KEYS TO SUCCESS WITH SOFTWARE-DEFINED ON-PREMISES CLOUD INFRASTRUCTURE

PeerPaper Report

BASED ON REAL USER EXPERIENCES OF
THE NETAPP ELEMENT SOFTWARE ON SOLIDFIRE

ABSTRACT

Software-Defined, On-Premises Cloud Infrastructure has great potential in the enterprise. Done right, and properly automated, it can speed up IT operations and contribute to digital transformation. However, many subtle challenges arise in its implementation, especially with complex workloads. Solutions must be scalable, flexible and predictable. In this paper, IT Central Station members offer keys to success with Software-Defined On-Premises Infrastructure based on their experiences with the NetApp Element software on SolidFire platform. Their insights, gleaned from real world IT managers, include suggestions regarding storage architecture, scalability and automation.

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INTRODUCTION

Sustainable competitive success today requires connecting with customers in ways that would have seemed like science fiction or wishful thinking just a few years ago. Intelligent self-service apps and portals offer instant online gratification and sophisticated omnichannel marketing strategies. Similarly, businesses can now also provide their employees with cloud-like applications on-premises.

Realizing such digital transformations requires IT departments to be agile. IT must be able to innovate quickly using techniques like DevOps while also supporting internal and external service level agreements for application response times. Typically, IT wants to run multiple applications on a single platform, delivering high availability while protecting them using segmentation. Not only does such an approach make the business more responsive to customer and employee needs, it also contributes to IT budget reductions.

In this continuing quest for greater agility and better data center economics, IT has begun to switch workloads from traditional infrastructure to automated, Software-Defined Infrastructure (SDI). Also known as "Infrastructure as code," SDI removes many, if not all, of the physical processes required to provision infrastructure for a particular application.

SDI is possible on-premises, in the public cloud or in a hybrid. Organizations that require on-premises infrastructure for reasons of security and Quality of Service (QoS) are now able to create a fully-functioning private cloud environment that runs a software-defined infrastructure. Such a Software-Defined On-Premises Infrastructure can speed up IT operations and facilitate moves toward customer self-service and related competitive capabilities.

That said, there are still a number of challenges that arise in implementation. It requires design and tooling that enable it to be scalable, flexible and predictable. This paper offers insights into achieving success with Software-Defined On-Premises Infrastructure. It is based on user reviews from members of IT Central Station. They offer recommendations based on their experiences with the NetApp SolidFire platform. Their insights include suggestions regarding storage architecture, scalablity and automation.

Keys to success with Software-Defined On-Premises Infrastructure

When an application is ready for deployment in Software-Defined On-Premises Infrastructure, it's possible to arrange for the required compute, storage and network automatically instead of physically standing up hardware and installing software. The code invokes the APIs fronting the software-defined infrastructure resources. Figure 1 offers a simplified reference architecture for Software-Defined On-

Premises Infrastructure.

The process is largely automated. The result is a significant jump in deployment efficiency and agility. From a business perspective, outcomes include faster time-to-market for applications and feature updates as well as more flexible, fast execution cycles for IT initiatives.

IT practitioners can benefit from expert guidance on getting to success with Software-Defined On-Premises Infrastructure. Factors influencing the outcomes of Software-Defined On-Premises Infrastructure
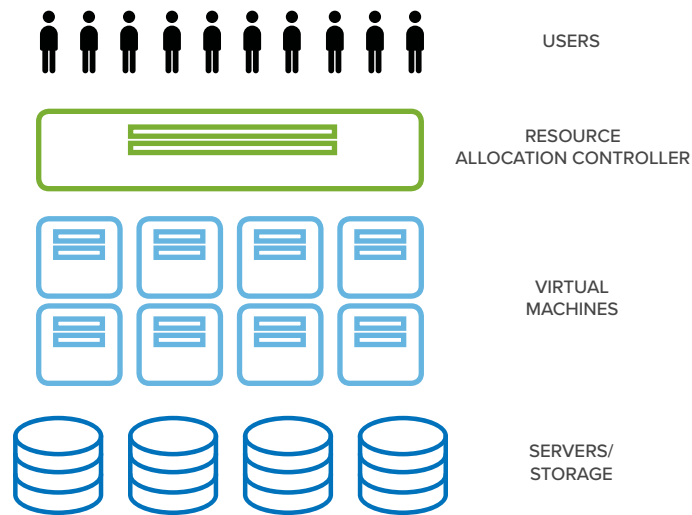
Figure 1 - Simplified reference architecture for infrastructure, where a resource allocation controller determines how pools of virtualized digital resources are provisioned to end users.

include solution architecture, levels of automation and management of storage. Storage deserves particular attention because it affects the viability of the infrastructure overall. Managed the wrong way, storage can be an impediment to flexible, responsive infrastructure.

ARCHITECT FOR SIMPLE, FLEXIBLE CLOUDLIKE INFRASTRUCTURE THAT SCALES

Ideally, infrastructure will be simple. It will scale with relative ease. And, it will be responsive and flexible. These are essential qualities of Software-Defined On-Premises Infrastructure. Architecting them for these outcomes is partly a matter of tool selection. Not all storage solutions, for instance, offer these qualities in the same way. A Senior IT Systems Engineer at a transportation company commented on this topic, saying, "We chose this solution [NetApp SolidFire] because of the flexibility to scale out compared to the competitors."

A Senior Storage Administrator at a tech services company with over 1,000 employees added that he valued the competitive advantage of his solution's potential to scale as well as his ability to implement it quickly. Describing how SolidFire lets him be a hero to his business, he said, "Because we're a service provider, we have customers that need to grow and need their data increased quickly, so it helps us with that. We're also incorporating [Element software with]

SolidFire into being our cloud-providing mechanism, so it allows customers to get in and out of our cloud, as well as move into the main cloud. Given the ease, for the value of the product, it's a great thing to bring in and start going to the cloud with."

Horizontal scale is what matters to an Enterprise Architect at a comms service provider with over 1,000 employees. With Element software on SolidFire, he can "add a node, we add compute, we add storage, and we've had really good luck with that." A Storage Architect at a tech services company with over 1,000 employees also places a premium on the ability to scale. His storage solution for Software-Defined On-Premises Infrastructure is "simple to scale" and is able to "scale up, scale down."

In contrast, he found with other solutions, "There's a ton of pre-planning that has to happen to buy them. And then," he added, "If you didn't plan well, you're going to have a messed up implementation. With the SolidFire, I don't have to think about those things. We can just buy them, scale them as we need on demand, and we don't have to spend so many front end cycles on designing the architecture." This user also noted, "It's the overall simplicity of the platform in that you can learn to operate one of these in half a day. You can stand them up in half a day. Whatever you need to purchase, it has a simple bill of materials. It's great."

A Lead Engineer at a tech services company with over

1,000 employees echoed this sentiment, saying, "With traditional SAN architectures, you have to architect what kind of disk you need and how many of those disks you need in your storage pool and things like that. With the SolidFire [solution], it's really just a number and it's really just a matter of typing in that number for that certain LUN or whatever it is that you want to allocate for your users."

Even the basic act of moving from spinning disks to solid state storage contributes to business advantage from infrastructure. As a Senior Manager of Infrastructure Services at a legal firm with over 1,000 employees explained how SolidFire allowed him to "have a much smaller footprint within our datacenter." As a result, he said, "We've able to reduce overall operating expenses within our datacenter; shrinking costs for our business. It's been a fantastic improvement all round."

AUTOMATE ALL ASPECTS OF STORAGE MANAGEMENT

Speed of provisioning and scaling is one of the main advantages of Software-Defined On-Premises Infrastructure. To this end, automation is a significant enabler. The more automation is available for infrastructure provisioning, management and reporting, the better the infrastructure can serve the business. As it is with architecture, choice of solution affects automation potential. As the Senior Manager of Infrastructure Services at the legal firm pointed out, "I do like their automation, some of the things that they've actually built in with their PowerShell. A lot of that stuff will help us automate our day to day operations. They've been on track with everything that we're looking for and it's just a great solution."

A System Admin praised Element software on SolidFire for its ease of administration. "It's very automated," he said. "If a workload is more demanding, it accommodates increasing workload, without us, as admins, having to go in and do the manual administration. So it seems to be intuitive as to what's taking place within the system and the workloads." He also liked that "SolidFire comes with its own interface and APIs." He shared, "That makes it much more intuitive and a little simpler to use when we're creating volumes, and managing it."

Automation helps drive service level adherence, as a SAN Administrator at a healthcare company with over 1,000 employees found. He said, "We went for QoS-driven design for our new array. It really helped us not only in delivering the service levels to our users, but also automating that. So it makes it a lot easier for provisioning. It also makes it a lot easier to guarantee performance for our end users." An Associate Director, IT at a pharma/biotech company with more than 500 employees praised the ability of his solution's automated data balancing. When he adds a new node, he is pleased that "data is re-balanced across the new nodes automatically." He then added, "Removing/Decommissioning a node is just as easy."

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ABILITY TO ALLOCATE IOPS TO LUNS INDEPENDENT OF CAPACITY AND MAKE CHANGES ON THE FLY

Software-Defined On-Premises Infrastructure works best when it can adapt to changes in load independently of physical capacity. This ability may appear to be innate for software-defined infrastructure, but the underlying solutions that power the infrastructure vary in their resource allocation capabilities. For example, the Associate Director, IT at the pharma/biotech company highlighted the benefit of being able to allocate storage Input/Output Operations Per Second (IOPS) to Logical Unit Numbers (LUNs) separate from capacity. He uses Element software on SolidFire as a backend iSCSI SAN for his Oracle 12c RAC implementation, expressing satisfaction that "we can guarantee IOPS so we know that regardless of what we do in dev/QA, it won't incur a performance penalty for production volumes."
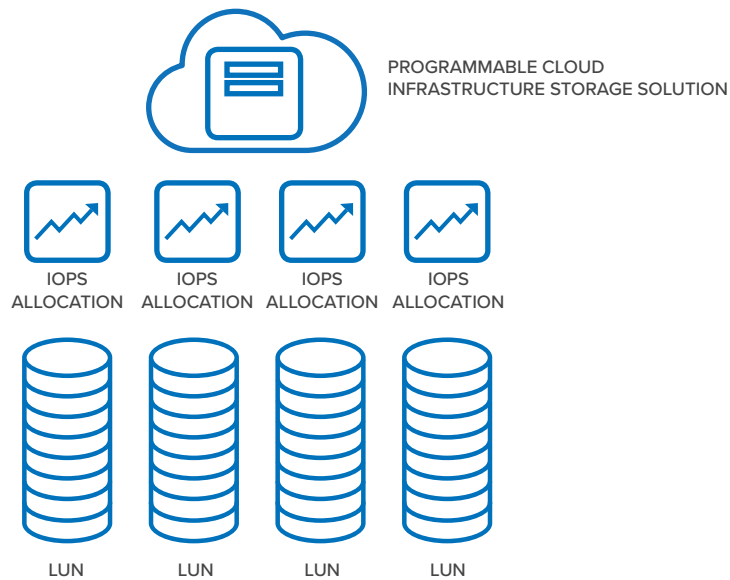

Figure 2 - A Software-Defined On-Premises Infrastructure storage solution should be able to assign IOPs to LUNs dynamically, without the need for reconfiguration.

The Lead Engineer at the tech services company has a solution that is "able to allocate a certain number of IOPS in your throughput to your LUNs. That's something that's a little bit more difficult using traditional methods." This helps him with Virtual Desktop Infrastructure (VDI), which he described as "a perfect use case." He added, "If you have ones that need more performance than others, it's easier to allocate it on a prolonged basis for a VDI environment for your specific virtual desktop users."

Dynamic assignment of IOPs, represented in Figure 2, can translate into savings of physical data center space. An Enterprise Architect at a construction company remarked, "We went from huge NetApp arrays to essentially a half a rack with the same amount of space that was required as far as data drives. With the footprint being smaller, and performance being way up, we're able to increase IOPS, which will give us better capability to actually mimic the production network on a government network." He added, "With our SolidFire, we're going to be doing things like DevOps for ease of use. We're going to be able to expand in a condensed environment with a lot of IOPS to create a very small footprint on an all-flash array using a web interface, which makes it easier for some of the lower technicians to use it."

A Principle Engineer at a tech company with over 1,000 employees uses dynamic allocation of IOPs to handle unpredictable spikes in demand. Such events are common in private cloud environments, where fast-moving initiatives can garner large numbers of users without much warning. He was pleased that SolidFire helped him "accommodate extreme needs, like burst IOPS." The Enterprise Architect at the comms service provider reflected a similar capability, praising Element's software "being able to add a node, add compute, add storage, and being able to restrict IOPs for specific applications and workflows is a really a huge benefit for us."

QUALITY OF SERVICE (QoS)

The IT department is usually responsible for meeting established Service Level Agreements (SLAs). Thus, QoS features become an essential ingredient for a Software-Defined On-Premises Infrastructure solution. As an Architect at a retailer with over 1,000 employees explained, "The most valuable features for us are their QoS, the scalability and the serviceability of the environment. Our ability to add nodes or take nodes out for service and the QoS policies we're able to wrap around volumes are all very helpful."

This user had approximately 8,000 VMs running on a traditional storage system. It was not not able to keep up with the workload, prompting the department to

migrate to the SolidFire solution. Now, with Software-Defined On-Premises Infrastructure, his provisioning times have gone down. In addition, "A lot of the random errors from different things that we've seen across time kind of all went away. It's made everything much more efficient," he said. "We do a lot of tear-downs and rebuilds in non-production environments, so those processes have been reduced to minutes." The change in service levels has "been tremendously beneficial for our development."

Moving into a private cloud is a big step for most organizations. The Enterprise Architect at the comms service provider discussed how SolidFire helps his team address the QoS issues that can arise in this new environment. He shared, "It's a very IOP-driven environment, very IOP intensive, and the SolidFire handles that quite well using the QoS for IOP." Similarly, the Principle Engineer at the tech company mentioned "Our biggest challenge was QoS - not getting guaranteed IOPS at the volume level." Now, with SolidFire, he is able to provide quality of service as promised.

> ## It's a very IOP-driven environment, very IOP intensive, and the SolidFire handles that quite well using the QoS for IOP."

An Infrastructure Engineer at a small tech services company described how Element's QoS capabilities are helping his organization move into the next generation data center. In particular, he liked that SolidFire made him "able to use QoS settings and maintain a standard of performance for the VMs and things that are underlying it." He prefers Element's control "from a node perspective instead of having a controller shelf architecture." As he put it, "One node can control everything, but if the node goes down, obviously the other nodes can bring everything back up." This enables him to "maintain a level performance for our customers on whatever application that they're running at that particular time. For us, a business advantage is implementation time; our first cluster, four hours from un-boxing, racked, stacked and having it up and running."

REDUCE "NOISY NEIGHBORS" IN MULTI-WORKLOAD CONSOLIDATION

As IT departments consolidate workloads in Software-Defined On-Premises Infrastructure, they must contend with the well-known "noisy neighbor" phenomenon. A noisy neighbor is a virtual machine that has a much higher load than those running on the same node. To get the best performance for all applications with Software-Defined On-Premises Infrastructure, it's helpful to work with tools that address the noisy neighbor problem. As the Principle Engineer at the tech company explained, SolidFire gave him to the ability "to provide multi-tenant applications." He said, "We were able to migrate some applications from spinning media to SolidFire, and we were having 'noisy neighbor' problems before."

TAKE ADVANTAGE OF FLEXIBLE, NODE-BASED SCALE-OUT

Data migration and configuration changes can be a drag on flexibility and scaling. Without the right tools, these tasks can even mitigate the benefits of Software-Defined On-Premises Infrastructure. SolidFire offers a solution, as the Senior Manager of Infrastructure Services at the legal firm described. He said, "Scaleout, the ability to just add additional nodes without needing storage vMotion, moving anything on the virtual side around, has been really great to see. We actually just recently went through and added an additional node, we did that seamlessly; no impact to the business, no impact to our users. Our application set just continued to run. All of the LUNS just expand once the new node is added, you really can't ask for anything better."

The Architect at the retailer agreed, adding, "It is very easy to scale. We started with our non-production cluster. I think we started off with six nodes. It's now a 14-node cluster. That's a seamless process. It just worked. No down time, no service disruption, nothing." He added, "There is another unique option. Let's say I grow to 10 nodes, but the LOB [Line of Business] application changes, and the role is no longer the same. I can break that into 2 x 5-node arrays and redeploy in different roles."

According to the Infrastructure Engineer at the tech services company, "If needed, you can easily remove one node and ship it to another location or attach it to a different cluster, with very little effort. The implementation of the structure is fairly easy, as well. Our first 5-node cluster from the box to serving data (for testing), took about five hours."

STABILITY, DATA REDUCTION, DATA PROTECTION, ETC.

Storage for cloud architecture needs to conform to all standard expectations about enterprise storage. It should be stable, with high uptime and include data reduction and protection features. A Head of Commercial Management Servers at a tech services company praised SolidFire as "absolutely a consistently stable solution." He noted, "We have, currently, up-times of 100% and no data loss at all, not even the slightest. That's one of the major points why we went for flash array storage and not local SSD storage, which is, of course, faster, when you look at the IOPS, but the redundancy is just missing. SolidFire was delivering not only stability, but also a lot of efficiency with the data storage."

He also lauded Element's licensing model, explaining that now, "We can just add new appliances without purchasing new software." Why does this matter? He continued, "That will be very relevant for us in the future, especially since we added new data centers all the time over the last year. We started with one data center in Europe, we added another one and another one, and now we're provisioning it in four data centers all around the globe."

Stability also applies to administration, as the Enterprise Architect at the comms service provider explained. "We've had non-disruptive upgrades, non-disruptive hotfixes, which is really great for the customer - the R&D customer," he said. "They don't like any disruption. Disruption is money to them. So we have been really satisfied."

The Associate Director, IT at the pharma/biotech company spoke highly of SolidFire for data reduction, saying "The compression and de-dupe have been great in terms of space-savings, especially for our prod/stg/qa/dev DB instances (where you gain add'l savings for the de-duped data); the QoS for IOPS helps us to ensure that no non-prod action can be deleterious to our production-stack data." He also expressed appreciation for the solution's failure recovery and data protection features, noting, "We wanted it to be as bulletproof as possible, and yet be able to change/grow with us."

CONCLUSION

IT departments are discovering that Software-Defined On-Premises Infrastructure offers flexibility and a new, faster pace of adaptation to changing business requirements. As members of IT Central Station share, however, true success relies on adopting practices that bring out the best in the technology.

These include an emphasis on scalability and automation. Effective implementation of Software-Defined On-Premises Infrastructure involves a focus on QoS, stability and data reduction as well as data protection and reducing the "noisy neighbor" phenomenon. Experienced managers also look for solutions that enable dynamic allocation of IOPs, a capability that frees them from time-consuming data migrations that can arise even with software-defined infrastructure. The potential of Software-Defined On-Premises Infrastructure is striking. By following the tips and tricks suggested by members of IT Central Station, IT departments can realize the inherent benefits of this approach to infrastructure for themselves.

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