# Why big data overwhelms enterprise networks

Move large files with speed – anytime, anywhere in the world.

**Contents**



**A better solution for big data**

Today, businesses across industries are under pressure to handle big data transfer efficiently. The need to move large files quickly and reliably across global locations is essential for maintaining productivity and staying competitive.

If organizations can't overcome data transfer challenges, they risk falling behind on key goals such as revenue growth, cost reduction, improved customer experience, and business innovation.

Big data movement includes use cases like sending genomic data to healthcare experts across continents for critical analysis or uploading massive video files to streaming platforms. These tasks demand a high-speed transfer solution that can handle huge datasets over long distances.

As the size and volume of data continue to grow and impact more business processes and decisions, the speed at which data moves over the WAN becomes increasingly important.

However, most enterprise tools in use today cannot reliably and securely move large files and data volumes at high speed over global distances. This is due to the inherent limitations of the Internet’s underlying transfer technology called the Transmission Control Protocol (TCP).

Figure 1 illustrates how the TCP window functions — as packet delays occur, TCP reduces its window size, decreasing the rate of data transmission. If a packet acknowledgment is not received, TCP retransmits the packet and further reduces the send rate to minimize network congestion.

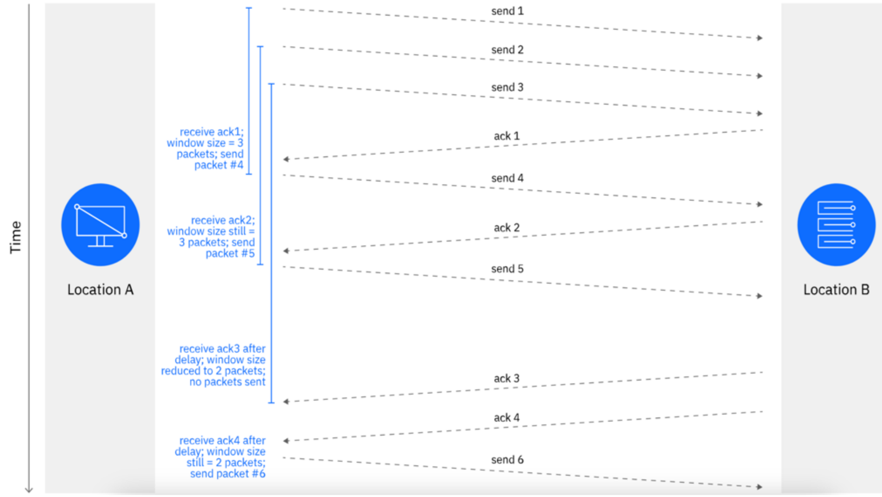


Figure 1: Diagram showing TCP waits to send each packet based on receiving acknowledgement from the receiving side

**The TCP bottleneck explained**

The Internet Protocol is the universal communications protocol for the Internet, serving as the primary means of relaying data across networks that make up the Internet.

Due to its relative reliability compared to other transport protocols, TCP is the most commonly used IP transport layer for creating connections between systems and applications. Originally developed in the early 1970s—when networks were local, and files were small—TCP served as the underlying protocol that enabled data to move efficiently and reliably over LANs with minimal bandwidth.

To ensure data integrity, TCP guarantees that data sent within a single connection is delivered in order. It does this by splitting data into small packets, sending them over the network, and getting an acknowledgment that each packet is received. The amount of data that can be buffered is called the TCP window, which controls how much data can be sent without receiving acknowledgment.

Have you noticed that your upload or download speeds rarely match your actual bandwidth? This is often due to packet loss during large file transfers. In real-world conditions— that use public internet - like cloud-based storage and big data applications .

This issue is often caused by oversubscription, where routers and network nodes drop packets because they receive more data than they can handle. Since most networks are shared by multiple systems and applications, a single transfer rarely uses full bandwidth. When large transfers flood the network, TCP throttles speeds to reduce congestion and only slowly ramps back up, resulting in artificial throughput limitations.

TCP couple reliability with congestion control, but in the age of fast data delivery, accelerated file transfer, and high-speed file movement, this behavior severely limits performance—especially when transferring large datasets over WANs.

**The penalty of distance and latency**

Whether over copper wires, optical fiber, or wireless radio signals, there is a baseline amount of time it takes for data to physically travel between any two endpoints in a network.

Round-trip time (RTT) is the time it takes to send data from the source to the destination and receive an acknowledgment. RTT increases with distance and network congestion, as more intermediary nodes are introduced, and queuing delays grow.

RTT plays a significant role in how TCP determines the amount of data that can remain in flight between endpoints before being acknowledged (the TCP window), and the rate at which new packets are sent.

When data is transferred over longer distances on high-capacity networks, more data remains in flight due to the higher RTT. These delays—combined with large volumes of in-flight data—cause TCP to reduce the transfer rate dramatically. It then takes a long time to recover and ramp up the transfer speed again after throttling.

Figure 2 displays how RTT and packet loss impact TCP throughput. It shows the maximum throughput possible under various packet loss and latency conditions for traditional TCP-based transfer technologies. The throughput has a hard theoretical limit that depends only on RTT and packet loss rate.

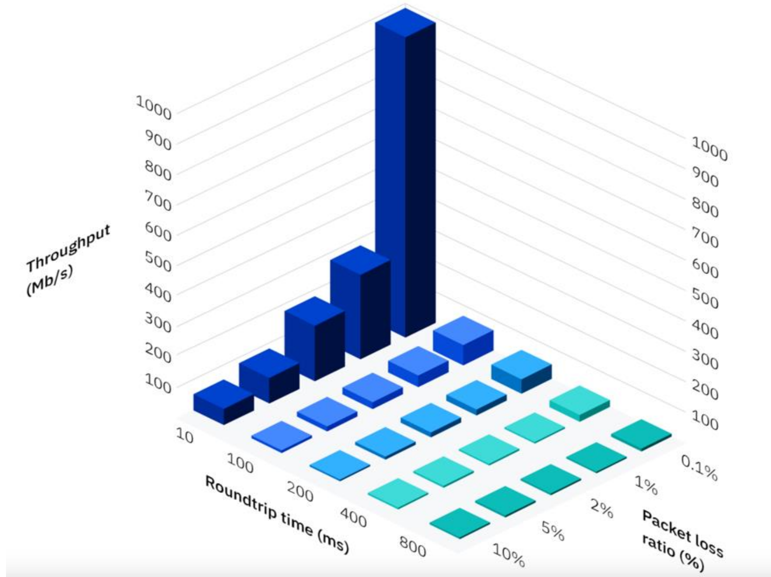


Figure 2: Graph showing how TCP-based transfer throughput is severely degraded by distance and network conditions.

The inherent design limitations of TCP over WANs create a paradox—as bandwidth increases, utilization efficiency drops dramatically. If a business increases FTP traffic in line with higher bandwidth, the return on that extra bandwidth investment decreases.

As file sizes and volumes continue to grow, TCP's performance limitations increasingly impact global business operations and team collaboration.

**IBM Aspera FASP – built for high-speed data transfer**
Transporting bulk data at maximum speed requires an end-to-end approach that fully utilizes the available bandwidth from the source to the destination.

To achieve high performance along the entire transfer path, a fundamentally different approach to bulk data movement is needed. This approach must handle a wide range of network RTTs, packet loss rates, and bandwidth capacities, which are typical in today's commodity Internet WAN environments.

IBM® Aspera® FASP® (Fast, Adaptive, and Secure Protocol) is a bulk data transport technology implemented at the application layer.

Figure 3 shows the throughput achieved under various packet loss and latency conditions using the Aspera FASP protocol. Unlike TCP, bandwidth efficiency does not degrade with latency and remains highly resilient to packet loss.

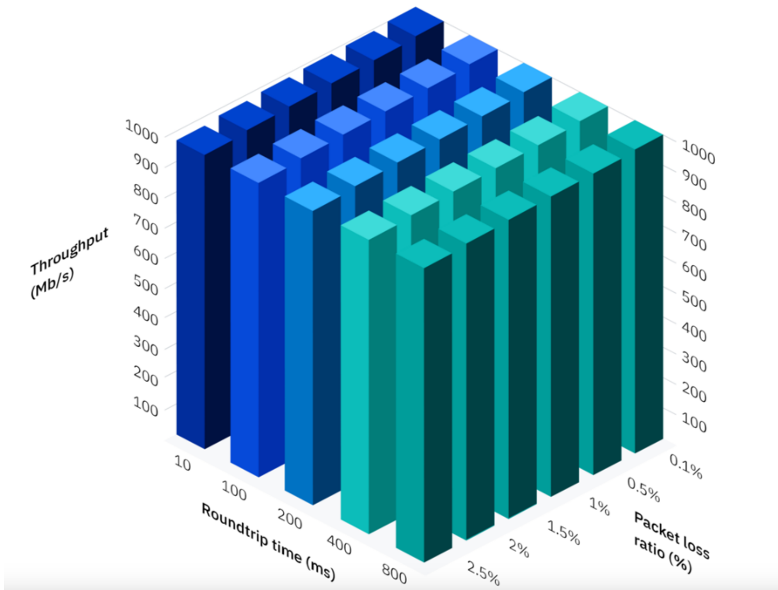


Figure 3: Graph showing how Aspera FASP transfers remain unaffected by transfer distance and highly resilient to network conditions.

It provides secure, high-speed transfers while remaining compatible with existing network infrastructure.

The protocol only retransmits data that is not still in flight, ensuring 100% "good data" throughput. Its rate control allows deployment across shared Internet networks by maintaining bandwidth fairness and avoiding congestion. It also offers the option to dedicate bandwidth for high-priority transfers when needed.

Aspera FASP is a patented technology designed for transferring large files, streaming data, and high-bitrate video over long distances—environments where TCP fails due to packet loss and high RTT.

Its adaptive rate control enables transfers to quickly ramp up and fully utilize available bandwidth. It also dynamically adjusts transfer rates to allow other TCP-based applications to operate without disruption.

With Aspera FASP, users can reliably exchange files and data sets of any size—from gigabytes to multiple terabytes and beyond—anywhere in the world. The protocol supports live video, growing files, and integrates the latest security technologies, best practices, and audit tools to protect data in transit.

Figure 4 shows that transferring a 10 GB file across the U.S. using a typical 1 Gbps line with standard TCP-based tools can take 2 to 3 hours. Despite the higher bandwidth, performance is limited by latency, packet loss, and protocol inefficiencies. As the transfer distance increases — for example, to Europe or Asia — TCP-based tools become even slower and more unreliable, making large data movement impractical for time-sensitive workloads.

**Moving a 10GB file**

| | Network Bandwidth | Across US | US-Europe | US-Asia |
|---|---|---|---|---|
| Legacy Transport | 100 Mbps | 10–20 hours | 15–20 hours | Impractical |
| | 1 Gbps | | | |
| | 10 Gbps | | | |
| Aspera FASP® | 100 Mbps | 14 min | 14 min | 14 min |
| | 1 Gbps | 1.4 min | 1.4 min | 1.4 min |
| | 10 Gbps | 8.4 sec | 8.4 sec | 8.4 sec |

Figure 4: Examples of 10 GB file transfer times over varying distances and network bandwidths.

**How fast is fast? Reduce transfer times from hours to minutes.**
In today's real-time digital business environment, organizations must access and move large files and data across globally distributed teams and systems in seconds or minutes—not hours or days.
As a result, organizations experience reduced productivity. Long wait times can delay decisions and actions, limiting the usefulness of insights derived from data analysis.

Hollywood studios, major broadcasters, telecommunications companies, sports leagues, oil and gas firms, life sciences organizations, government agencies, and Fortune 500 companies all share a common challenge: transferring large volumes of data securely and cost-effectively at high speeds for real-time and near-real-time applications.

Meeting this challenge goes beyond supporting a single workflow—it can mean the difference between strong ROI and lost revenue, business success and failure.

"With the speed that Aspera FASP offers, you don't need a local ingest site. You can actually transfer data from anywhere in the world."

**Suresh Bahugudumbi**
Senior Manager
NetApp

**Get ahead with blazing fast data transfer**

The ability to transfer large files securely, quickly, and reliably is not just a convenience—it's a business necessity. Traditional protocols like TCP simply cannot keep pace with the volume, velocity, and variety of data generated across cloud and global environments.

IBM Aspera provides a modern solution built for today's challenges. Its unmatched speed, scalability, and reliability help organizations move data of any size—whether it's high-resolution video, sensitive medical information, or enterprise backups—without delay or compromise.

With Aspera, your data reaches its destination faster and more securely, enabling better collaboration, quicker insights, and real-time decision-making across geographies.

Stay competitive. Stay productive. Move your data at the speed of business—anytime, anywhere in the world.

## About IBM Aspera

IBM Aspera offers next-generation transport technologies that move the world's data at maximum speed regardless of file size, transfer distance and network conditions. Based on its patented, Emmy® award-winning FASP® protocol, Aspera software fully utilizes existing infrastructures to deliver the fastest, most predictable file-transfer experience. Aspera's core technology delivers unprecedented control over bandwidth, complete security and uncompromising reliability. Organizations across a variety of industries on six continents rely on Aspera software for the business-critical transport of their digital assets

## For more information

To learn more about IBM Aspera contact your IBM representative or IBM Business Partner, or visit ibm.com/products/aspera


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