

US ISP Long-term Latency Benchmark Trends: March 2020 through March 2021

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EXECUTIVE SUMMARY

NetForecast analyzed internet latency and packet loss for five major US ISPs across 10 metropolitan areas from March 2020 through March 2021. This report highlights the following trends observed during this 13-month period:

- Pandemic stay-at-home orders issued in March 2020 dramatically increased internet traffic volumes, which degraded aggregate latency and loss performance in March and April.
- From mid-April to early September, performance gradually recovered to pre-pandemic levels.
- Performance remained stable from September through the fall of 2020.
- Performance degraded again in December due to spiking holiday traffic volumes.
- As of March 2021, performance had not yet recovered to fall 2020 levels.
- AT&T and Charter contributed the highest overall latency and loss over the 13 months, thus lowering aggregate performance scores.

NetForecast’s QMap™ benchmark methodology used for this report is described in our first benchmark report available [here](#). NetForecast’s methodology uniquely scores latency and loss performance for access to local content (**near**), and to content that is distant to the user across a substantial portion of the US internet (**far**). To reflect the user’s true experience, it is important to measure both near and far performance because although users are unaware of which path their content is traversing, they are affected by both. In fact, a typical use case operates over both near and far paths simultaneously.

The Apdex scores in this report represent a combination of latency and loss. Packets that are lost enroute to/from their destinations experience infinite latency, which must be factored into performance scoring along with latency for successfully delivered packets. Apdex scores are normalized from zero to 1.0, with 1.0 being the best (very low latency and no loss) and zero being the worst performance.

LONG-TERM LATENCY PERFORMANCE TRENDS

Figure 1 shows the near and far Apdex scores during the 13 months averaged daily across all 10 cities served by a mix of five ISPs. Summarizing the data in this way highlights the aggregate near and far performance for the entire period. Note that a January 7th to 15th data gap reflects our annual probe-server pair adjustment. The measurement methodology and analysis parameters did not change.

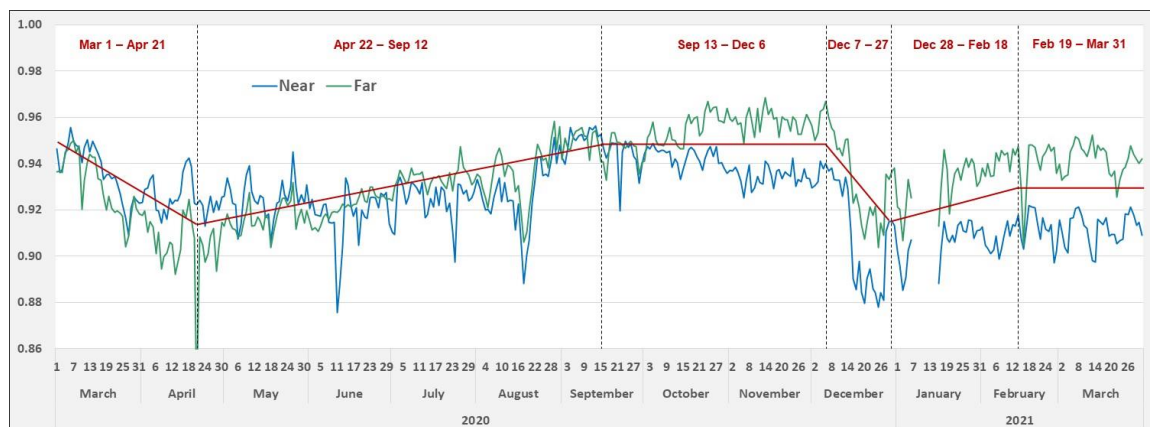


Figure 1 – National US Internet Latency Shifts

Striking changes occurred during the reporting period. In early 2020 near latency scored better than far, and starting in early September the near and far scores were almost the same. In October, far latency became consistently better than near, and this situation continued through March 2021. Overall latency and loss performance degraded during the holiday period between December 7th and 27th, likely exacerbated by families and friends forced to gather virtually by videoconference rather than in person during the Covid pandemic. Adding huge amounts of videoconferencing traffic to the internet likely caused some ISPs to experience packet queuing and loss.

Long-term Near and Far Latency Trends by ISP

Figures 2 and 3 document the separate near and far performance delivered by each of the five ISPs in the cities they serve. Comparing Figures 2 and 3 to the aggregate results in Figure 1, highlights how individual ISPs influenced aggregate performance. For example, the December holiday performance dip was not experienced by all of the ISPs. AT&T and Charter experienced sizeable holiday-related performance drops, while Verizon and CenturyLink were unaffected, and Comcast was only modestly affected.

Examining individual ISP performance over the entire 13 months, AT&T and Charter consistently contributed the poorest overall latency and loss performance, thus lowering the aggregate performance in Figure 1.

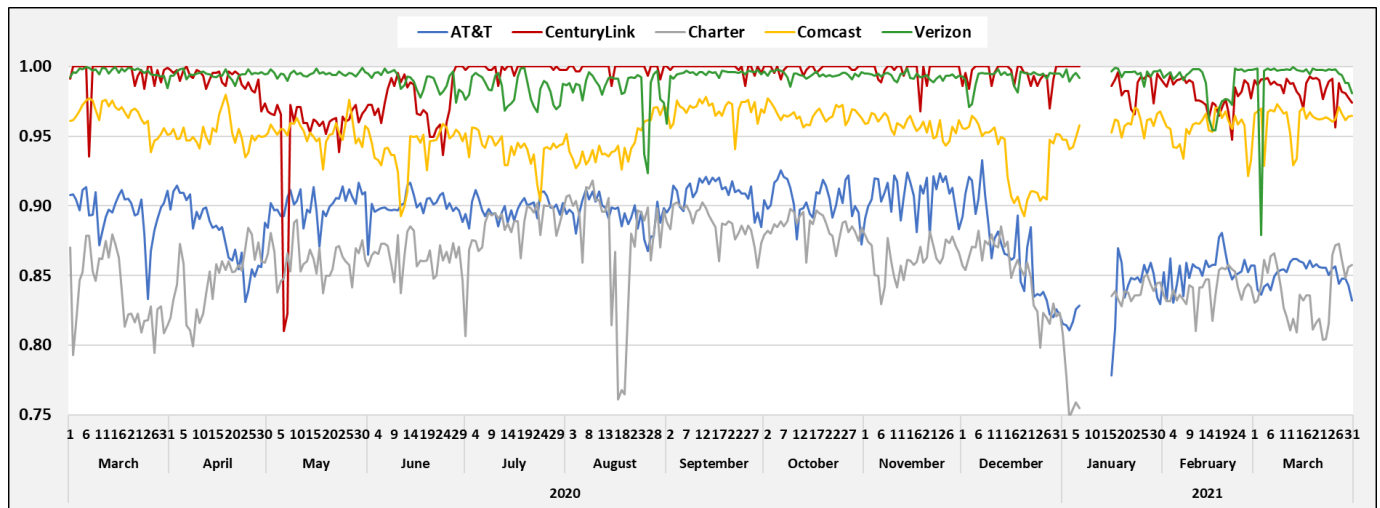


Figure 2 – Near Internet Latency Apex Scores for Each ISP in the Cities They Serve

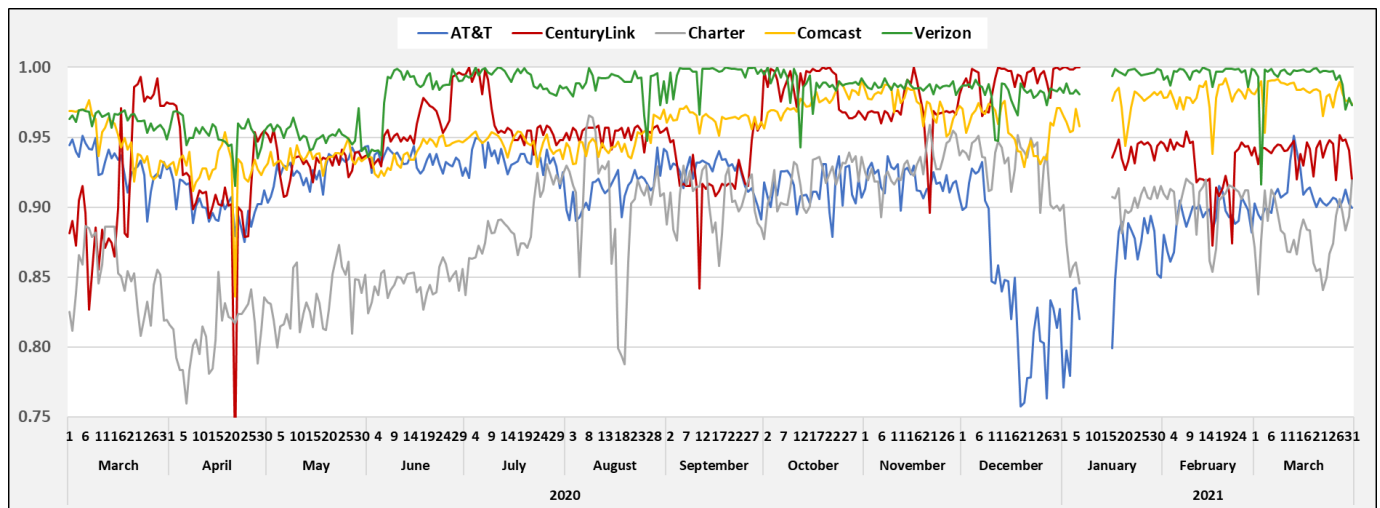


Figure 3 – Far Internet Latency Apex Scores for Each ISP in the Cities They Serve

PERFORMANCE BY HOUR

Whereas Figures 1, 2, and 3 show average Apdex values for each day, this section examines performance during each hour averaged over a number of days. Analyzing the data in this way highlights hourly variations within select groups of days. Figure 4 compares the hourly Apdex far scores averaged from November 7th through 27th, with scores from December 7th through 27th. This analysis reveals the following notable trends:

- AT&T's performance was significantly poorer than all of the other ISPs during the December period.
- During the December period, AT&T experienced high latency and loss starting at 7AM each day—and performance degraded throughout the day, reaching its lowest point at 9PM each evening.
- Charter also experienced some degradation in the evening hours during the December period; however, the magnitude of the decline was relatively modest compared to AT&T.
- The trends noted above were not evident during the November comparison period (although AT&T and Charter underperformed relative to the other ISPs in November).

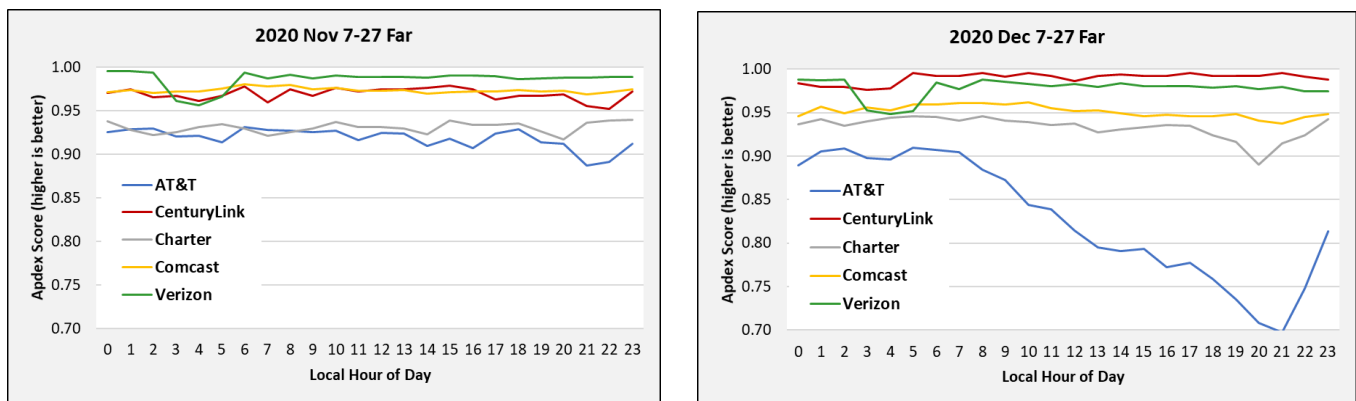


Figure 4 – Hourly Far Apdex Scores November 7-27 and December 7-27, 2020

A noteworthy trend during both the November and December periods, was a consistent performance degradation for some ISPs between the hours of 2AM and 5AM. In our experience, this is generally caused by ISPs implementing network changes (e.g., infrastructure upgrades and routing changes) during the hours when subscribers are least active and thus least likely to be adversely affected. We have observed this phenomenon across every ISP whose performance we track.

ABOUT THE AUTHORS

Peter Sevcik is the Founder of NetForecast and is a leading network performance expert. An internet pioneer, Peter was among the first to measure and develop internet performance improvement techniques. He helped design more than 100 government, corporate and commercial networks. In addition, Peter invented the Apdex performance reporting methodology, and has co-patented application response-time prediction and network congestion management algorithms.

Alan Jones is NetForecast's Director of Software Development. He has lead teams in developing products and internal infrastructure for some of the largest telecom companies in the world. After eight years in cellular handset design and testing, he spent over a decade working on test systems for mobile networks. He currently works with mobile and cloud-based product development.

Rebecca Wetzel is the President of NetForecast, and an internet industry veteran. She helped realize the commercialization of the internet in its early days, and worked to design and market some of the internet's first value-added services such as IP-based VPNs, web hosting, and managed firewall services, as well as internet protocol testing services. She also spent many years as an internet industry analyst and consultant.