open with OfCom about current usage and future usage with metaverse and other innovations.

In the United States, there is some investment from the federal government through the Inflation Reduction Act (P.L.117-18) and the Infrastructure Investment and Jobs Act (P.L.117-58), which include billions-of-dollars for broadband investment and tax breaks to push communications innovations.

In automotive, manufacturing, and healthcare, there will be amalgamations of video, robotics, AI, sensors, AR/VR, and more. More performance-dependent applications will exert even more pressure on operators' networks in terms of latency, responsiveness, and speed.

The time has come for network operators and service providers in telecom to be unshackled from outdated rules and regulations so that networks can keep pace with the trajectory of innovation that is coming.

As that happens, it will be imperative that operators up their game with data quality and data accuracy, and more sophisticated machine learning, heuristics, and application content classification. As we covered in section four in "Rise of the Super App," applications will be magnitudes more demanding and complex, and a greater degree of application and network intelligence will be needed to ensure the best application quality of experience for the most customers of fixed and mobile networks.

> "Network operators will be expected to do what's necessary to fuel the optimal application experience"

# What next? **Contact Us**

**Next Steps with Sandvine**
Now that you know what applications are driving internet consumer trends, plan for 2023 with Sandvine.

Reach out to **phenomena@sandvine.com** if you have any questions or to meet with our team of experts.

**Do you have requests for insights?**
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**

We will also blog regularly; if you missed some of our recent ones, check out the Phenomena Spotlights:
**https://www.sandvine.com/blog**

SANDVINE The App QoE Company

Visit **www.sandvine.com** and read our blog at **www.sandvine.com/blog** to learn more about our Application and Network Intelligence portfolio.

**Resources**
Come see our Resources page for a wide range of videos, webinars, and whitepapers:
**www.sandvine.com/resources**

## ABOUT SANDVINE

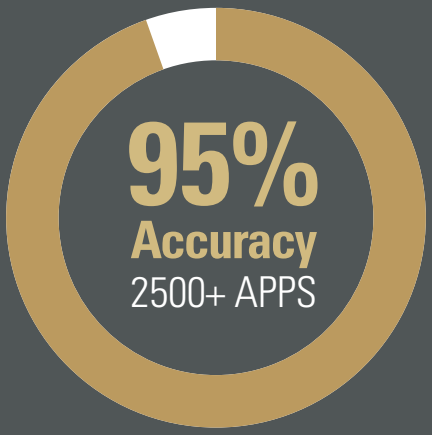
Sandvine recognizes that telecom service provider brands are inextricably tied to application quality of experience (App QoE) – the best measure of real-time customer satisfaction. Whether video, messaging, social media, or collaboration, the application is the subscriber's primary interface with the network.

To optimize App QoE to the most customers, application and network intelligence must be rooted in data that can drive better business outcomes. That's why Sandvine uses a unique combination of data management, network infrastructure, and application solutions to accurately identify, categorize, and classify more than 95% of all internet traffic across all access types.

Sandvine's 20 years of experience with the world's most innovative operators brings unparalleled expertise to analyze, optimize and monetize networks. Using advanced heuristics and machine-learning based App QoE scoring, we help service providers accurately identify who, what, when, and where App QoE issues are occurring, enabling operations teams to quickly resolve problems, and planning teams to precisely plan for future growth.

From the CTO to customer care, Sandvine's App QoE focus will improve operations and planning. while reducing costs and improving customer satisfaction.

## App QoE at multiple levels uncovers the unseen




**What is the application QoE:**

- per location?
- by user segment?
- per device?
- by plan?

| Guided Workflows | | | |
|---|---|---|---|
| What | Who | Where | When |
| **What is being impacted?** | **Who is being impacted?** | **Where is being impacted?** | **When did it happen?** |
| Application | Individual subscribers | Locations | Time of day |
| App Category | HVAs | Slices | Peak hours |
| App Content Category | Enterprises | Specific nodes | Trends |
| | Specific devices | | |
| **Drill down to "why?" – most likely cause with recommended next best action** | | | |
| **Closed-loop Automation to implement recommended next best action** | | | |

## Better data accuracy leads to better planning, troubleshooting, and monetization

For more information visit **https://www.sandvine.com**
or follow Sandvine on Twitter **@Sandvine**.

SANDVINE

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