

# What the Broadband Industry Learned from COVID-19

A reflection on how networks coped with unprecedented challenges brought on by the pandemic, how it changed the way the industry thinks about connectivity, and how broadband networks can prepare for what's next.

By Mattias Fridström / *Telia Carrier*

**C**OVID-19 presented service providers with an acid test and proof about their ability to deliver when demand increases. In 2020, sustaining connectivity has never been more critical. With entire countries in lockdown, digital connection suddenly became a critical resource for work, school and staying in touch.

Telia Carrier solves global connectivity challenges for multinational enterprises whose businesses rely on digital infrastructure. Traditionally the company is known as a wholesale carrier – a network service provider selling connectivity and bandwidth to other service providers – but it also works with large enterprises. Because it manages the world's No. 1 IP backbone, with a network spanning 67,000 km across 35 countries in Europe, Asia and the United States, you could say we know a few things about networks.

As a global internet backbone provider, Telia Carrier serves customers spread across more than 120 countries and accounts for more than 65 percent of global internet routes, including more than 300 points of presence and cloud on-ramps. What makes the company unique in the United States is that it has aimed to grow organically to develop a diverse network. Telia Carrier can connect 95 percent of U.S. and European end users within one hop. We like to think of our network as small enough to care,

but big enough to make it happen. Given this, I want to share some insight on trends and reflect on what the pandemic year has taught about the critical role the internet has in society.

## TELIA CARRIER'S PANDEMIC YEAR IN REVIEW

Last year, my 2020 predictions focused on developments around infrastructure, customer experience and the resurgence of the cloud edge. What happened instead was a lesson in survival. Network operators, carriers and suppliers were flooded with a demand that looked unlike anything they had ever seen.

Earlier this year, Telia Carrier reported that overall traffic volume rose by around 50 percent during March because of pandemic-driven shifts in network usage. Peak traffic levels were up about 35 percent in certain countries and regions. Over the course of a few days, traffic increased more than 400 percent for some videoconferencing suppliers. In a three-week span, Telia Carrier saw pretty much a full year's growth. This all led to a rapid buildout of practically all optical backbone links.

In previous years, traffic generally followed a weekly seasonal pattern with occasional outliers in which the highest load on the network per continent was Sunday evenings. Then, suddenly in March, every day looked like Sunday – with more traffic and a wider peak. That trend



Fig 1: Telia Carrier North America network map

continues – and will continue to do so because in many businesses in the United States and around the world, workers telecommute.

The largest increase in traffic occurred during “normal” office hours. There was also an added global effect from the European evening peak traffic, eventually blending with the U.S. afternoon traffic increase. Everyone was online working, streaming or staying in touch through some form of social media. Suddenly, telepresence and videoconferencing became the most-used form of communication. Telia Carrier received urgent requests for multiple 100Gs of IP capacity. From a maintenance perspective, the hours of the week that typically had lower usage and were used for maintenance did not exist anymore. In a typical week, Telia Carrier saw more regular peaks and valleys of traffic. But at the height of the pandemic, there was simply a constant flow. This makes a huge difference when managing a network – there were no calm hours – networks had to constantly be up and running and needed to add capacity along the way.

Following the initial massive increase of traffic in the spring, there was a bit more normal seasonal development, with a slight drop in traffic over the

summer. Those weary of staying at home ventured outside but stayed local. Yet traffic levels remained significantly higher in the summer, as the broadband industry caught its breath and built out networks to keep up with demand.

In the fall – historically the year’s growth months – there continued to be similar peaks of Sunday network traffic and a massive increase from video and unified communications (UC) providers compared with the pre-COVID-19 era. When schools started back up in September, traffic increased and so did the rise in distributed denial of service (DDoS) attacks. You may have read about DDoS attacks launched against schools, preventing faculty and students from accessing important educational materials online. Legacy systems and the vulnerability of new hybrid learning environments proved to be an easy target for malicious attacks – as if online learning for kids wasn’t already a challenge for many families and teachers.

### LESSONS LEARNED FROM COVID-19

From a networking perspective, this year solidified the broadband industry’s focus and priorities in areas that industry players have known are significant for a long time. Planning

and turning up capacity at such a rapid pace in response to COVID-19 proved that optical layer automation is vital not just for the future but also today. Networks need to be even more automated, scalable and diverse.

As a society, people also learned that not everyone needs to be in the office all the time. They can be productive working remotely, and this has far-reaching challenges to the way businesses operate and how communities plan their broadband needs. It’s important for networks to simplify how they structure their domains to make it easier to modularize and expand where necessary. Priorities include

- A robust and automated network now requires more diversity and redundancy than ever. With the introduction of 5G mobile technology, the increasing number of networked devices, and the exploding number of services relying on connectivity, such as IoT, VR, AR, gaming and other cloud offerings, billions more devices will require more automation and intelligence. On the supply side, COVID-19 reminded suppliers to ensure that they had not only diverse

## THE COVID-19 EFFECT

- Suddenly every day looks like a Sunday.
- There's more traffic and with a wider peak.

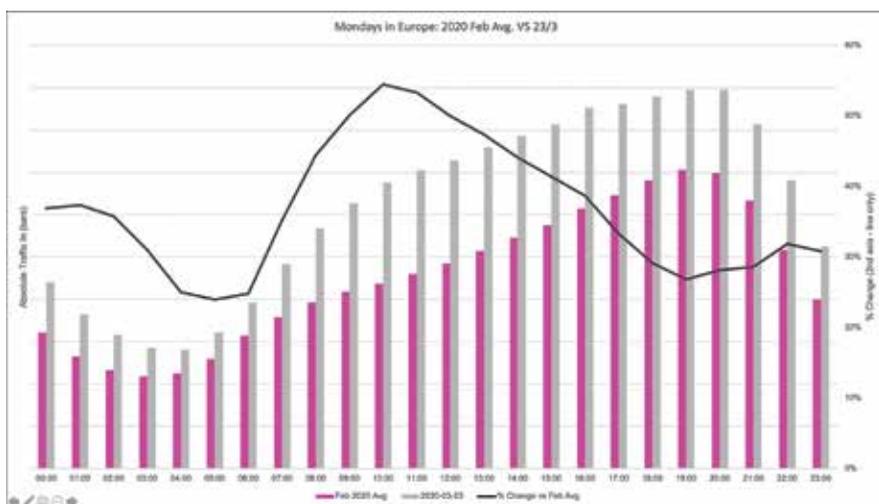
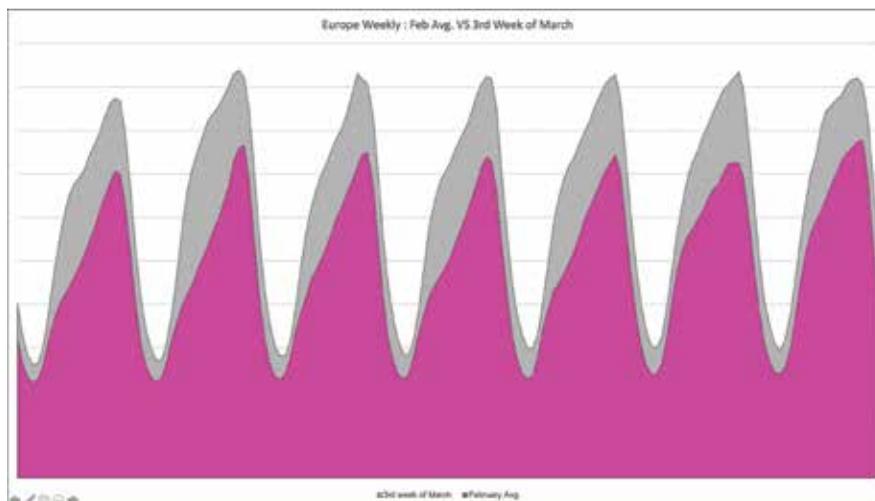


Figure 2: The COVID-19 effect on the network, European network traffic

- Largest increase of traffic in “normal” office hours
- The European evening peak suddenly got boosted by the U.S. afternoon traffic increase.

networks but also diverse supply chains. During times of uncertainty, it is dangerous to rely solely on a single vendor. Service providers need a better understanding of vendors’ supply chains down to a component level to ensure diversity and ability to meet unpredictable demands on capacity in the future.

- Focus on key capex investments in the backbone because it’s hard to predict when the next traffic surge will come. Many networks were not prepared for the sudden and constant surge in traffic. Service providers always need to be prepared to run at correct traffic levels. Sometimes providers can be tempted to delay capex-related investments in the backbone, but

this will get them into trouble when capacity increases dramatically.

- Working together is critical in the service provider world. This was seen in the peering community among Tier-1 networks. An update between networks that previously took months and multiple layers of negotiation suddenly happened within hours. Peering, which had become a more commercial decision, went back to its roots. It became a technical decision made in the best interest of the traffic. Past disagreements were left in the past. The peering community came together in a universal effort to keep the internet running as normally as possible because the world needed it more than ever.

- Under extraordinary circumstances, watch for traffic at risk. During the first few weeks in March, Telia Carrier saw that not all networks were scaled to handle large traffic spikes, resulting in unavoidable packet loss during peak hours. Others were not sufficiently diverse (or diverse at all), which means they shut down, ultimately resulting in outages. The biggest threat to public internet traffic performance is connections between different networks themselves. Unfortunately, these are not always set up in the best interests of the traffic they carry. We learned to keep an eye on “traffic at risk” during these situations to rescue as much as possible with proper rerouting.

## TRAFFIC CAN TAKE VASTLY DIFFERENT ROUTES DEPENDING ON ISP CHOICES

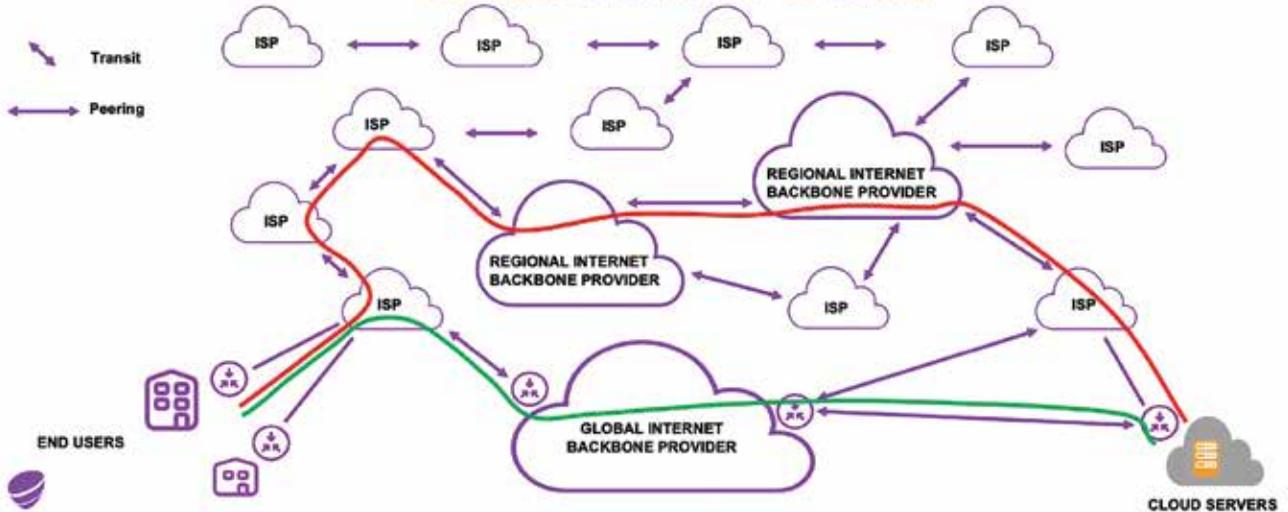


Figure 3: Traffic routing between networks often is still based on cost considerations.

### UNDERSTANDING HOW INFORMATION TRAVELS THROUGH THE NETWORK

Because there are commercial relationships behind every connection, traffic routing between networks often is based on cost considerations. If it is cheaper to offload traffic to specific networks regardless of their ability to carry it, many networks will do it anyway. Perhaps there are cost-driven capacity limitations between some networks en route? Throw a few political and legislative restrictions into the mix, and it starts to become clear that the internet is not quite the same everywhere.

Although traffic will generally reach the required destinations, the experience will vary significantly between different network paths. Sensitivity to network performance will depend mainly upon the application used, but poor internet connectivity can be the result of many things that can result in significant financial losses. Direct routing delivers the best performance and greatest consistency. Wherever possible, it is always best to avoid the scenic route and connect as closely as possible to critical content and applications.

### CUSTOMER EXPERIENCE

IT administrators from businesses are now more mindful about reviewing their network strategies in the post-COVID-19 world, keeping an eye on scalability and network performance.

When the world stayed home, Telia Carrier's entire customer care team worked remotely in March and continues to work from home today. The company's focus has always been to deliver the best possible experience. We received positive feedback from customers for things such as instant access to services' current and historical status and up-to-date incident information that delivered greater network transparency and visibility to network maintenance affecting customers. Telia Carrier had already developed application programming interfaces (APIs), but during COVID-19, customers suddenly wanted to use them much more, including APIs for usage data, planned works and services orders, which they use for increased automation and control. The ability to scale was also critical. In one example, for urgently requested multiple 100Gs of IP capacity during COVID-19, Telia Carrier could turn up new services in fewer than 24 hours.

Beyond simply looking at cost, Telia Carrier received increasing feedback from large operators and IPs that faster deliveries and better performance were why customers chose to stay with us. There have been so many years in which the total cost of ownership (TCO), or just the street price, was the dominating factor as companies chose providers. Looking ahead to 2021, Telia Carrier expects more companies to select service providers

based on the experiences, flexibility and predictability they can offer and not just TCO – from the connected home and streaming services to broadband-on-demand and customer-facing interfaces. If anything, the at-home digital economy built from necessity further heightened the importance of critical connectivity.

### LOOKING BEYOND

People come together during times of crisis. A sense of urgency increases focus and execution. This is undoubtedly the case looking back at 2020. The broadband industry must be conscious of the vital role it plays. From a connectivity perspective, the industry's primary focus is to maintain operations and a sufficient level of network capacity to handle unexpected hikes in traffic, thereby safeguarding global communications.

The internet is an ecosystem, which means it is not enough for providers to worry about just their networks. The same applies to communities. It's worth remembering that the internet and the communications industry facilitate connecting the world. It's about collaboration and building a more resilient network, a trend that must continue with future challenges ahead. ❖

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