WHITE PAPER

FlashStack: Defining the Modern Infrastructure

CISCO AND PURE STORAGE

September 2020

TABLE OF CONTENTS

THE DEMANDS ON IT KEEP GROWING AS BUSINESS OPERATIONS DEPEND MORE AND MORE ON A MIX OF TRADITIONAL AND MODERN APPLICATIONS.

When looking at your datacenter, you may be considering how a converged infrastructure (CI), hyperconverged infrastructure (HCI), or reference architecture-based hybrid cloud strategy can help you meet these demands while providing a foundation for those workloads that should leverage cloud resources.

Regardless of the direction you go, you're looking to apply cloud-like operating principles to your datacenter—it all adds up to more complexity and more challenges for your IT team.

FlashStack™ was built to overcome that complexity. Cisco® and Pure Storage® took a deep look at the datacenter with a critical focus on what matters to our customers in their day to day lives. We looked at the pressure points in their datacenters and the causes behind them. What we learned was, well, simple. In fact, simplifying every aspect of the datacenter lifecycle while relieving those pressure points was what IT leaders wanted more than anything else. So we designed FlashStack to do just that, maximizing productivity and making the life of everyone in IT easier at the same time.

We started by breaking the datacenter lifecycle down into Day 0/1/2 phases that match our customers day to day experiences—architecture, deployment, and daily operations. We then looked at how we could simplify and solve key IT challenges in each of these phases.

A DAY IN THE LIFE OF THE DATACENTER

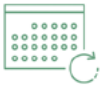
Day 0

Architect
(Design)

Day 1

Implement
(Deliver)

Day 2



Operate
& Optimize

DAY 0: ARCHITECT (DESIGN)

Day 0, the architecture phase, is all about flexibility, scalability, and preparing for the future. You need your datacenter to be ready as your business grows and evolves. Your requirements need to support business goals.

That used to mean scanning the horizon from three to five years out and then making your best guess as to what you'll need then. All while still putting out fires today. And there are downsides to thinking too small as well as dreaming too big, so the choice isn't easy.

DAY 1: IMPLEMENT (DELIVER)

On Day 1 you're thinking about deploying and implementing the architecture and how you'll set things up. At this point you may need Professional Services support to help deal with the complexity that comes with deployment. That sounds fine, but the real challenge is that Day 1 isn't just day one. It could be Day 180 or Day 365—because Day 1 happens every time you rearchitect or substantially expand your infrastructure. And every time Day 1 comes back around, you're back to dealing with more complexity and more costs.

DAY 2: OPERATE AND OPTIMIZE

Day 2 is where many IT professionals spend most of their lives. In fact, day to day operations and optimization can be so time consuming that your IT team may not be able to meet new demands for innovation and performance. Of course, many IT teams don't think a lot about Day 2 as their systems hum along—that is until something goes wrong. Then they care. A lot.

While the business leaders tend not to dwell on daily operations, that quickly changes if applications become unstable and unavailable. That scrutiny only grows if too much employee time and IT budget is spent keeping the lights on, leaving no time for new projects that impact the business.

THE DATACENTER EVOLUTION: STRIVING FOR SIMPLICITY

Storage, computing, and, of course, virtualization are the foundational elements of the datacenter. For more than a decade virtualization has been the big driver in datacenter innovation. But its benefits come with new complexity and new challenges. That's because virtualization solves previous problems so well that it has driven datacenters to grow exponentially.

REFERENCE ARCHITECTURES

Reference architectures have been the datacenter infrastructure stack starting point for IT teams for many years. By narrowing down the unlimited options there are in designing a datacenter into documentation and guides, reference architectures help meet the goal of everything operating together and working well on Day 1. Hopefully, the reference architecture provider got it right. That's one step toward making things simpler, but still not easy—especially at scale thanks to the complexity of the underlying components.

Over time, reference architectures have become a victim of their own success, as datacenter footprints have grown dramatically.

CONVERGED INFRASTRUCTURE: PROGRESS COMES AT A COST

Converged infrastructure (CI) then moved to the fore in pursuit of offering greater stability by tightly limiting your options (although largely using the same components and products), especially when looking at Day 1 or Day 2. For Day 1, CI was often based on a "Logical Configuration Survey" (LCS) that required all configuration to be planned out far in advance.

For Day 2, customers had to keep up with Release Compatibility Matrixes that both enable and require you to update your whole stack in lockstep. Sometimes you're required to keep all versions in sync. That means you don't have a choice—even if you would prefer to wait for the vendor to certify new versions. That should make it easier to upgrade, but sometimes upgrades don't work out as planned. Again, a step forward, but still not easy.

HCI: TRADE-OFFS CONTINUE

Over time the rigidity, cost, and scaling challenges of CI led to the rise of hyperconverged infrastructure (HCI). With HCI you turn the storage, compute, and virtualization layers into software on individual servers. These are tightly coupled, so each scales in lockstep with the other, offering what is called "linear scalability." Initial installation and management is often dramatically simplified with HCI, too. Interestingly, this trend started with hyperscaler consumer technology companies and, over time, moved into the enterprise space.

While HCI offers benefits (as do all architectures to some degree), it also comes with trade-offs. With HCI you've lost the ability to independently scale each of these components to meet your specific needs. In some cases HCI may be somewhat more flexible, but that tight coupling of components can still limit your flexibility. And, often the benefits of initial easy implementation can be overshadowed by increased silos at scale.

Some hyperscalers have moved away from HCI's "tightly coupled" architectures to disaggregated racks of compute and storage. While in some ways HCI has been a step forward, it also highlights a core problem for datacenters: The lifecycle of computing is usually not the same as the lifecycle of storage.

COMPARING THE BENEFITS AND TRADE-OFFS

Reference architectures for a hybrid cloud strategy are recognized for scalability and flexibility. These benefits can come at the cost of complexity and, often, more IT time wasted or greater reliance on outside support. There are also a lot of good reasons to go with CI. We hear from most customers that CI means VCE, vBlock, or possibly Oracle Exadata to them.

But, while faster to deploy and easier to maintain than legacy solutions and recognized for performance and resilience, CI severely limits your options. And, in reality, CI hasn't proven to be easier to maintain than other options, and can even create more rigid silos. Finally, there's the simplicity and low initial entry cost of HCI. Collapsing the entire datacenter stack into software is a great idea. But HCI's tightly coupled design center also involves architectural trade-offs, including requiring many ports while still potentially creating silos.

Simplicity is what IT people are after, so how do you get there? Enter FlashStack, the solution for simplifying every day in the lifecycle of your datacenter—Day 0, Day 1, and Day 2—so you can focus on the applications your business needs with the confidence that your datacenter stack won't get in your way.

SIMPLICITY WITHOUT TRADEOFFS

FlashStack stands out from traditional CI because it was designed from the start to avoid CI's typical tradeoffs.

When we designed FlashStack our starting point was taking a deep, analytical look at our customers' infrastructure stacks and listening to their challenges. There wasn't a shortage of them. From architecture to deployment to operation—Day 0/1/2—complexity was often overwhelming IT.

Delivering simplicity—without sacrificing performance and scalability over the entire infrastructure lifespan—became our primary objective.

So let's break down where FlashStack makes a difference. When your business asks IT to deploy several new applications you'll want to know the easiest way to get that done, not just in terms of development (architecture)—Day 0—but also from a Day 1 (deployment), and Day 2 (operation and optimization) perspective? For FlashStack, Pure looked at the datacenter from our customers' perspective, too. What matters to you? What are your requirements?

We boiled it all down to three simple (but highly critical) areas: Make storage a snap; maximize the potential for consolidation; and build with complementary and proven products that share a stateless architecture.

DELIVERING ON THE PROMISE OF HYBRID CLOUD REFERENCE ARCHITECTURES, CI, AND HCI

The Three Key Ingredients to the Ultimate Application Stack for Your Infrastructure

In some ways FlashStack started with Cisco and Pure customers recognizing the "force multiplier" impact of two products centered around stateless architecture—Cisco UCS and Pure Storage. Amazingly, this customer trend started several years before FlashStack was trademarked.

As we listened to our customers, we began to rethink datacenter architecture entirely. Given the force multiplier of simplified, stateless architectures, what immediate benefits could we provide customers? And what unique capabilities could we build on top of that simplified, stateless foundation?

The results of that process—FlashStack—give you everything you need to succeed, without any tradeoffs. Because IT is usually tasked with architecting for a future three to five years out, you typically add, say, 20 percent overhead so you're covered 'just in case.' What if you could only buy and consume only what you need right now?

FlashStack makes that possible because it lets you start with what you need now and scale with ease as your needs evolve. We've also dramatically simplified FlashStack's components by making them stateless from the start—servers, storage, and the underlying hardware platforms. And each component is best-of-breed in its respective component layer.

Cisco Unified Computing System (UCS)

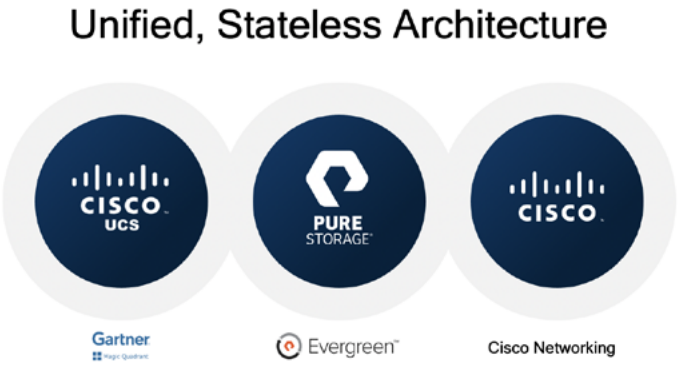
Cisco UCS became the first architecture to make servers stateless by abstracting their identity into a service profile. Cisco UCS entered a mature market and turned it upside down, quickly seizing the lead in blade server market share thanks to its flexibility.

Pure Storage

Pure Storage® recognized flash as the catalyst for disrupting the storage market by focusing on performance and simplicity as a long-term, high-value differentiator. Pure's radical *Evergreen™* storage approach has eliminated the need for forklift upgrades across multiple product families, and all upgrades can be implemented non-disruptively. In fact, Gartner named *Pure as a leader in their Magic Quadrant for Primary Storage*. Gartner also placed Pure the furthest to the right on the completeness of vision axis. That means you and your IT team can count on Pure today and into the future, supporting you every step of the way as evidenced by Pure's industry-leading, certified Net Promoter Score® (NPS®) of 85.

Cisco Networking

Cisco has led the way since the infancy of the network market. Designed to improve both productivity and the customer experience, Cisco network switches provide application visibility and control and intelligent traffic management to help prioritize critical traffic.



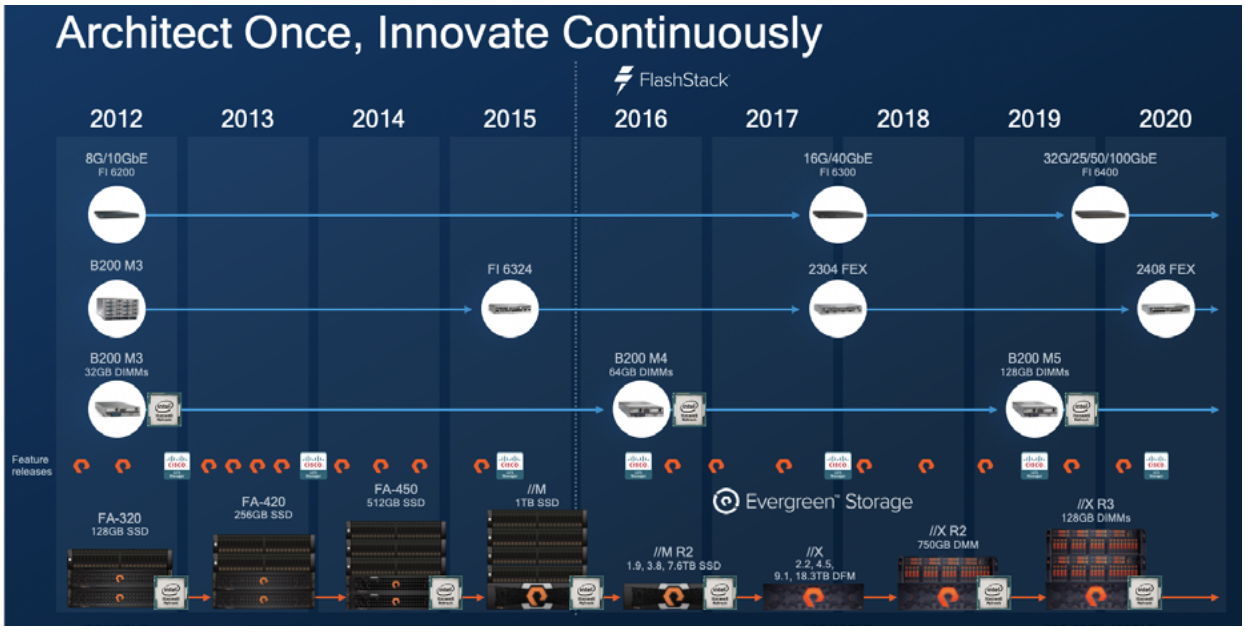
STATELESSNESS DRIVES SIMPLICITY

FlashStack's components make it possible to replace and even upgrade every component through multiple refresh cycles—without taking downtime. Some competitors may make this claim but FlashStack has a proven track record of delivering innovation without rearchitecture. This capability also redefines the concept of "infrastructure lifespan." Instead of having products or stacks that you periodically replace, customers can modernize an entire FlashStack, in place, over many years as shown by the chart below. It all adds up to letting you scale your servers and storage simply, independently, and non-disruptively, while deploying the world's leading, most advanced, and secure networking platform. With FlashStack you've got the foundation you need to create an entire stateless architecture without any tradeoffs. That means you can build a better, flexible reference architecture that can meet and surpass many of the capabilities found in CI and HCI.

IT'S EVERYTHING YOU NEED IN A MODERN, INTEGRATED PLATFORM

While simplicity was our primary goal when creating FlashStack, the resulting platform delivers many other high-impact benefits. That's because simplicity enables flexibility and speed, so you get the application performance you need and the agility to quickly respond to business needs.

Want to learn more? *Read the white paper* "Migrate FlashStack to Cisco UCS 6400 Series Fabric Interconnects and Pure Storage FlashArray//X"



THE 3 FLASHSTACK PILLARS

MORE SIMPLICITY

Deliver Cloudlike Experiences and Economics to Your datacenter

Our description of FlashStack to this point probably covers a lot of what you're looking for in a cloud solution. It should. Because FlashStack makes it possible to deliver cloudlike experiences right in your datacenter. That starts with simplicity.

FlashStack makes adoption easy while maximizing productivity. With FlashStack you can run your entire infrastructure without specialized staff, streamline the number of resources needed to manage interfaces, and free up admins to focus on application and service delivery. That also frees up your engineers to work on business-driven innovations. FlashStack also lets you automate workflows, design end-to-end orchestration, and even manage FlashStack itself as a unified whole. The results? Customers also told IDC that staff time to manage infrastructure is reduced up to 61%! And FlashStack is easy to integrate with cloud platforms from Cisco, VMware, OpenStack, and others, as well as automation tools like Ansible and Powershell, by letting you leverage its API-first philosophy.

MANAGEMENT MADE SIMPLE

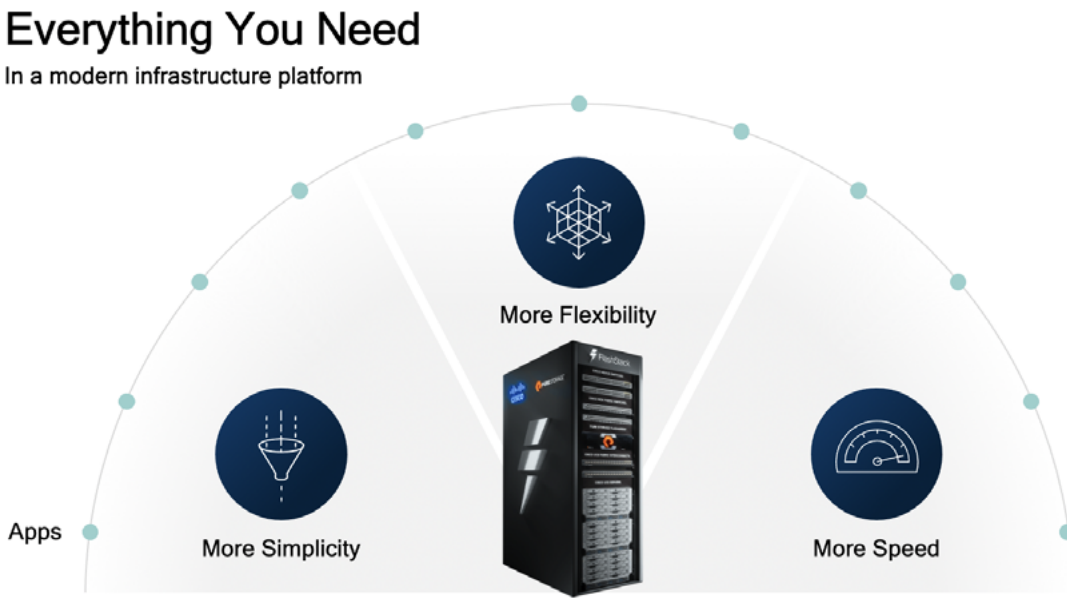
Cisco and Pure collaborated closely to make sure FlashStack's user interface delivered on the platform's promise of simplicity. FlashStack also simplifies lifecycle management by letting you manage everything as software.

THE CISCO ADVANTAGE:

FlashStack can be built using B-Series or C-Series UCS servers. Cisco UCS servers provide FlashStack with industry-leading stateless capabilities and an economical high performance solution.

Cisco's diversified ecosystem makes both deployment, management and maintenance of your environment easy.

Cisco Intersight provides a single management console and enables easy access to data from compute and storage greatly enhancing workload performance.



Cisco Workload Optimization Manager (CWOM) makes resource scaling easy. CWOM analyzes workload consumption continuously and allocates resources in real-time, on premise and in the cloud.

AppDynamics: AppDynamics (AppD) offers application intelligence software that enables enterprises to monitor, analyze and optimize complex environments at scale. AppD is the only APM solution with ABAP code-level SAP visibility and business transaction monitoring.

Cisco Container Platform (CCP) offers container management for a multi-cloud world. Everybody loves using containers. Nobody loves deploying, monitoring, and managing them- especially across multiple public and private clouds. There are simply too many tools and too little standardization. CCP automates the repetitive things and simplifies the complex ones so everyone can just go back to enjoying the benefits of containers.

Cisco Application Centric Infrastructure (ACI) automates deployment, orchestration, and management. ACI allows application requirements to define the network (SDN). This architecture simplifies, optimizes and accelerates the entire application deployment life cycle.

PURE STORAGE SIMPLICITY:
Simplicity is a foundational attribute of Pure Storage's product and support strategy, reducing complexity, administration, and maintenance.

Quick Deployment: Storage and enterprise data services can be installed, configured and delivered in a few steps.

Super-Simplified Infrastructure Maintenance: To simplify ongoing operations, Pure's Evergreen Storage™ subscription model delivers a fundamentally different experience. Customers receive a subscription to innovation that includes all array software, non-disruptive upgrades, controller upgrades, and trade-in opportunities. These, along with *Pure1*® proactive support and workload modeling capabilities, simplify infrastructure planning by eliminating planned downtime windows and budgetary requests to upgrade systems or add on important data services. The September 2019 Gartner Magic Quadrant for Primary Storage names Pure Storage as a Leader.[2]

WIDE RANGE OF SUPPORT OPTIONS
In addition to its unmatched underlying capabilities, FlashStack offers a world-class support model that includes multiple options so you can choose the one that best fits your individual business requirements. These range from truly collaborative support from Cisco, Pure, and VMware (leveraging TSAnet) to single call support for an entire FlashStack whether offered by Cisco or Authorized FlashStack Support Partners.

GET IT AGILITY WITHOUT COMMON CI AND HCI HEADACHES

IT teams are continually challenged when it comes to deploying CI and HCI infrastructures. FlashStack was built to put those headaches to an end, reducing complicated application silos by making it possible for you to architect once and continuously innovate without worrying about headroom or integration. By eliminating silos you can reduce operational overhead and increase efficiency. It's also easy to dynamically provision virtualized and containerized resources—without ever impacting your performance.

Ultimately, FlashStack future-proofs your datacenter so you can architect once and easily scale with non-disruptive upgrades. Plus, FlashStack offers multiple support options, including single-call support, and proactive assistance and analysis.

Getting down to the bottom line, you might ask how much can FlashStack impact your costs? *Customers have found FlashStack delivers an infrastructure that is as much as 46% more cost-effective* thanks to increased productivity and reduced hardware, storage, OPEX, utility, datacenter space, and personnel costs.

MORE FLEXIBILITY

Start Small, Scale Fast, Upgrade Without Disruption

FlashStack's stateless architecture is the foundational feature that gives you so much flexibility. It starts by making it possible for you to never need a forklift upgrade ever again. And when you do upgrade, FlashStack lets you do so non-disruptively, on your own schedule, eliminating downtime, long migrations, and vendor lock-in down the road.

FlashStack stands out as the only infrastructure stack based on all-flash technology, and it's also the only all-flash array on the market that supports online upgrades from 6GB SAS to 12GB SAS to NVMe. FlashStack also lets you perform in-place upgrades on your own schedule. With its stateless servers and storage you never rip and replace. Instead simply swap out physical hardware—without interrupting the VMs running within it so your operations aren't disrupted. That built-in active resilience and with no single point of failure you can count on 99.9999 percent uptime and availability.

Today's data needs are exponentially growing. FlashStack eliminates the frequent rearchitecting and unnecessary cost involved to scale storage, compute and networking. Under provisioning and overbuying infrastructure is a thing of the past with FlashStack. You can easily grow and adapt as your needs change—even maintaining or reducing your rack space footprint as you add storage. You can also move any component into and out of FlashStack, so it's easy to make improvements over time. That means no tradeoffs or compromises in terms of configuration options, and no artificial constraints.

DECLARE YOUR INDEPENDENCE WHEN IT COMES TO SCALE

FlashStack's agility is even more impressive when you factor in its ability to scale compute, servers, and storage independently. That means you can consolidate workloads without the need for more computing power or to buy new arrays. You can even grow different resource pools—CPU cycles, memory, storage capacity, IOPS, and so on—independently of each other, too.

By removing the coupling between these components you're free to make changes only when you need them. So you can scale your server and compute from one to 160 servers, including both blade and rack servers. And you can scale your storage capacity terabytes to petabytes. Making any of these changes to your network is easy—just increase the number and capacity of your FlashStack components and you're there.

APPLICATIONS ARE THE DRIVER, FLASHSTACK IS THE ANSWER

Just about all of your efforts around infrastructure are ultimately about delivering applications. Our world runs on applications, and your users do, too. That's why FlashStack supports all of the major applications, from Oracle to VMware. FlashStack also offers more than two dozen Cisco Validated Designs (CVDs), providing pre-validated, documented, and tested solutions for critical datacenter workloads that encompass thousands of hours of solution engineering. That makes your job much easier. You can even choose configuration options that include the industry's first end-to-end NVMe storage.

FlashStack lets you confidently run almost any analytics workloads or databases, including virtual desktop infrastructure (VDI), machine learning (ML), AI, and open-source software platforms. Because FlashStack supports multiple applications within the same rack you don't have to optimize for a specific application's hardware requirements. And you can orchestrate and integrate using automation at each infrastructure layer. Even FlashStack's updates are automated, so as technology evolves you can be confident your systems are current. That's easy.

FlashStack also features Pure as-a-Service, a pay-as-you-go, 100% OpEx model for consuming block, file, object and cloud storage services from Pure. Scale up or down, you pay only for what you use, all with a simple subscription. For customers launching a new service, expanding into a new geography, or simply looking to align revenues more precisely with costs, Pure as-a-Service offers a great option.

Your Choice of Apps and Cisco Validated Designs

MORE SPEED

Get the Performance You Need and the Capabilities You Demand

You may think about speed in the classic sense—CPUs, clock speeds, latency, and so on. Those numbers matter to every business. And FlashStack delivers on those expectations and then some.

But FlashStack goes further when it comes to speed, because it also accelerates deployment (Day 1) thanks to its inherent simplicity and fully API-driven platforms that facilitate fast integration. FlashStack makes deployment seamless and predictable with our prevalidated SmartConfig tool, developed jointly by Cisco and Pure. FlashStack also lets you use Cisco's application-centric infrastructure (ACI) for policy-driven automation.

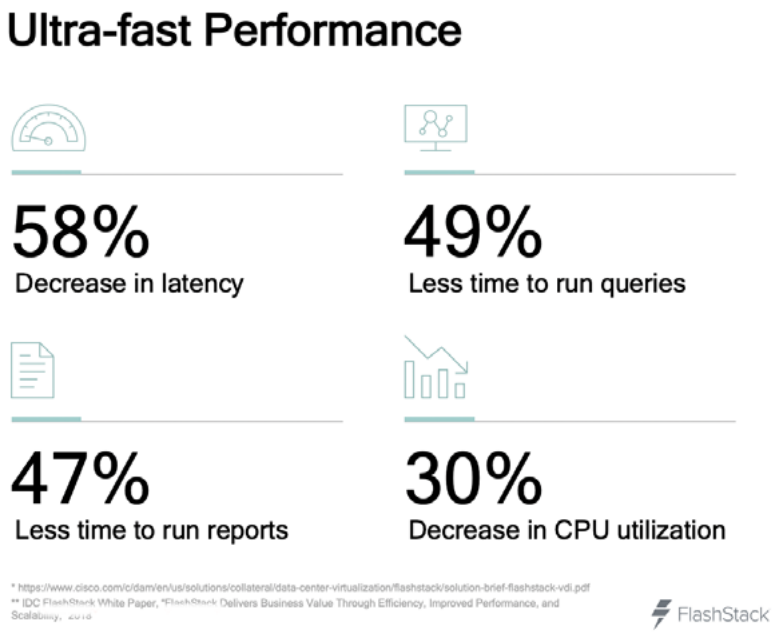
Now, let's get back to speed in the traditional sense because FlashStack is a standout there, too. With FlashStack you can run stand up workloads in hours. As illustrated in the graphic [at right] with FlashStack you can also realize a marked decrease in latency.

We've also highlighted a few other metrics worth noting, like a significant reduction in time to run queries and reports. And FlashStack decreases CPU utilization by reducing your data footprint through compression and deduplication, accelerating end-user application performance.

MOVE FAST, STAY AGILE

We said speed means more than traditional metrics and that includes your ability to respond to new requests and support business objectives. One of the fundamental concepts behind the cloud is the ability to answer the question, 'how quickly can I spin up new workloads or adapt my existing infrastructure to support them?'

Suppose you're looking at a VDI use case and wondering if you should pivot over to run your analytics on it in the future. With FlashStack it's easy to repurpose the platform so you have the flexibility, speed, and agility to get it done. In fact, FlashStack lets you spin up new capabilities to support any application or use case while cutting down lead times for re-provisioning resources. And it doesn't stop there. With FlashStack you can easily repurpose an application as your business needs change, and even evaluate new workload requirements to run advanced "what if" scenarios.



INNOVATE FASTER

FlashStack doesn't lock you into architectural decisions because the platform makes it easy to flexibly respond to technological advances. Equally important, *FlashStack can increase developer productivity by an impressive 25 percent,*[1] so you'll get releases out the door faster without adding staff. That also means faster responses to business needs and increased agility. And, if you do run into trouble, FlashStack offers single solution support with a joint commitment from Cisco and Pure Storage.

FlashStack also solves problems faster with Cisco Intersight, automatically detecting issues and sending them to Cisco's technical assistance center for remediation. That helps your IT team avoid those long nights and weekends while still ensuring you can meet your SLAs.

* IDC FlashStack White Paper, "FlashStack Delivers Business Value Through Efficiency, Improved Performance, and Scalability," 2018

A DAY IN THE LIFE OF FLASHSTACK CUSTOMERS

FlashStack's Benefits on Day 0/1/2

This at-a-glance overview illustrates where FlashStack will make a difference on Day 0, Day 1, and Day 2 in your datacenter.

As you can see, some benefits apply across Day 0/1/2 boundaries. Given that, we'll walk through each benefit individually.

Architect Once, Innovate Continuously

Both Pure Storage and Cisco UCS are built on stateless architectures. That makes it possible to architect once and upgrade any component, without disruption. Sometimes we refer to this as "innovation without rearchitecture"—a truly powerful concept that can give so much time back to IT teams.

Buy Only What You Need

With FlashStack's disaggregated flexibility you can scale compute, network, and storage independently, so expansion is easy.

Ensure Fast, Reliable, and Predictable Deployment

Cisco Validated Designs (CVD) reflect a substantial investment by Cisco and Pure—often hundreds of hours per CVD. These documented, validated, and tested application-centric designs provide detailed configuration guidance and real-world performance testing at scale.

Add Capacity Without Adding Footprint

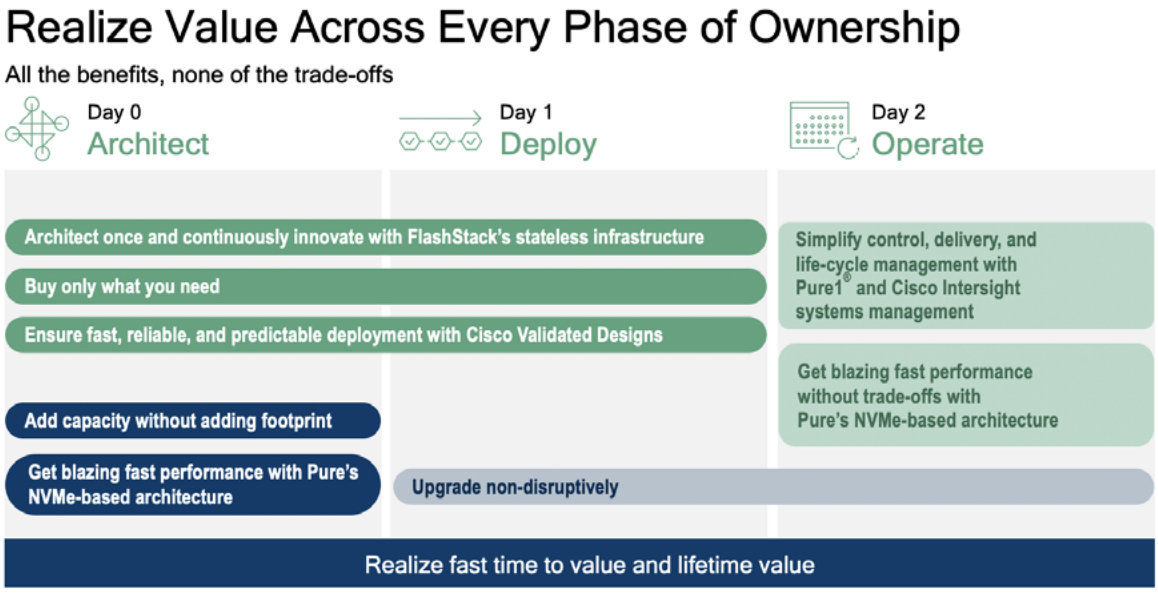
FlashStack lets you buy only the components you need as you grow, while letting you consolidate workloads without buying new arrays.

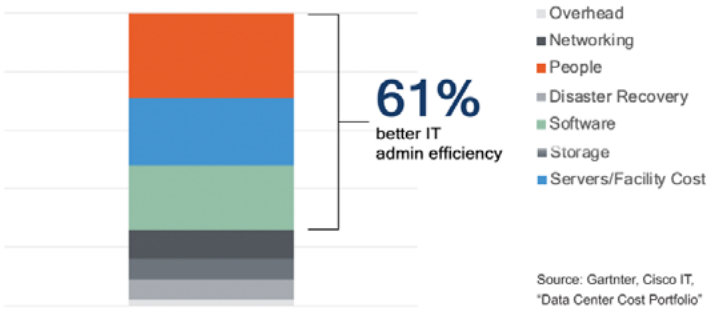
Get Blazing Fast Performance Without Tradeoffs

FlashStack uses Pure's NVMe-based architecture—and offers configuration options that feature the industry's first end-to-end NVMe, including the network and server layers. The results are incredible performance and a future-proof investment.

Upgrade Non-Disruptively

With FlashStack as shown both from this paper by ESG and this joint Cisco + Pure white paper. you never need to rip and replace. You can just swap out physical hardware without interrupting the VMs running within it, so you can perform in-place upgrades on your schedule.





Simplify Control, Delivery, and Lifecycle Management

FlashStack lets you manage everything as software, eliminating manual provisioning and reducing interfaces to a single workflow.

REDUCE EVERY MAJOR IT COST DRIVER

Finally, datacenter costs are going through the roof because so much more data is being generated everywhere. FlashStack cuts costs throughout your IT landscape.

While people are the biggest cost for IT, hardware, facility, and software costs are close behind. FlashStack slashes costs across the board, driving IT admin cost down by as much as 61% and TCO by as much as 33%.*

WHY FLASHSTACK?

Make Storage a Snap

Historically, a lot of the complexity in the infrastructure stack was in the storage layer. FlashStack simplifies storage to the point where IT time spent on day-to-day management is slashed and forklift upgrades are a thing of the past. You can even pay as you grow. So instead of guessing what you'll need three or five years down the road, you can use what you need now, and be confident that when you're ready to scale, it will be dead simple.

Maximize the Potential for Consolidation

Stove pipes and application silos are problematic. FlashStack lets you consolidate non-uniform or disparate workloads with ease, simplifying your infrastructure.

Build With Proven Products

The primary driver for simplifying the datacenter is freeing up IT to focus on innovation. That can be a big investment and is definitely a commitment to the future. So you need products that are continuously focused on innovation, too. FlashStack meets that requirement head on, because it's built from best-of-breed solutions from Cisco and Pure and is continually updated and improved. It's a bold claim but one we can back up based on Pure's innovative technology and high customer satisfaction scores. Cisco re-invented the server market by bringing statelessness to servers - a capability Pure mirrors on the storage side.

ADD IT ALL UP—SIMPLICITY, FLEXIBILITY, SPEED—AND COST—AND FLASHSTACK IS THE BEST CHOICE FOR YOUR MODERN DATACENTER.

*https://www.purestorage.com/content/dam/pdf/en/white-papers/wp-quantifying-value-of-ci-solution.pdf

Pure Storage, Inc. 650 Castro Street, Mountain View, CA 94041

FLASHSTACK@PURESTORAGE.COM

WWW.CISCO.COM/GO/FLASHSTACK