

The IT Roadmap

from Modernization to Innovation
with Consistent Hybrid Cloud



An IDC InfoBrief, Sponsored by Dell EMC & Intel | September 2019

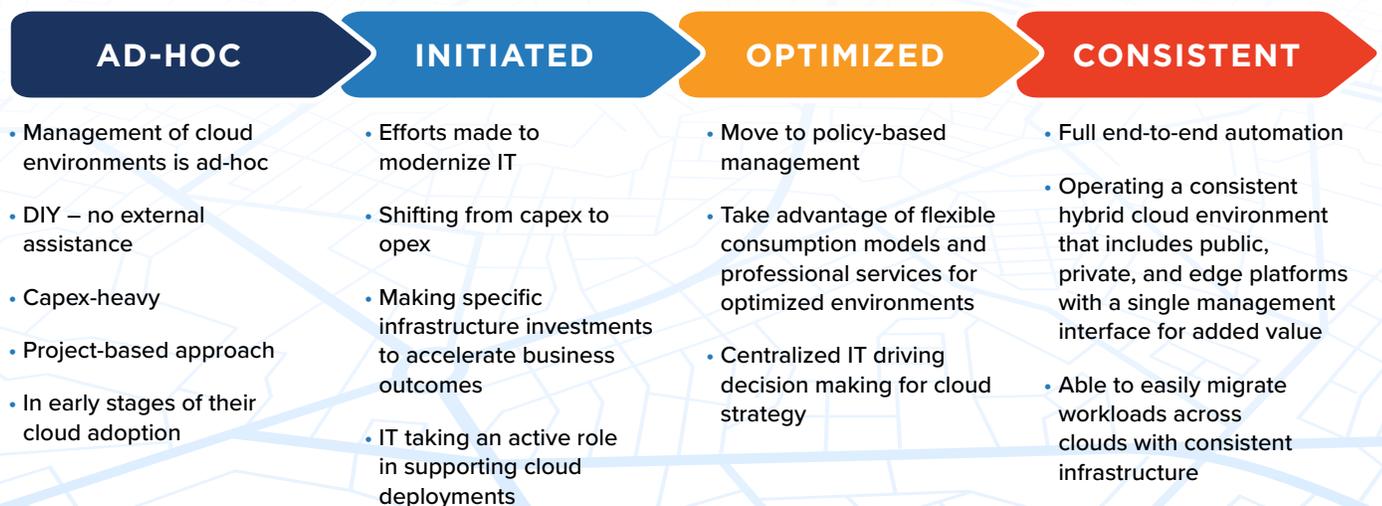
Ashish Nadkarni, Richard Villars, Matt Marden, Rob Brothers, Susan Middleton

Executive Summary

It has become the norm for enterprises to deploy workloads across multiple public, private, and edge cloud platforms due to business strategy and technical requirements. To reduce complexity and accelerate business outcomes in this multicloud world, leading IT organizations are seeking to operate more cohesively with a consistent hybrid cloud, which requires a modern, cloud-ready IT infrastructure on-premises to reap the benefits of cloud at scale.

Delivering a consistent hybrid cloud can seem daunting; it is a multi-year, multi-phased journey and requires a thoughtful plan to yield success. IDC conducted research to learn more about the obstacles organizations are encountering on this journey, how such obstacles are being overcome, and the outcomes that result. This research, which was sponsored by Dell EMC and Intel, reveals the business value of modernizing IT for cloud readiness and provides a roadmap for organizations to follow along the path to delivering consistent hybrid cloud, including key success metrics, investment areas, and peer-to-peer guidance. Follow this roadmap to see how you can take control of your clouds and continuously drive business value.

The Cloud Consistency Continuum



FOR IT LEADERS, THE BENEFITS OF DELIVERING A CONSISTENT HYBRID CLOUD ARE:

- ✓ **Operational Excellence:** Reduced TCO, improved ROI, increased productivity, reduced risk and improved performance and reliability
- ✓ **Accelerated Innovation:** Faster time to market and increased business agility
- ✓ **Better Customer Experience:** Real-time data access, better customer satisfaction rates and improved IT service delivery

AD-HOC

INITIATED

OPTIMIZED

CONSISTENT

Managing Multiple Clouds via Legacy Systems Slows Business Outcomes

IT leaders have a lot to think about, and infrastructure operations should not be a bothersome task on their to-do list. The burden of managing legacy IT environments creates a huge drag on not only the IT resources, but also the business. Add in multiple clouds, and the situation becomes very complex. Characteristics of an ad-hoc multicloud environment include:

- Legacy IT infrastructure with no planned approach for modernization
- Point tools for managing cloud environments is ad-hoc - early stages of cloud adoption
- Management is in-house – there is no external assistance
- Very capex-heavy IT investments
- Project-based approach creates siloes and inconsistent usage

Consistent hybrid cloud requires IT modernization — a complete rethinking of the IT ecosystem from the technologies deployed, to the processes followed, to the types of skills required.

Delivering a seamless and consistent hybrid cloud experience is a multi-year, multi-phased journey. In order to move from Ad-Hoc to Initiated, IDC recommends tying business outcomes to modern, cloud-ready infrastructure investments.



Lowering costs is top-of-mind

“Lowering cost is one of the key objectives for us, yet the fact is we’re not always saving costs, sometimes it’s cost-neutral and sometimes we’re actually spending more, to become more agile. There is always a question mark how we are going to achieve that.”

— Director Information Technology / NA operations, Manufacturing Firm



Infrastructure sprawl is a drain on datacenter resources

“Infrastructure sprawl leads to datacenter resource constraints. No consistent policies for upkeep (e.g., patching). Lack of policies for business continuity left the environment exposed. Costs are consistently high.”

— Director of Global IT, Consumer Products Firm

AD-HOC

INITIATED

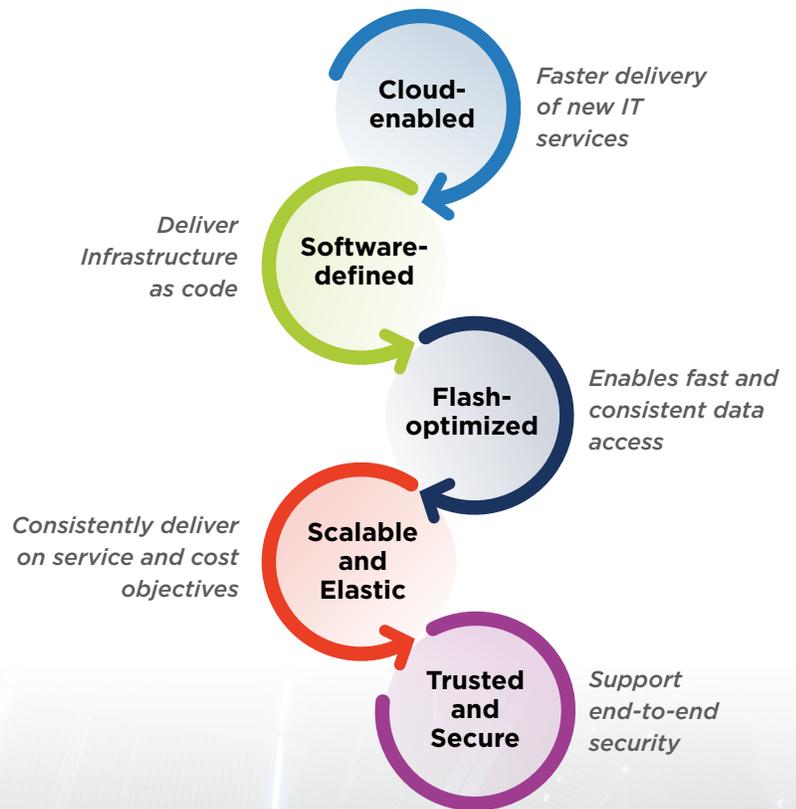
OPTIMIZED

CONSISTENT

A Modern, Cloud-Enabled IT Infrastructure Moves You Forward

Investing in a modern, cloud-enabled IT infrastructure on-premises is the first step towards delivering a consistent hybrid cloud experience. Key investment areas should include modern storage, compute, data protection, hyperconverged, and software-defined networking for optimal value and cloud readiness.

- Businesses achieve a higher rate of operational excellence, accelerate innovation, and improve customer experiences.
- IT Leaders can deliver resources instead of products, set and exceed high security standards, and overcome obstacles associated with varying workload requirements.
- IT Practitioners can shift to more autonomous operations, delivering infrastructure as code and enabling continuous and consistent workload enhancement.



5 core modern infrastructure solution areas



Traditional IT infrastructure requires higher costs to maintain

“Traditional IT infrastructure is siloed and inconsistently virtualized. No consolidation, workloads are compartmentalized and isolated, leading to high management costs, high TCO, and maintenance challenges.”

—Sr. Director of Engineering, Telecommunications Services Firm

AD-HOC

INITIATED

OPTIMIZED

CONSISTENT

Build the Business Case for IT Modernization

IDC's research shows that IT Leaders who want to move from Ad-Hoc to Initiated will find investing in modern infrastructure technologies delivers from both short and long-term perspectives.

Investments in modern IT not only establish a path for delivery of a consistent hybrid cloud experience, but deliver significant value through IT and business improvements as demonstrated by IDC's research:

In the short term, IT modernization for cloud consistency delivers:

- More cost-effective and efficient IT operations (17% lower IT budgets)
- Improved security and resiliency (86% faster RPOs)
- Tools for employees to work effectively (Almost 3x more new applications and features developed)
- Faster delivery of new applications (51% faster development lifecycles)
- Better access to data-driven analytical insights (53% faster completion of analytical queries)

In the longer term, IT modernization for cloud consistency helps organizations:

- Establish hybrid cloud environments (>3.5x more applications in the cloud)
- Provide IT foundations that meet changing business demand (94% more bandwidth)
- Win new business (One-quarter of revenue won or protected)
- Improve scalability (48% faster deployment of new servers, 46% faster deployment of new storage)
- Reduce risk (90% less productive employee time lost due to unplanned outages)



- ✓ Operational Excellence
- ✓ Accelerated Innovation
- ✓ Better Customer Experience



Managing complexity starts by measuring it

“Infrastructure complexity becomes unmanageable over time; different point products and vendors to fulfill a solution. It takes too long to implement new workloads, the process is not efficient, and project becomes too complex by the time it is completed. Reigning it in starts by measuring it.”

—Director of IT, Equity Capital Mgmt. Firm

AD-HOC

INITIATED

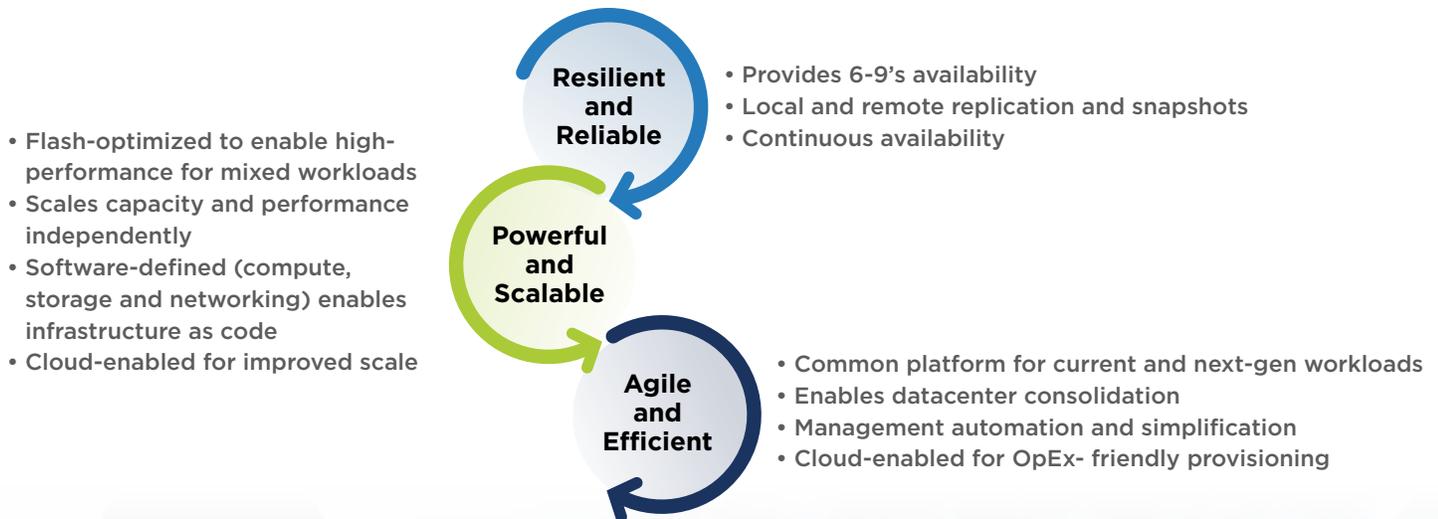
OPTIMIZED

CONSISTENT

Start with Hyperconverged

Organizations want to deploy workloads more efficiently and in growing numbers of critical business locations, not just core datacenters. The fastest path to delivering consistent hybrid cloud is through hyperconverged infrastructure, which boosts IT efficiency and performance with fully virtualized servers, storage, and networking.

Key Attributes of Modern Hyperconverged Infrastructure



Doing your homework is essential for maximizing investments

“Embracing hyperconverged infrastructure requires doing our homework. Reading about the platform and the vendors in the market is necessary. How will your architecture work? What are you trying to achieve? For us, it is about learning, then trying it out and then looking at real-life scenarios. For example, we need to examine failure scenarios, talk to others in the same industry that may be doing something similar, then workloads and ultimately easing it into production when we are comfortable with it.”

—VP Technology, Retail Bank



Hybrid Cloud building block approach with Hyperconverged Infrastructure

“Hyperconverged Infrastructure enables us to do ‘the public cloud on-premises’ essentially with a building block approach. Applications that we deem might need extra processing such as analytics or simulations for the financial markets – we scale them to the public cloud using an on-premises control layer. We then scale it back down when the tasks are completed. That’s the hybrid cloud to us. It is basically making the public cloud a commodity.”

— Sr. Director of Engineering, Telecommunications Firm

AD-HOC

INITIATED

OPTIMIZED

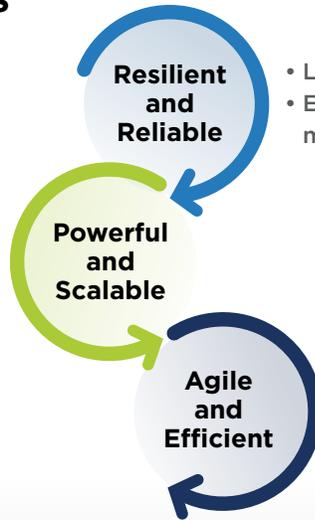
CONSISTENT

[BACK TO MAIN PAGE](#)

Investing in Modern Hyperconverged Infrastructure

Overcoming Obstacles

- Look for virtualization efficiency and density without compromising performance
- Scaling virtualization layer should not come at the expense of storage or compute hardware



Resilient and Reliable

- Look for hardware reliability, not just the software
- Examine level of vendor support when maintenance is necessary

Powerful and Scalable

- Look for platforms that enable automation (i.e., provide the ability to script software-defined infrastructure)
- Do not overlook the overhead of the storage layer in terms of efficiency (without compromising performance)
- Invest in platforms that automate life-cycle management for a more sustainable solution

Agile and Efficient

Delivering a consistent hybrid cloud experience starts with connecting business outcomes to IT investments. IDC's research shows organizations who modernize IT for cloud consistency have:

- 22% of their compute delivered from converged and hyperconverged solutions
- 28% more productive developers
- 44% more efficient IT management teams
- 90% less productive time lost due to unplanned downtime



- ✓ Operational Excellence
- ✓ Accelerated Innovation
- ✓ Better Customer Experience



Embracing Hyperconverged Infrastructure is a Journey

“We didn’t just jump in and rip everything out to throw in the hyperconverged. What we did was to step into it. We identified a workload in our business that we wanted to become more agile and had the ability to scale easier. We purchased a few nodes of hyperconverged infrastructure at the right specifications and then migrated those VMs onto the platform. That organically grew quarter after quarter. From there we felt it was working fabulously so migrated other workloads.”

— Sr. Director of Engineering, Telecommunications Firm

AD-HOC

INITIATED

OPTIMIZED

CONSISTENT

Future-Proof with Modern, Cloud-Enabled Storage

IT Leaders must decide how and where to manage their organization's most important capital asset, its data, while maximizing business value. To accommodate the more data-intensive workloads underlying modern digital services, IT must deliver high performance on scalable and reliable modern storage infrastructures, including NVMe-based all-flash and storage-class memory (SCM) technologies. Modern, cloud-enabled storage provides faster and more secure data management from core-to-edge-to-cloud, automated insights, effective continuity/backup, and end-to-end security regardless of where workloads reside.

Key Attributes of Modern, Cloud-Enabled Storage Infrastructure

- High-performance (low latency, bandwidth, IOPS) enables mixed workloads
- Scales capacity and performance independently
- Flash-based for consistent performance

Resilient and Reliable

- Provides 6-9's availability
- Enables data resiliency via local and remote replication and snapshots
- Provides continuous application availability
- Cyber-resilient architecture
- Self-encrypting components

Powerful and Scalable

- Common storage platform for current and next-gen workloads
- Enables datacenter consolidation
- Simplifies data landscape
- Software-defined and cloud-enabled
- Is data-efficient by leveraging deduplication and/or compression
- Management is automated and simplified

Agile and Efficient

Future-proofing infrastructure investments

"Future-proofing our infrastructure is the highest priority for us, followed by the ability to scale capacity and performance independently."

—Director of Storage Strategy & Planning, Healthcare Services Firm

AD-HOC

INITIATED

OPTIMIZED

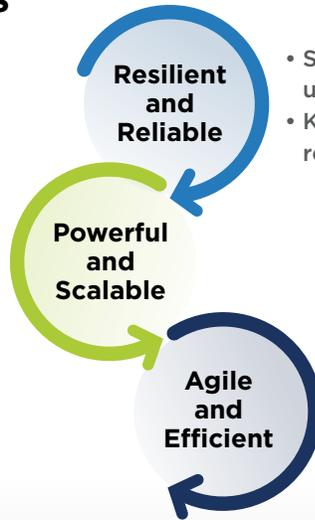
CONSISTENT

[BACK TO MAIN PAGE](#)

Investing in Modern, Cloud-Enabled Storage Technologies

Overcoming Obstacles

- Don't skimp on budget – it can inadvertently cripple ability to scale
- Know your priorities in terms of performance, scalability and tolerance for mixed workloads



- Storage software is just as important as the underlying hardware
- Know the metrics that are important from a reliability perspective

- Know what your key outcomes are. It will help you decide on what your business is looking for in terms of technology
- Know your priorities in terms of ease of management, impact of deduplication, datacenter consolidation and seamless scaling – they all have an impact on agility and efficiency

Delivering a consistent hybrid cloud experience starts with connecting business outcomes to IT investments. IDC's research shows organizations who modernize IT for cloud consistency have:

- Increased modern storage footprint to 21% of overall storage
- 45% lower application latency
- 87% less frequent unplanned outages



- ✓ Operational Excellence
- ✓ Accelerated Innovation
- ✓ Better Customer Experience



Business outcomes enable prioritization of features.

"All product capabilities affect business outcomes. For us it is a matter of figuring out what the target costs are, and prioritizing capabilities to align with that target without compromising stated outcomes"

—Director of Storage Strategy & Planning, Healthcare Services Firm

AD-HOC

INITIATED

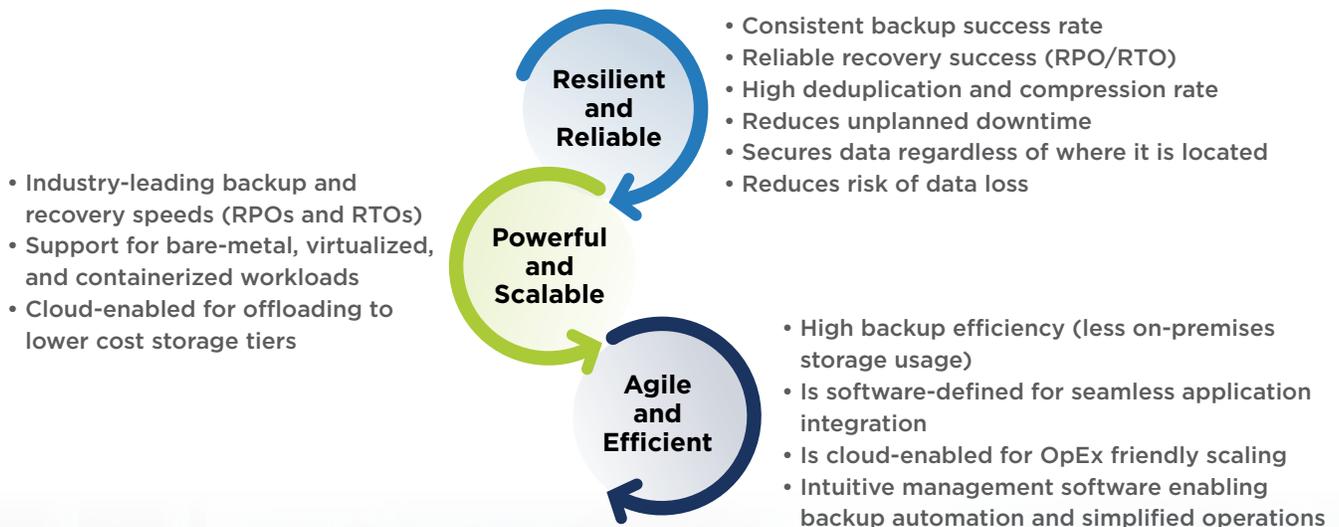
OPTIMIZED

CONSISTENT

Protect Data from Core to Edge to Cloud

The collection, delivery, processing, and analysis of data is at the core of innovation, but this focus on data also introduces new risks in the areas of cost, resiliency and privacy. Regardless of where workloads are being managed, it's evident that end-to-end data protection is critical. Organizations can significantly reduce business risks related to data-driven activities by deploying modern, cloud-enabled data protection solutions on-premises.

Key Attributes of Modern, Cloud-Enabled Data Protection



Data Protection is visible all the way to the top – to the Board of Directors

“If I went to one of our Board members right now and asked what is the one area of investment from an infrastructure perspective that cannot be compromised, they would say data protection. For us, it is all about protecting our most valuable asset: information. It is one of the top priorities for the bank.”

— VP of Technology, Major Retail Bank

AD-HOC

INITIATED

OPTIMIZED

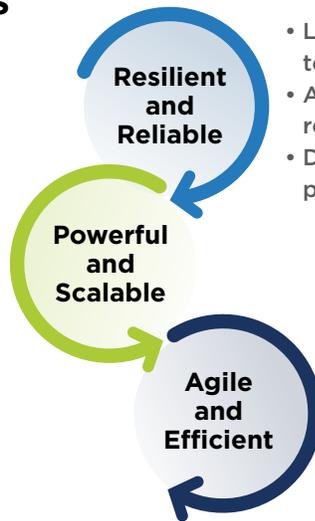
CONSISTENT

[BACK TO MAIN PAGE](#)

Investing in Modern, Cloud-Enabled Data Protection

Overcoming Obstacles

- Look for performance issues when handling one-off situations (e.g., large database backup and recovery)
- Examine backup and recovery performance under real-life scenarios for virtualized and non-virtualized applications



- Look for hardware reliability, not just the software in terms of daily backup success
- A protected environment is only as good as its recovery capabilities – test often and test always
- Data encryption is necessary, and is safe only if best practices in key management are adhered to

- Look for platforms that enable automation (i.e., provide the ability to script software-defined infrastructure) via purpose-built backup appliances
- Do not overlook the overhead of the storage layer in terms of efficiency (without compromising performance)

Delivering a consistent hybrid cloud experience starts with connecting business outcomes to IT investments. IDC's research shows organizations who modernize IT for cloud consistency have:

- Up to 85% of their environment managed by modern data protection solutions
- 64% faster data backups
- 86% faster data recovery
- 56% improvement in ability to meet data recovery objectives
- 51% more productive data protection teams



- ✓ Operational Excellence
- ✓ Accelerated Innovation
- ✓ Better Customer Experience



Data Protection is all about RPOs and RTOs

“We monitor RPO and RTO closely. We examine the operational and disaster recovery objectives for each of our applications. For us it is imperative to determine what they are, how much data can we lose and how long does it take to recover those applications. Another metric we examine is maximum tolerable downtime.”

— VP of Technology, Major Retail Bank

AD-HOC

INITIATED

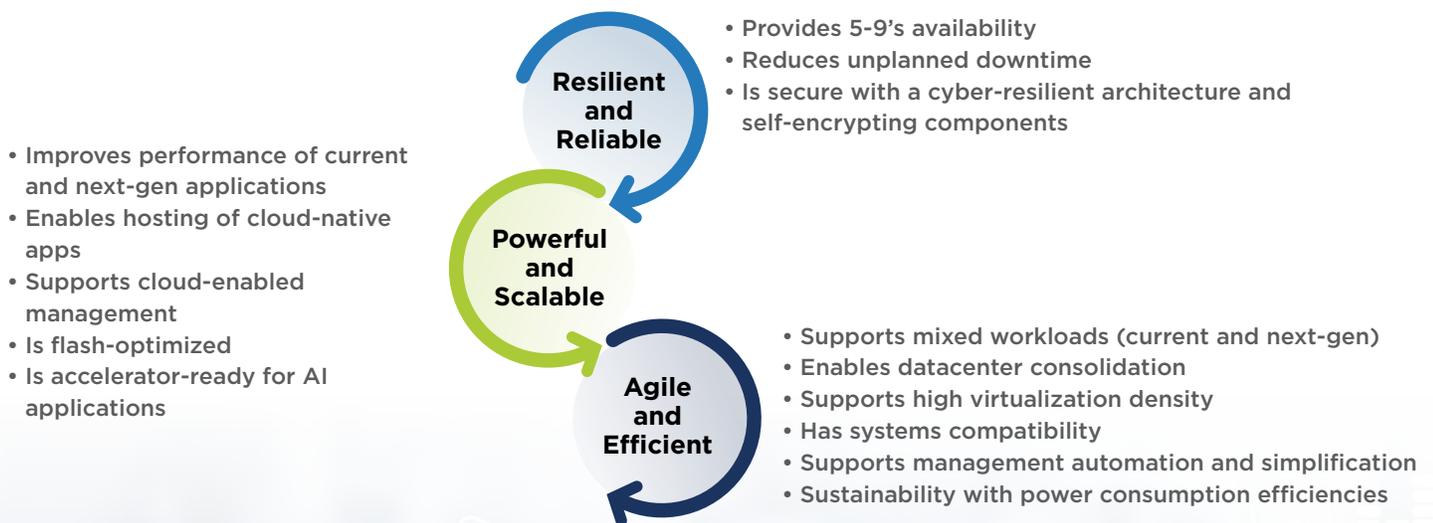
OPTIMIZED

CONSISTENT

Scale Workloads Securely with Modern, Cloud-Enabled Servers

We're witnessing a reengineering of public cloud services to use a serverless approach, but this isn't suitable for all workloads. Delivering agile access to modern compute resources on-premises is critical for workloads that require scalability and security. Organizations must ensure that the performance, automation, and configurability of their on-premises server infrastructure matches business demand by continuing to refresh their servers in a timely manner (on 3-year cadence).

Key Attributes of a Modern, Cloud-Enabled Compute (Server) Platform



Upgrading Server infrastructure provides tangible operational cost savings

“Server infrastructure is a key area of investment for us. We get real estate savings by reducing the footprint in datacenters. We reduce power consumption by using more energy-efficient servers. We reduce administrative and maintenance costs by simplifying the environment – we now manage a system with resources versus managing discrete components. When we upgrade our infrastructure, we see tangible savings in our operational costs.”

— VP Technology, Large Retail Bank

AD-HOC

INITIATED

OPTIMIZED

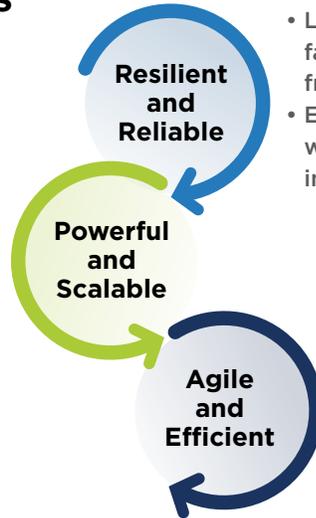
CONSISTENT

[BACK TO MAIN PAGE](#)

Investing in Modern, Cloud-Enabled Server Platforms

Overcoming Obstacles

- Invest in platforms that enable automation (i.e., provide the ability to script software-defined infrastructure) - management automation and simplification can save on long-term costs
- Invest in platforms that provide disaggregated solutions allowing a choice of the latest hardware, OS software, virtualization and open source orchestration and automation tools



- Look for reliability in terms of mean-time between failures, and the level of maintenance support from the vendor to bridge/reduce gaps
- Examine performance for current and next-gen workloads with the objective of future-proofing investments

- Examine the cost savings achieved when implementing fixed form factor platforms with high density connectivity that require less power, cooling and space
- Pick a solution that helps ensure the physical underlay network is properly provisioned and operating for the unique demands of the virtual network
- Seek vendors that provide end-to-end solutions across servers, storage, and networking platforms with global support and services

Delivering a consistent hybrid cloud experience starts with connecting business outcomes to IT investments. IDC's research shows organizations who modernize IT for cloud consistency have:

- Refreshed 43% of their server environments in the last several years
- 48% faster server deployment
- Almost 3x more new applications and features delivered per year



- ✓ Operational Excellence
- ✓ Accelerated Innovation
- ✓ Better Customer Experience



Older infrastructure is a resource and productivity drag

"Maintaining older infrastructure was laborious. Upgrading a server for more capacity was very labor-intensive and time-consuming."

—VP Global IT, Consumer Products Firm



A Flash-enabled server infrastructure provides better utilization and TCO gains

"Flash-enabling our computing infrastructure allows us to optimize utilization both from a storage and compute standpoint. From a TCO standpoint there are clear gains for us."

— VP Global IT, Consumer Products Firm

AD-HOC

INITIATED

OPTIMIZED

CONSISTENT

Stay Connected with Open, Software-Defined Networking

More and more organizations are looking to deliver optimal experiences and manage data at critical edge locations, which requires an agile, secure connection in the datacenter and across the enterprise. Monolithic networks are not conducive to supporting distributed services and applications, which is why organizations should embrace an open, software-defined networking approach from the edge, to the core, into the cloud.

Key Attributes of a Modern Software-Defined and Open Networking Infrastructure

- High-performance for mixed workloads
- Scales capacity and performance independently
- High-performance, high density fixed form factor platforms with connectivity from 25GbE to 400GbE
- Optimum non-blocking switching fabrics delivering line-rate performance under full loads
- Modern leaf-spine fabrics for linear performance and scalability

Resilient
and
Reliable

Powerful
and
Scalable

Agile
and
Efficient

- Provides 6-9's availability
- Enables data resiliency via improved connectivity
- Provides continuous application availability
- Choice of industry-leading merchant silicon-based hardware and OS software
- Optimized delivery of workloads and VM mobility across virtual and cloud environments
- Redundant, hot-swappable power supplies and fans

- Common platform for current and next-gen workloads
- Enables datacenter consolidation
- Simplifies networking, storage, and connectivity landscape
- Disaggregated model separating hardware from OS software options
- Centralized management that integrates the design, provisioning and deployment of both physical and virtual networks
- Fabric-level automation framework with zero-touch expansion and automatic topology validation



Software-defined networking is mission-critical for our datacenter

“Software-defined networking is mission critical for us now in our datacenter. It’s the key piece. Software-defined workloads running on hyperconverged platforms is our sweet spot. They rely on software-defined networking for east-west and north-south traffic.”

— Sr. Director of Engineering, Telecommunications Services Firm

AD-HOC

INITIATED

OPTIMIZED

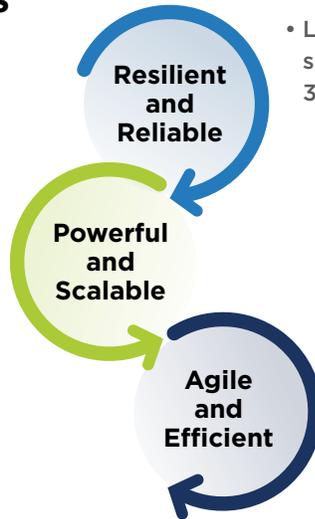
CONSISTENT

[BACK TO MAIN PAGE](#)

Investing in Open, Software-Defined Networking

Overcoming Obstacles

- Look for performance issues when handling one-off situations (e.g., large database backup and recovery)
- Examine backup and recovery performance under real-life scenarios for virtualized and non-virtualized applications



- Look for architectural issues when blending in software-defined networking into legacy layer 2 and 3 equipment

- Look for platforms that enable automation (i.e., provide the ability to script software-defined infrastructure)
- Do not overlook the overhead of the storage layer in terms of efficiency (without compromising performance)

Delivering a consistent hybrid cloud experience starts with connecting business outcomes to IT investments. IDC's research shows organizations who modernize IT for cloud consistency have:

- 40% of overall IT environments that are based on software-defined networking
- 94% more effective bandwidth in these environments, thanks to improved traffic management capabilities
- 39% more efficient IT security teams, thanks to improved traffic visibility



- ✓ Operational Excellence
- ✓ Accelerated Innovation
- ✓ Better Customer Experience



Software-defined networking is secure

"We've always been a secure organization, at least in the last few years. This is where software-defined networking comes in to work for us. It gives us the ability to offload sensitive data transactions to the software-defined layer in a much more flexible and secure manner."

— Sr. Director of Engineering, Telecommunications Services Firm

AD-HOC

INITIATED

OPTIMIZED

CONSISTENT

Shift from CapEx to OpEx with Flexible Consumption Models

To move from Initiated to Optimized, IT Leaders must consider flexible consumption models for all infrastructure investments as part of their consistent hybrid cloud strategy. Recent IDC research confirms the top reasons for adopting flexible consumption models are:

- Faster refresh of IT equipment
- Simplified management/governance
- Systems optimization services
- Predictable cost model with a monthly payment per seat
- Procurement efficiencies and reduced IT staff workloads

New FASB standards require that companies categorize leases as either operating or finance leases.

- Lessees will be required to recognize assets & liabilities for leases with terms over 12 months
- Finance leases will be accounted for in a similar treatment as capital leases
- Classify a lease if it depends on the use of an identified asset

How do you want to consume?



86%

of respondents stated that the new FASB regulations will impact their company's procurement strategies going forward

What to look for in a flexible consumption model:

- Metering and dashboards available and integrated into all customer access points: sales portals, mobile
- Ability to flex up and down
- Any configuration of base and flex requirements
- Any month term length
- Subscription-like model- no ownership
- Option to walk away

Source: IT Procurement Trends & Consumption Models - 2018, IDC, August 2018 N=300

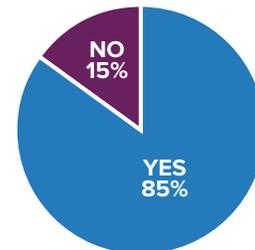


Boost Consistent Hybrid Cloud Delivery with Professional Services

In addition to flexible consumption, IDC research finds that the quality of the support organization influences the vendor selection process and is also critical for ensuring that investments in modern infrastructure continue to deliver value over the life of the system. A vendor’s services capabilities are a key differentiator for why enterprises do not use white boxes. White box providers generally do not provide the breadth and depth of services the OEMs provide.

- The use of vendor’s deployment services frees up internal IT resources so they can focus on strategic initiatives.
- Services enable IT to deliver a consistent hybrid cloud experience and include vendor expertise in application. profiling, cloud suitability, application modernization, and cloud migration.
- Services that enable IT to upgrade their operating model to add new roles and processes to support a cloud/service-orientation.

Do Services Matter? 85% of Enterprises Think So..



N=1200 Enterprise Datacenter Customers
Source: IDC 2019 WW Datacenter Support Customer Satisfaction Study

Why Did You Choose To Use Someone Other Than Your Own Internal Personnel?



Source: IDC 2018 WW Converged/Hyperconverged Services Attach Rate Survey

It is critical to get IT stakeholders aligned around the business reasons and IT architecture for consistent hybrid cloud >

AD-HOC

INITIATED

OPTIMIZED

CONSISTENT

Consistency is the Key

By combining the security, control and reliability of private cloud along with the simplicity, flexibility, and economics of public cloud, hybrid cloud has become the defacto approach for IT leaders who are managing multiple clouds. According to a recent IDC study, hybrid cloud users experience up to...

 **13%**
reduction in risk

 **11%**
lower annual
operating expenses

 **15%**
faster time
to market



What role does a hybrid cloud strategy play in modern infrastructure?

“We refer to it as Cloud 2.0. Cloud 1.0 was standing up the internal private clouds literally behind our firewalls. The next is to begin leveraging hybrid clouds or external clouds in tandem with our private clouds to give us that hybrid capacity and hybrid capability.”

— VP of Technology, Major Retail Bank

But, moving from Optimized to Consistent requires infrastructure and management consistency, which allows IT leaders to reap the benefits of cloud at scale without introducing additional management and overhead cost creep.

Dell EMC and VMware offer a holistic solution that enables organizations to implement a consistent hybrid cloud and realize their vision for innovation. Dell Technologies Cloud is a set of robust hardware and software offerings backed by professional and financial services that help IT leaders mitigate the complexity of multiple clouds by leveraging consistent management and orchestration tools across private, public, and edge cloud platforms.

Dell Technologies Cloud offers the industry’s first jointly engineered consistent hybrid cloud solution tightly integrated with VMware for a rapid and simple deployment. The familiarity with VMware cloud tools coupled with the reliability of Dell EMC hardware empowers organizations to focus on innovation by cutting costs, increasing employee productivity, delivering innovative products, and enhancing customer experiences all while reducing the complexity of managing multiple clouds.

Click here to learn more: www.dell EMC.com/cloud

Essential Guidance

Organizations that seek to deliver a consistent hybrid cloud experience:

- ✓ Make a conscious effort to minimize the footprint of traditional IT on-premises infrastructure (instead seek to build a modernized private cloud)
- ✓ Design IT infrastructure for scalability, agility, and elasticity with a focus on delivering resources instead of products
- ✓ Implement a system to measure investments in modernizing IT for consistent hybrid cloud readiness via metrics related to business outcomes
- ✓ Think beyond the initial investment to organizational and process preparedness and changes
- ✓ Constantly examine IT investments for business suitability and course correct as needed

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.

IDC Custom Solutions

IDC Corporate USA
5 Speen Street
Framingham, MA
01701, USA
T 508.872.8200
F 508.935.4015
Twitter @IDC
idc-insights-community.com
www.idc.com

This publication was produced by IDC Custom Solutions. The opinion, analysis, and research results presented herein are drawn from more detailed research and analysis independently conducted and published by IDC, unless specific vendor sponsorship is noted. IDC Custom Solutions makes IDC content available in a wide range of formats for distribution by various companies. A license to distribute IDC content does not imply endorsement of or opinion about the licensee.

External Publication of IDC Information and Data — Any IDC information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate IDC Vice President or Country Manager. A draft of the proposed document should accompany any such request. IDC reserves the right to deny approval of external usage for any reason.

Copyright 2019 IDC. Reproduction without written permission is completely forbidden.