The leader in Data Acceleration

Resilient Networking for AI:

Securely Moving Data at Scale

riverbed®

Introduction

In the era of artificial intelligence (AI), the ability to move vast quantities of data efficiently and securely is paramount. Riverbed Technology, with its long-standing expertise in network acceleration and resilient networking, is at the forefront of this transformation. This eBook explores the critical imperatives for organizations looking to leverage AI by moving data effectively across various infrastructures.

The Importance of Data Movement in AI

AI models require processing massive volumes of data at higher bandwidth and lower latency than other types of internet traffic. In practical terms, as enterprises generate more data—whether from transactional systems, IoT devices, user interactions, or machine learning models—that data needs to be moved near where AI applications and services are located to perform the best analysis possible on the data.

Data must be transported from its point of origin to processing locations, which can vary significantly depending on the type of AI application. For instance, edge AI data might need to be transferred to cloud platforms – like Azure, AWS, Oracle Cloud Infrastructure or Google Cloud – that have specialized AI capabilities for further processing and can also integrate with other operational data.

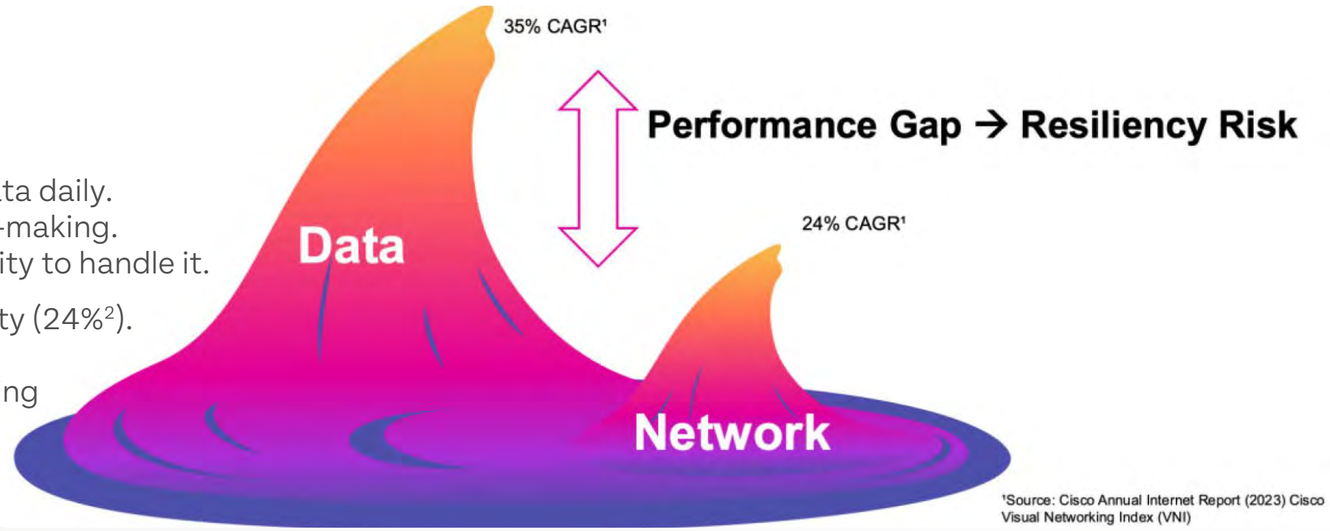
The most important factor in data movement is time. The time it takes to move terabytes to petabytes of data, within a limited time window. Whether this is transactional movement, where a series of file movement requests, S3 object dips take place, or replication/backup, where hundreds to thousands of files are moved in a replication window to be processed or stored in various locations, the time to move is the essential performance factor.

Consequently, the question of how to move data in time becomes a strategic one for network architects, who must carefully plan this movement and placement to optimize for performance, cost, and regulatory considerations.

Key Imperatives for Data Movement

AI applications require the efficient movement of terabytes to petabytes of data daily. This continuous flow of data is essential for real-time processing and decision-making. The challenge is the need to move all this data is outstripping networks capacity to handle it.

Driven by AI, global data growth (+35% CAGR[1]) is outstripping network capacity (24%[2]). The resulting constraints in all this data movement can impede AI initiatives. Some networks may lack the high data throughput required for AI model training and inference, and long network latency for distant edge sites slows data transfer required for split-second decisions.



¹Source: Cisco Annual Internet Report (2023) Cisco Visual Networking Index (VNI)

Security

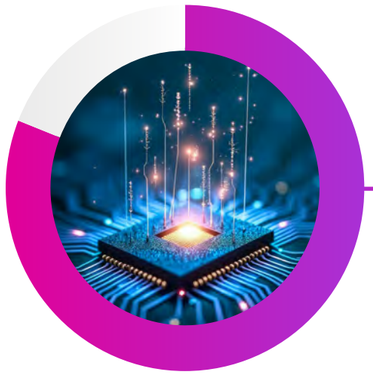
As data moves across networks, it becomes vulnerable to various threats. Ensuring the security of enterprise, government, and confidential information is crucial to prevent data breaches and cyber-attacks. These threats are real and come from both existing and future technologies.

Quantum computing poses a critical threat to traditional encryption systems, specifically those protecting data-in-transit and digital signatures in networking environments. Many encryption algorithms foundational to modern cybersecurity, such as RSA, Diffie-Hellman, and elliptic curve cryptography, depend on the difficulty of solving problems like integer factorization and discrete logarithms; these algorithms will become vulnerable once quantum computers can execute prime factorization in minutes, vs. what would take centuries using current computers. Governments are recognizing this threat and directing agencies to improve the security and integrity of software and network infrastructure critical to their resilient operations.

Hyperjacking is a sophisticated type of cyberattack where malicious actors gain control over the hypervisor, which is the critical component that manages the virtual environment within a virtual machine (VM) host. Once the attacker successfully takes control of the hypervisor, they can execute harmful code, conduct surveillance, manipulate devices, and steal sensitive information without leaving any trace. VMware warned in March 2025 that it has evidence suggesting the vulnerabilities are already under active exploitation.

Data Networking Flexibility

Finally, the dynamic nature of AI models and cloud environments necessitates flexible and scalable networking solutions. By some estimates, more than 80 percent of AI projects fail – twice the rate of failure for information technology projects that do not involve AI. Lacking adequate infrastructure to manage their data and deploy completed AI models increases the likelihood of project failure.



81%

of AI projects fail – twice the rate of failure for non-AI IT projects, often because of adequate infrastructure to manage their data.[1]

There are several causes of inadequate data infrastructure impeding successful AI implementation, and these include:

- **Network Congestion**
- **Scalability**
- **Data Synchronization Latency**
- **Infrastructure Strain**

Precisely because of the rapid changes in AI technologies, requirements, and market dynamics, it is essential organizations be able to pivot and adapt to unforeseen changes. In order to future-proof their approach and investments, organizations must be able to swiftly adapt their network capacity and connectivity to meet changing demands.

"We are at the dawn of a new era in AI. The breakthroughs we are seeing now are just the tip of the iceberg. The real impact of AI will unfold over the coming decades."

Demis Hassabis
Co-founder and CEO of Google DeepMind, a leading AI research lab

1 Source: Rand Organization - The Root Causes of Failure for Artificial Intelligence Projects and How They Can Succeed.

Riverbed's Resilient Networking Solutions

Riverbed's commitment to resilient networking is demonstrated through its innovative products and services designed to support the massive changes driven by AI. The company's portfolio, unified under the SteelHead brand, offers comprehensive solutions for data movement, security, and agility.

PERFORMANCE

Moving data at scale is ultimately measured by being able to transfer terabytes to petabytes of data, in the form of thousands of files and data objects within a limited time window. Riverbed's SteelHead appliances, powered by the new RiOS 10 software, deliver exceptional performance for data movement across data centers, edge, and cloud environments.

SteelHead and SteelHead Virtual

The latest SteelHead CX appliances, including the new 8090, 4090, 6090, and 2090 models, as well as SteelHead Virtual models, powered by RiOS 10, take advantage of new instruction sets and enhanced compression assistance capabilities, reaching up to 5 Gbps of accelerated traffic on the Wide Area Network (WAN). This translates to up to 50 Gbps of data movement in each direction, a significant improvement over traditional SD-WAN solutions.

Multiple SteelHead devices can be clustered to go beyond 100 Gbps of data movement, while only requiring 10 Gbps WAN connections, which are widely available, unlike 100 Gbps connections which are costly and uncommon outside of major hosting locations.

This means that with a single SteelHead, more than 20 TB of data can be moved in each direction across a 5 Gbps link, at a fraction of cost compared to other technologies.

SteelHead Cloud

RiOS 10 also enhances the performance of SteelHead in Cloud, available on AWS, Azure Cloud, Oracle Cloud Infrastructure and Google Cloud Platform, delivering up to 20 Gbps of data movement over an optimized WAN connection of 2 Gbps. This means that customers can move 9 TB per hour from a data center to cloud with a single SteelHead Cloud instance.

Additional capacity can be achieved in the future through cloud load balancing, enabling easy and low-cost scaling of capacity. The roadmap includes further advancements to ensure peak performance for data movement in cloud environments by deployment in shared services such as AWS Transit Gateway or Azure Virtual WAN.

SECURITY

RiOS 10 introduces advanced security features to protect data against emerging threats, including quantum computing attacks. These features include:

- **Secure Boot:** Detects hardware tampering and ensures secure data delivery.
- **TPM (Tamper Proof Modules):** Secure master keys for the secure vault.
- **Post-Quantum Cryptography:** Protects moving data from quantum computing threats.
- **Total Memory Encryption:** Makes any tampering blind to data and code.
- **Confidential Computing and Attestation:** Prevents hypervisor hacks.

Post-Quantum Cryptography

Riverbed RiOS 10 on SteelHead products integrates post-quantum cryptography (PQC) and hybrid cryptographic solutions, allowing organizations to seamlessly secure data moving across their networks against quantum computing risks while maintaining compatibility with existing infrastructure. By adopting Riverbed RiOS 10, enterprise and governments can mitigate future risk, comply with emerging standards, and build trust with clients and partners, ensuring that sensitive data remains secure against “Harvest Now, Decrypt Later" threats even in the age of quantum computing.

Total Memory Encryption

SteelHead Appliances running RiOS 10 implements Total Memory Encryption (TME) whereby all code and data processed by the CPU are encrypted. While physical tampering of appliances is rare, devices deployed in remote, un-manned locations are at risk of being opened and tapped. With TME, even a physical probe reading CPU to memory data busses will be unable to capture actual data since the data is encrypted as it exits the CPU.

Confidential Computing

When SteelHead Virtual or SteelHead Cloud are deployed on third-party compute, RiOS 10's Confidential Computing capabilities prevent hyperjacking, where malware takes over a hypervisor and starts to read application and data memory. Additional hypervisor-specific features based on Intel TDX and attestation services validate the security and supply chain of the CPU itself.

AGILITY

Riverbed Flex Subscription offers unparalleled flexibility, allowing customers to adapt their network capacity and connectivity with ease. This subscription model enables seamless transitions between hardware, virtual, and cloud deployments, ensuring that organizations can scale their networks efficiently.

Flex Subscription Benefits

- **Flex Across Architectures:** Customers can start with Flex licenses on hardware, move these licenses to virtual appliances, and migrate to cloud instances as needed.
- **Flex Capacity Across Fleet:** Customers can buy additional capacity and apply it to various locations, ensuring optimal throughput.
- **Upgrade Aged Appliances:** Flex Subscription allows customers to move licenses to newer devices without extra cost.
- **Future Proof Capacity:** Customers can buy more appliance capability upfront and upgrade capacity as needed without changing the appliance, cabling, or configurations.

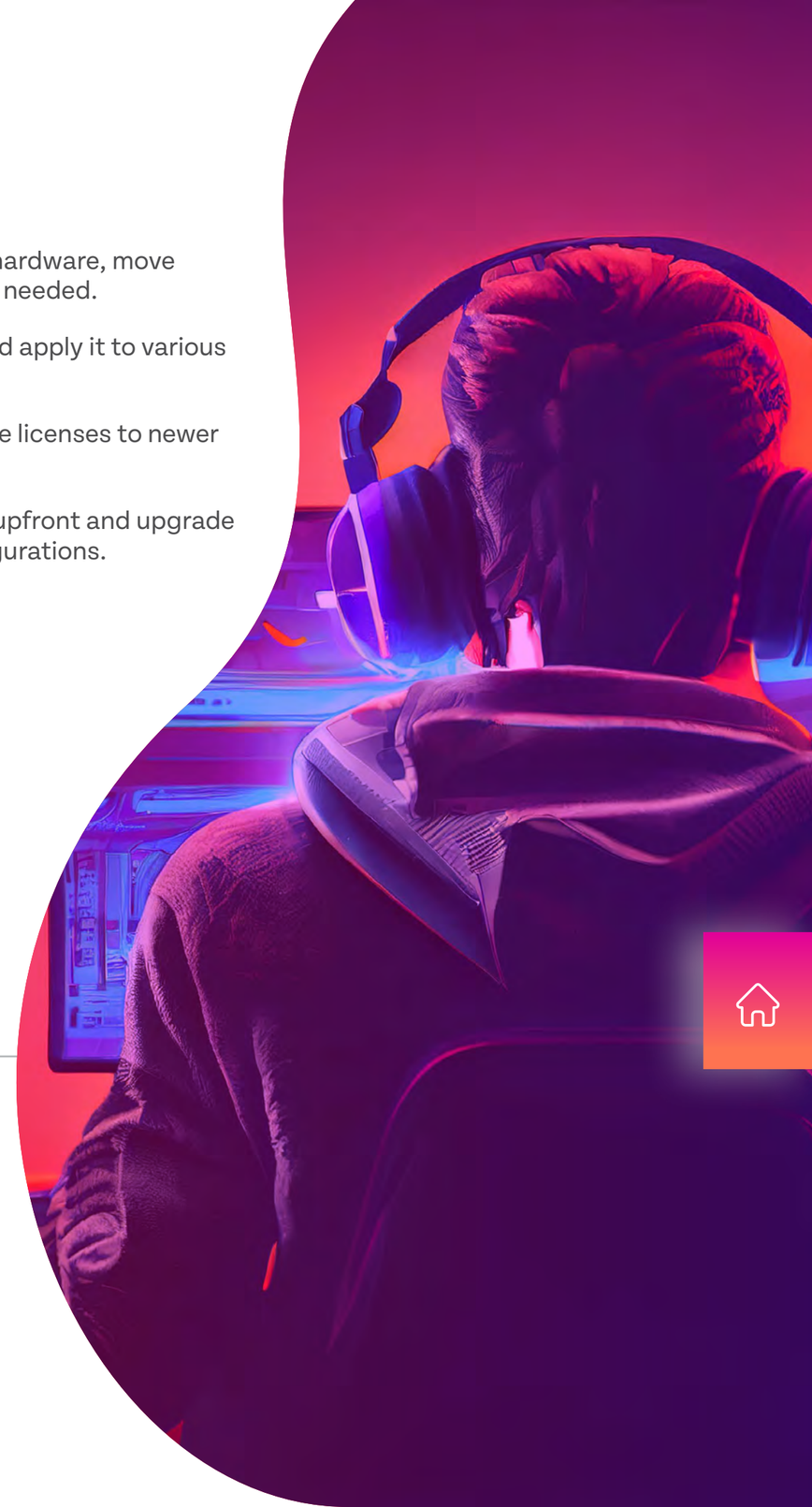
Customer Stories/Success

Online Gaming

An online gaming company required efficient data movement between data centers to analyze and protect terabytes of data generated daily. Riverbed's SteelHead appliances enabled 84% data reduction and acceleration, resulting in a 75% reduction in data movement time.

High-Tech B2B Software Design

A global high-tech company used a hybrid cloud design to transfer 20 TB of data daily between data centers and AWS. Riverbed's SteelHead Cloud solution reduced costs by 50% and halved the data transfer time, simplifying network operations and enhancing visibility.



Optimal AI Data Movement at Scale

Riverbed's Resilient Networking solutions provide data movement at scale unavailable in other solutions such as multi-cloud networking or SD-WAN vendors. Those solutions require large network flows entering or exiting clouds and often are unable to provide data movement acceleration at scale.

Keeping Your Data Moving

In the dynamic age of AI, resilient networking is crucial for organizations to move data at scale, maintain security, and adapt to changing demands. Riverbed's innovative solutions, powered by RiOS 10, provide the performance, security, and agility needed to succeed in this new era. By leveraging Riverbed's expertise, organizations can ensure their networks are equipped to handle the challenges and opportunities presented by AI.

For more information on Riverbed's products and services

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Riverbed – Empower the Experience

Riverbed is the only company with the collective richness of telemetry from network to app to end user that illuminates and then accelerates every interaction so that users get the flawless digital experience they expect across the entire digital ecosystem. Riverbed provides two industry-leading solutions: the Riverbed Unified Observability portfolio, which integrates data, insights, and actions across IT to enable customers to deliver seamless digital experiences; and Riverbed Acceleration, which offers fast, agile, and secure acceleration of any application over any network to users, whether they are mobile, remote, or on-premises. Together with our thousands of partners, and market-leading customers across the world, we empower every click, every digital experience. Learn more at riverbed.com.