

# The Cloud Edge

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Delivering unprecedented performance,  
agility, and security for the digital era



## The Edge Transformation Imperative of the Digital Era

In today's digital economy, the edge is the business. These remote office and branch office (ROBO) locations are where employees work, customers are served, transactions are completed, and revenue is recognized. The edge covers a wide array of business locations. They could be retail stores or regional sales offices. They could be manufacturing sites, warehouses, and distribution centers. They could even be oil rigs, naval ships, or embassies.

Of course, with the rise of the Internet of Things (IoT), edge locations host more than just people. Today, enterprises are deploying a wide range of sensors, gateways, and other connected devices to generate more business intelligence, automate processes, and make operations smarter and more efficient. In many cases, these IoT-enabled locations require limited or perhaps even no human presence or intervention.

Because the edge serves so many distinct functions, different locations have different IT infrastructure needs:

- Some are small stores or shops, using Internet-only networks to deliver apps and services to users.
- Others need to tap into the public cloud, SaaS apps, and the data center, requiring a mix of connectivity options (e.g., private MPLS and public Internet) to balance networking costs with performance requirements.
- Locations that generate a ton of data and other intellectual property require their own server, storage, and backup infrastructure to better support the needs of local employees and customers.

To accommodate these needs and the overall criticality of edge operations, businesses use nearly half of the overall IT budget<sup>1</sup> to power these edge locations. That figure is better underscored by an enterprise's need to refresh these sites with modern-age investments: extensive cloud adoption, guest Wi-Fi and employee BYOD, digital signage and content, and now IoT initiatives—all of which are designed to better engage customers and empower employees.

However, as enterprises embrace digital initiatives, a common theme has emerged: traditional approaches to edge IT are roadblocks to transformation. In fact, while cloud and other innovations are supposed to deliver efficiency and agility while generally making life easier for IT teams, the opposite often happens: these technologies often introduce more complexity and compromise primary business objectives.

**Figure 1: Edge IT Is a Roadblock to Digital Business Objectives**

<p><b>Lack of agility and continuity:</b> Aging infrastructure prevents change from happening quickly and makes it difficult to recover from business-impacting issues.</p>	<p><b>Corporate vulnerability and risk:</b> Though vital for competitive differentiation, improper management of data leads to increased security concerns.</p>	<p><b>Productivity loss and downtime:</b> Applications and digital services are vital to business execution, but the cloud often introduces unanticipated performance and availability issues.</p>
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A number of technical pain points contribute to these overall business challenges, but they can best be grouped into the following categories:

- **Network complexity:** Legacy approaches are hardware-bound, fragile, and can't keep up with business needs for agility.
- **Cumbersome edge infrastructure:** Having distributed islands of infrastructure across the edge is duplicative, costly, and inefficient.
- **Risk of data loss:** Storing data at the edge increases risk for lost business and downtime.
- **Unpredictable application performance:** Ensuring performance becomes increasingly difficult in distributed delivery chains, particularly for cloud apps.

These challenges can't be understated: 91% of organizations report that their ROBO environments are actually more complex to manage as a result of using cloud services<sup>2</sup>. Put another way, legacy IT infrastructure and distributed modes of operation were not designed for the speed and flexibility needed at the edge today.

What's needed instead is a complete edge IT transformation. The solution lies in a holistic, cloud-driven architecture that grants enterprise leaders with the agility, security, and performance to support the dynamic requirements of modern businesses. At Riverbed, we refer to this solution as the cloud edge.

## Challenges

### Today's networks hinder cloud ambitions

In a digital era where greater agility and flexibility are required to remain competitive, IT needs to enable edge locations with instant and secure access to cloud services. Unfortunately, advances to cloud technology have outpaced the very networking infrastructure that connects remote offices to the cloud. As a result, today's networks are:

- **Unwieldy and fragile:** Current networks are built on thousands of routers and time-consuming CLI configurations. It takes four months to implement changes on traditional router-based networks<sup>3</sup>. Additionally, because of the hand programming required to configure these routers, more human error is introduced, which accounts for 35% of all network downtime<sup>4</sup>.
- **Complex and costly:** To offset capacity constraints imposed by cloud, bandwidth-intensive apps like voice and video, and enabling guest Wi-Fi and BYOD, many ROBOs combine traditional MPLS with a lower-cost transport such as broadband Internet. But the resulting topology actually adds complexity and cost. Controlling which apps should take which network path—across all locations, users, and business rules—is nearly impossible using legacy approaches to routing. Consequently, Internet circuits often go underutilized, sometimes leveraged only as back-up connections should primary MPLS links fail.

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## 91% of organizations agree that the introduction of cloud-based applications into the IT portfolio has increased the complexity of managing ROBOs.

Enterprise Strategy Group  
The Digital Transformation Journey: Meeting the Management Challenges of Complex ROBO Environments

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- **Insecure and inefficient:** Enabling direct Internet access at multiple ROBOs means datacenter-grade security services are often bypassed, prompting CIOs to purchase additional security devices. But backhauling that traffic through the data center rarely poses a better alternative. That approach adds distance and latency between the user and the end destination, consuming unnecessary bandwidth and affecting the application experience for edge users.

### Islands of infrastructure are costly and inefficient to manage

Sixty-percent of enterprise employees are based in ROBOs<sup>5</sup>, so delivering fast-performing applications and instant access to data is a must. Because of this, organizations are often forced to implement cumbersome, on-site IT infrastructure at the edge. But while viewed as a business necessity, installing server, storage, and backup equipment to manage local applications and data services at each business location is inefficient and costly.

It's inefficient in terms of capital expenditures because the infrastructure is replicated across potentially hundreds or thousands of sites. Moreover, there is often a lack of standard IT systems, management tools, and processes across edge locations, creating a patchwork approach that makes it difficult for the enterprise as a whole to act with agility.

It's even more inefficient in terms of operational expenditures because IT operations are also replicated across all these sites. Given the time and financial costs of keeping trained IT staff out at every location, non-IT employees are often forced to perform basic IT operations, taking them away from business-critical functions while increasing risk of error.

### Risk of data loss and downtime are at an all-time high

The distributed nature of edge IT also means corporate data—the lifeblood of the business—is everywhere across the enterprise. In fact, 52% of companies say over half of their corporate data is outside the data center<sup>6</sup>. Why is this a problem?

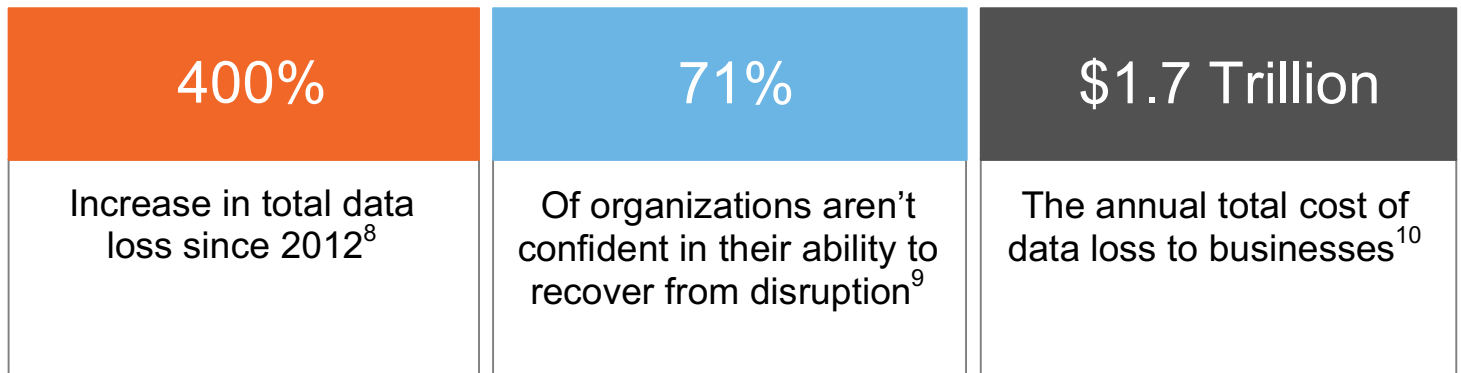
#### **ROBOs lack proper protection mechanisms:**

These edge locations aren't often equipped with datacenter-grade security devices. Storing data

across so many sites introduces additional points of exposure, leaving organizations more susceptible to information loss at high-risk sites — those prone to theft, natural disasters, and other unanticipated issues.

**ROBOs employ fragmented approaches to data backups:** Different locations may employ different methods and schedules for completing data backups. Even worse, some may not complete them at all, as only 75% of local data is backed up today<sup>7</sup>. For many organizations, the staggering amount of edge data cannot be backed up in the allotted timeframes because networks are too slow, putting enormous amounts of data at risk.

**Figure 2: The Impacts of Data Loss by the Numbers**



### Application performance is unpredictable from location to location

Successful edge operations hinge on superior-performing applications. After all, if applications are slow or unavailable, employees can't work and customers can't utilize on-site services, directly impacting top- and bottom-line results. But as mentioned previously, many of the ROBOs that comprise the enterprise edge are without full-time IT personnel. So when apps running locally experience issues, engineers must be dispatched to the ROBO to troubleshoot them, often causing unacceptable periods of slow performance or downtime.

Of course, enterprises continue to offload more applications to the cloud, where they can be centrally managed, in theory by a third party. But even with cloud-hosted workloads, enterprise IT practitioners face challenges when supporting ROBO applications.

- **Degraded service levels:** Traffic from SaaS and other cloud applications must travel longer distances to reach far-flung locations, causing unpredictable performance for many edge users. In fact, 89% of medium-sized enterprises and 70% of large organizations have reported user-impacting performance issues in the cloud<sup>11</sup>.

- **More blind spots:** Traditional performance monitoring tools don't work in public cloud or SaaS environments as IT relinquishes some control over the hosting infrastructure where monitoring agents are installed. This loss of visibility cascades across the enterprise, from headquarters to regional offices and out to edge locations.
- **Difficulty enforcing SLAs:** When issues do occur at certain locations, it's difficult to hold cloud providers accountable for SLAs because they also don't control the infrastructure from end-to-end. So, for instance, while cloud providers can provide metrics like server uptime, they lack insights into the behavior of devices and other endpoints, so the user experience of employees or customers can't be properly measured and maintained.

## The Solution: Cloud Edge

If edge operations are to keep pace in the era of cloud and digital transformation, the underlying IT infrastructure needs its own transformation. But this cannot be a piecemeal approach that treats the aforementioned challenges as discrete problems solved by disparate solutions within IT silos. Only a complete overhaul of edge IT infrastructure and operations will resolve these issues.

The solution? A holistic, fully integrated approach known as the Cloud Edge, which consists of:

- SD-WAN for simplifying hybrid network design, management, and cloud connectivity
- WAN optimization to accelerate cloud, SaaS, and on-premises apps
- Edge data services to protect data and simplify and accelerate IT operations
- An extensible services platform for tighter integration and easier management of critical third-party services
- Performance monitoring for apps, networks, and user experience, on and off the cloud

## Bring networks into the cloud era with SD-WAN

To counter the challenges imposed by legacy approaches to distributed networking, many

organizations are moving to SD-WAN, attracted by a number of factors, including:

- **Centralized management:** Instead of managing individual appliances with outdated CLI, SD-WAN provides a centralized point of administration, empowering network operators to quickly make policy changes at the global, site, or user level.
- **Increased business agility and scale:** New services or entirely new sites can also be designed and deployed much faster, while reducing the need to dispatch engineers from location to location.
- **Simplified control:** Intelligent routing alleviates the complexity of managing multiple connectivity types at each edge location, as applications are securely directed over the optimal network path based on link health as well as global, site, or user-based policies for quality of service, security, and other SLAs.

## Solution considerations for SD-WAN:

- **Ubiquitous and automated connectivity:** Simplifying connectivity across the WAN is a start, but look for solutions that offer a unified network fabric spanning the cloud, data center, and wired and wireless LAN. Additionally, connecting new or existing sites to leading cloud providers such as Amazon Web Services and Microsoft Azure should be as quick and easy as spinning up other cloud computing resources.
- **Business-aligned orchestration:** It's no longer efficient to think in terms of IP addresses and ports. What matters is applications, users, locations, and other keywords shared across business and IT. Network operators need the ability to translate business requirements into traditional network resources—all driven by an intuitive management console that doesn't require advanced certifications to learn and operate.
- **Cloud-oriented workflows:** Cloud-driven businesses need networking solutions that are equally cloud-centric. The right SD-WAN solution

should allow IT teams to virtually design their networks first before ever shipping a single piece of hardware to any ROBO site.

### Simplify IT with edge data services and an extensible services platform

Readying the edge for the cloud doesn't stop with overhauling networks; the islands of edge infrastructure need to be streamlined, too. Hyper-converged infrastructure (HCI) solutions—software-centric offerings that tightly couple compute, storage, networking, and virtualization resources—have risen to popularity in the data center. While similar approaches are making their way to the edge, these locations often have their own sets of unique requirements.

IT leaders need the ability to collapse remote infrastructure back into a centralized location, while still delivering the right apps and services to every site without the operational cost or burden. Solutions offering edge data services and an extensible services platform accomplish this by enabling IT to:

- **Simplify and “cloudify” all IT operations:** Heavy edge IT operations, such as provisioning new apps, services, and sites, as well as recovering data or sites in the case of unplanned outages, can happen from the private data center or public cloud, and in seconds or minutes, rather than days or weeks.
- **Eliminate redundant IT and duplicative operations:** Slash capital and operational expenses by eliminating hardware and maintenance of multiple vendors at each location. This allows IT teams to become more efficient, too, as performing options centrally ensures standardization across the edge and means IT specialists no longer need to travel to remote locations to address issues that pull them away from strategic projects.
- **Protect and secure data:** Mitigate the risk of having data in remote locations by centralizing it in well-protected data centers or in the cloud.

### Solution considerations:

1. **Choice and flexibility:** For most enterprises, going cloud-first doesn't mean cloud-only. For a number of reasons, some IT assets will need to remain on-premises. So consider solutions that seamlessly support a hybrid mix of traditional data center and private or public cloud environments.
2. **Centralize, but don't compromise:** This centralized mode of IT only works if application performance, data availability, and user experience aren't impacted. Evaluate solutions that include application acceleration capabilities, as well as the ability to instantly project volumes of data out to the edge, whenever and wherever needed. That way, critical apps and services perform as if they're still running locally.
3. **Remember, ROBOs aren't data centers:** HCI solutions weren't designed for ROBOs. Hypervisors and networks are stateless functions, but data remains statefully stored in ROBOs, meaning it's difficult to recover if an outage occurs. Moreover, while HCI is easy to expand and administer in a data center, that advantage doesn't extend to the edge, as each location needs its own version of the same components, requiring distributed management. So consider a solution that eliminates this management overhead, scales and standardizes to support all ROBO types, and truly centralizes data management and edge IT operations.

### Fighting app performance issues with cloud-enabled optimization and monitoring

Combining the capabilities of performance monitoring and WAN acceleration provides a formidable one-two punch to ensure application SLAs across ROBOs. While both capabilities have been long-term mainstays for enterprise IT, these solutions are equally vital in cloud-driven architectures.

- **Accelerate cloud migrations:** Monitoring solutions can aid migration planning by helping IT teams understand application dependencies, usage and performance characteristics, and the required network capacity at every edge site. As a

result, IT teams get the granular detail needed to accurately size cloud resources from location to location, across the entire infrastructure. Then, throughout the migration, WAN optimization streamlines the movement of large volumes of data over long distances, reducing network utilization and associated time and costs.

- **Improve ongoing cloud performance:** Post-migration, cloud-enabled monitoring solutions become the “eyes at the edge,” allowing IT to stitch the performance picture together across the entire application delivery chain, expediting troubleshooting processes while helping keep cloud service providers accountable for SLAs. Cloud-aware WAN optimization can then accelerate SaaS and other cloud applications while increasing business transaction throughput.

#### **Solution considerations for cloud-enabled monitoring:**

- **Think unified, not just integrated:** Tighter integration between performance monitoring solutions is important—one toolset must be able to share data or communicate with another. But take it a step further: Look into solutions that deliver unified performance management—a common platform that spans infrastructure, networks, apps, and user experience for a holistic view of performance.
- **End-user experience reigns supreme:** In the digital era, users expect superior experiences at all times. To understand that experience across

the entire ecosystem, evaluate solutions that extend monitoring to user browsers and devices.

#### **Solution considerations for WAN optimization:**

- **Multiple form factors:** Apps are hosted and accessed in a variety of places. As a result, WANOP needs to span mobile, cloud, SaaS, virtual, and physical form factors to support users wherever they need to access an application.
- **Broad application support, including SaaS:** Look for vendors offering proven support for a wide range of critical applications—including their SaaS equivalents—from collaboration tools such as Office 365 to CRM like Salesforce.com to major ERP applications.

## Conclusion

As organizations embark on their digital journeys, the edge will continue to serve an essential role within the enterprise. But distributed, hardware-bound approaches to managing IT infrastructure and services at the critical edge sites are obsolete and can't keep up with the frenetic pace of today's businesses. As a result, ROBOs and other edge locations are often roadblocks to successful business transformation.

A cloud-ready edge eliminates these IT barriers, delivering the levels of edge agility, security, and performance today's businesses need to fully embrace cloud, digital, and other modern innovations. To learn more about Riverbed's vision for a cloud edge, please visit: [www.riverbed.com/cloud-edge](http://www.riverbed.com/cloud-edge).

#### **Footnotes:**

1. "IDC – Riverbed Total Addressable Market Study," November, 2013
2. "ROBO Challenges and Considerations," ESG, Dec. 2016
3. "5 steps to a software defined network," ZK Research, Feb. 23, 2016
4. "The Quantitative and Qualitative Benefits of the New IP Network," ZK Research, July 2015
5. "Transforming Branch/Remote Office IT in the Digital Economy," Aug. 2015

6. "Think You Mastered App Performance? Think Again," Forrester, July 2013
7. "Transforming ROBO IT in the Digital Economy," IDC, Aug. 2015
8. "Data Loss, Downtime Cost Businesses \$1.7 Trillion," eWeek, Dec. 4, 2014
9. Ibid
10. Ibid

#### **About Riverbed**

Riverbed enables organizations to modernize their networks and applications with industry-leading SD-WAN, application acceleration, and visibility solutions. Riverbed's platform allows enterprises to transform application and cloud performance into a competitive advantage by maximizing employee productivity and leveraging IT to create new forms of operational agility. At more than \$1 billion in annual revenue, Riverbed's 28,000+ customers include 97% of the Fortune 100 and 98% of the Forbes Global 100. Learn more at [riverbed.com](http://riverbed.com).

The logo for Riverbed, featuring the word "riverbed" in a lowercase, sans-serif font. The "i" and "e" are blue, while the other letters are orange.