Hardware agnostic Hyper-Convergence Storage for vSphere®

Cutting down SMB and ROBO cost by using less hardware with software defined storage management

StarWind Virtual SAN
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Introduction

This StorageIO Industry Trends Perspective thought leadership white paper looks at addressing the shared storage and business resiliency needs of small medium business (SMB), remote office branch office (ROBO) and service providers using VMware vSphere Hypervisor. The focus is on how software defined storage management solutions unlock the full value of server based storage for VMware server virtualization environments. Hyper-Convergence enables software defined storage

Common Challenges Strain IT Resources
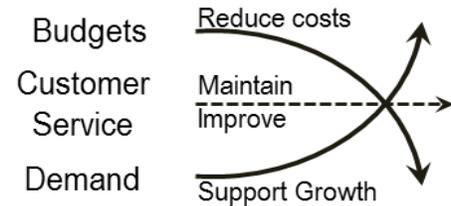
Balancing budgets, service and growth
Result = IT resources and services squeeze

management technology to be deployed with flexibility including in guest virtual machines (VMs) as a virtual storage appliance (VSA). VMware has demonstrated the viability of running storage in a VM as being good enough with their own VSA prior to the release of Virtual SAN in 2014.

Flexibility for deployment of software defined storage management tools is key to unlocking the value of your IT investment. Being able to get more value out of your existing software and hardware investment without introducing complexity and overhead helps to remove or cut costs for SMB and ROBO environments. Exercise caution when simply cutting costs to not cut performance, availability or resiliency, capacity or indirectly increase costs elsewhere. StarWind Virtual SAN is an example of a software defined storage management solution that fits the needs of larger and smaller SMB or ROBO environments.

Issues and Challenges

Organizations of all size, from SMB to large enterprise have ROBO have a reliance on information. Another common challenge is economic including budget related requiring new outside of the box thinking boosting your return on innovation (the new ROI) and return on investment (traditional ROI). Key to support various types of business environments and their information technology (IT) / ITC applications are cost effective, flexible and resilient data infrastructures that support VM centric solutions including those for VMware based environments.

Addressing VMware VSA Void

With introduction of hypervisor based Virtual SAN (VSAN) in 2014 (public beta 2013) supporting scaling of three or more hosts [1] VMware also discontinued their Virtual Storage Appliance [2] (VSA). While VMware VSAN supports scaling up and scaling-out (currently up to eight VMware hosts), the removal of VSA has created a void for smaller SMB and ROBO environments. This void is for environments with only two VMware host servers that need software defined storage. What this means those smaller environments need to step up and spend more of their budgets on hardware and software licensing costs, or seek out alternative software defined storage management solutions.

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[1] VMware host refers to a physical machine (PM) server with vSphere hypervisor installed. In addition, VMware hosts may also be referred to as nodes when two or more are configured into a cluster.

[2] VMware discontinued in 2014 their previsly available Virtual Storage Appliance product solution that enabled software defined storage management functionality residing in a guest VM.

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Many challenges are common across SMB and enterprise ROBO environments along with service providers (Cloud, Internet, and Managed). For example, there is the need to move, process, protect, preserve and serve more information for longer time while enabling robust customer responsive services in a cost effective way. In addition to growth, there is also the increased dependence upon information systems (e.g. computer servers, storage, networks, applications and data) being available or resilient.

The above and other results in challenges including:

- Economics   Flat or declining budgets means doing more with what is available
- Service   Enhance customer experience including making systems resilient
- Growth   Increasing data and IT demands that have to be available when needed
- Staffing   Limited number of people and skills
- Flexibility Different environments have various needs vs. one size fits all solutions
- Technology   Remove complexity while leveraging software and virtualization
- Stability   Introduction of technology should not be disruptive to core business functions
- Durability   Protecting and preserving IT and business information cost effectively
- Resiliency   Enabling the business to be tolerant and survive various threats and disasters
- Scaling   Scale-up, scale-out and scale-down to support SMB and ROBO with stability

ROBOs as scale-out SMBs?

SMB and ROBO environments have many common characteristics. These include being smaller than there larger enterprise core data center counterparts. In many ways enterprise ROBO are essentially SMB like environments with limited staffing and small budgets. Likewise, SMB and ROBO both have the need for resiliency including ability to replicate data to another location.

However, a difference between a typical SMB is that there can be many more ROBO in an enterprise environment. With enterprise ROBO costs increase, or savings decrease scale with the number of sites vs. a single SMB. This means that the costs seen by a SMB can be multiplied times the number of enterprise ROBO sites. On the other hand, removing complexity and overhead from ROBO cuts costs per site multiplied times the number of sites.

VMware vSphere storage challenges

No one solution fits all needs or environments. Smaller environments typically do not have economies of scale to spread costs across many systems. In smaller SMB and enterprise ROBO environments there are not as many systems resulting in a higher cost overhead to share across fewer systems. SMB and ROBO environments also may not have the specialty skills trained staff that are typically found in larger enterprise data center environments. ROBOs also have the need to replicate data for resiliency to a core data center location. For cloud and service provider environments the cost crunch comes from removing complexity and cost to keep service offerings price competitive while meeting performance and service objectives. Hyper-convergence should not cause hyper-complexity, hyper-compromise or hyper-costs for SMB and enterprise ROBO environments.

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That was then; the resilient SMB and ROBO today

Historically tools, techniques, and approaches for enabling business resiliency have been focused upon, or in some cases only applicable and affordable by large enterprise environments. Another consideration is that in the past SMB and ROBO environments tended to have smaller information needs and in some cases, a lower reliance on systems and applications being accessible. That was yesterday and today the situation is much different.

Resiliency means enabling information systems to be tolerant and revisit various threat risks. This can be as simple as protecting against loss of electrical power, a server or storage system crashing to loss of access to your physical facilities or the contents located within it. Part of being resilient also means the ability to isolate and contain faults such as server, storage, network hardware or related software failures. This can be accomplished using servers, and software configured for replication and failover.

Keep in mind the role of computers and their applications (e.g. data infrastructure) is to protect, preserve and serve information when and where needed. A smaller environment might only need one physical server to handle their entire work particular after virtualizing, however what if that one server fails? If that one physical server fails that in turn is supporting several virtual machines (VMs) or Windows and *nix[3] guests, all of those would be impacted as would the workers who depend on them.

In a larger organization, the loss of one physical server may not be noticed as much as there could be a standby or backup server ready to handle the work. There could also be more servers where the work is spread out across to minimize the impact. Larger organizations while being budget constrained, also have economies of scale. This means an enterprise might tolerate the crash of a single server with less impact than if a SMB or ROBOs only server were to fail. Of course that also assumes that there is a dependence on a single SMB or ROBO server being accessible, as well as that single large environment server is not a single point of failure (SPOF).

Enabling Resilient SMB and ROBO

With new tools, technology solutions and options SMB and enterprise ROBO environments can implement a resilient infrastructure without busting your budget or compromising on functionality.

A key point is to know and understand your applicable threat risks then align the appropriate technology to those needs. This also means knowing what technology solution options exist along with how to use them in new and different ways without adding complexity that results in extra costs.

What needs to be done?
- ✓ Protect against various threat risks
- ✓ Isolate and contain faults
- ✓ Local data protection (backup)
- ✓ Shared storage with replication
- ✓ Server and storage failover
- ✓ Optional off-site failover
- ✓ Leverage existing hardware
- ✓ Utilize automation software
- ✓ Scaling-up and scaling-out
- ✓ Scaling with stability
- ✓ Scaling down without compromise

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[3] *nix = Unix and Linux

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VMware vSphere software defined storage options

As the industry server virtualization market leading in terms of revenue installed hypervisors and associated management tools, VMware has different options for various environments. This includes both free basic functionality vSphere hypervisors along with for fee or commercial versions and solution bundles.

What is the best software defined storage option for VMware environments?

The answer should be it depends, as not everything is the same for all environments!

This means the best storage option should depend on what your specific requirements are. For example, what size is your environment, types of applications, number of remote sites, performance, availability, capacity and budgets, staff skillsets and applications among other criteria.

SMB and ROBO VMware software defined storage gap

When VMware discontinued their Virtual Storage Appliance (VSA) when they released hypervisor based VSAN a void was created. This void is a gap for smaller SMB and enterprise ROBO environments that only have or need two VMware hosts. The gap is a result of software defined storage management VSAN needing at least three VMware hosts for resiliency. The good news is that there are third-party software defined storage management tools for filling this void and closing the gap.

What is good for one environment and usage may not be the best for another. One size solutions or different architectures do not fit all needs. Some solutions are designed for larger enterprise, others for large or mid-size SMBs while others are for small SMBs and SOHOs or ROBOs environments.

Some solutions are bundled or hyper-converged with hardware, software, virtualization and management tools optimized for specific environments such as VMware or Microsoft Hyper-V while others are more general purpose. There are also solutions that are delivered as software which can be installed onto your own choice of server and storage hardware (e.g. tin wrapped software), or install into a guest VM as a VSA (e.g. virtual wrapped software). In addition to options in how the software that defines the storage management is delivered or packaged, other differences include architectures for scaling up, scaling-out or even scaling-down (e.g. to support smaller environments).

Keep in mind that scaling with stability means being able to add Performance, Availability and Capacity in an efficient, effective and economical way with as little overhead as possible. Overhead is the result of having extra hardware and software to support a given architecture for availability including resiliency (failover, fault tolerance, fault isolation) along with durability (how many copies and versions, replication and RAID).

Since everything is the not same for all environments, trying to use a one-size fits all approach can add complexity and overhead. The result of increased complexity and overhead is higher costs for SMB and ROBO environments. As an example, a ROBO or SMB environment using a solution designed for scaling-up to support the needs of small medium enterprise (SME) or larger enterprise can carry overhead when used for small deployments.

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With solutions designed for larger environments, extra hardware is absorbed and used as part of scaling up, however for smaller environments the scale-down results in overhead. Of course, the same can hold true in that solutions designed and optimized for the SMB and ROBO can be used to scale-up, however, there can also be limits on how effectively and economically this can be done.

To support sharing of direct attached storage (DAS), a solution should be hardware agnostic while removing complexity and support scale-up, scale-out and scale-down. Other software defined storage management considerations for VMware environments include:

- Ability to replicate locally over Ethernet and remotely via wide area networks (WAN) for resiliency
- High-end solutions using Fibre Channel (FC) have higher costs including Capex[4] and recurring Opex
- Freedom and flexibility to choose your server, storage and networking hardware vs. proprietary technology
- Remove complexity and spend less time managing your data infrastructure (servers and storage)
- Maximize investment in your existing servers, storage, network and software tools
- Sharing of storage among VMware vSphere hosts as well as among other systems
- Enable resiliency for SMBs without busting the budget or compromise on functionality
- Budget friendly if not being a free solution with service and support capabilities

An ideal candidate solution should provide simplicity in terms of deployment, ease of use, coexistence and leveraging your existing data infrastructure networks, hardware, and software tools.

Additional considerations items for VMware software defined storage management include:

- Spend less time being a systems integrator, more time supporting your business
- Leverage existing skillsets and people experience to reduce complexity and costs
- Remove complexity and unnecessary overhead while enabling resiliency
- Scale with stability across performance, availability / durability, capacity, economics
- Leverage what you have without having to buy more than what is needed
- Flexibility to choose hardware and redeploy based on your organization needs
- Small footprint in terms of hardware, software, networks and associated complexity
- Keep in mind complexity and large footprints contribute to higher Capex and Opex costs

Scaling with Stability

Scaling means supporting more with stability. For example more performance, availability, capacity and functionality. Stability means that as resources or functionality are added, there is no compromise. This also means other scaling items are not impacted and there is no increase in management complexity. For example adding storage space capacity should not result in more management complexity, overhead or loss of performance. Scaling also means:
Up – Using larger faster servers
Out – Using additional servers
Down – Using smaller / fewer servers

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[4] Capex = Capital expenses for purchases including hardware, Opex = Operating expenses for staff and other recurring costs including software maintenance, electrical power or other facilities and service subscriptions.

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StarWind Virtual SAN storage complementing VMware vSphere

StarWind Virtual SAN is an example of a solution for VMware vSphere that is hardware agnostic providing software defined storage management. In addition to complimenting Microsoft Windows and VMware vSphere, StarWind Virtual SAN also cuts complexity and reduces cost. Cost savings are the result of having a lower hardware footprint overhead vs. some other solutions. An example of how StarWind Virtual SAN uses less hardware is that it is able to provide high-availability (HA), Business Continuance (BC) and resiliency capabilities with two physical servers. Using just two physical servers (e.g. VMware hosts) StarWind Virtual SAN enables replication without requiring additional local servers. This results in lower Capex and Opex costs.

StarWind Virtual SAN can scale-up, scale-out, as well as scale-down to meet the needs of smaller SMB and ROBO environments. For example, StarWind Virtual SAN can enable resiliency including replication with as few as two physical machine (PM) servers also known as VMware hosts without introducing extra costs, complexity or overhead for SMB and enterprise ROBO environments. This differs from other solutions that require three, four or more physical servers and their associated I/O networking and storage hardware. In addition to being able to do more with less hardware, StarWind is also flexible to scale beyond the limits of some single or dual physical server node solution architectures. For example, the StarWind flexibility supports scaling down as well as scaling up and across multiple sites adapting to your environment needs.

Figure-1 shows an example of a VMware dual-host environment configured for HA and BC using commodity hardware (servers, SATA storage, and GbE or 10 GbE networks). Note that while industry standard GbE and 10GbE LAN switches can be used, StarWind also supports point to point direct connect cable configurations. The StarWind Virtual SAN configuration shown uses less-hardware while providing shared storage and business resiliency for VMware vSphere environments.
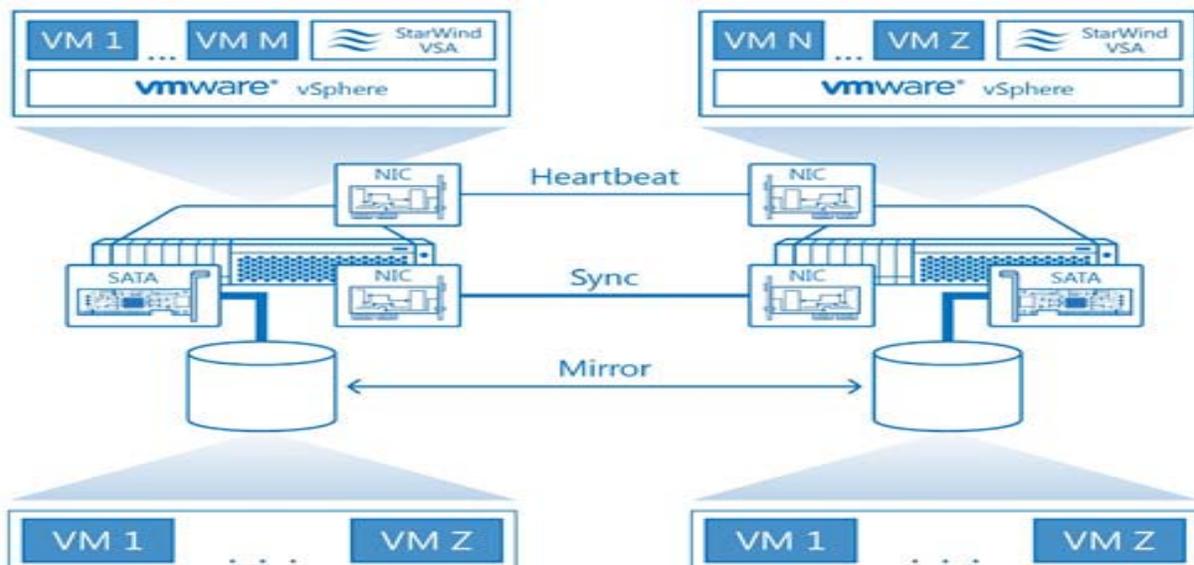

Figure –1 StarWind VSA for vSphere (Image via StarWind Software)

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In figure-1, StarWind Virtual SAN is shown leveraging commodity servers and SATA DAS storage in a hyper-converged environment (server, storage and software). The StarWind Virtual SAN software defined storage management technology installs into a guest VM functioning as a VSA. StarWind Virtual SAN enables local DAS storage to be shared across VMware hosts as well as with other non-VMware based systems. This functionality provided by StarWind fills the functionality gap for ROBO and SMB previously provided by the VMware VSA that resided in a guest VM.

For HA, BC and DR, StarWind Virtual SAN has the ability to run on as few as two VMware hosts (e.g. physical servers with vSphere hypervisor). This differs for resiliency compared to some other solutions that require three or more VMware hosts, or physical bare-metal servers. In addition, StarWind Virtual SAN also eliminates the need for additional cluster quorum or voting servers and storage resulting in less hardware overhead (e.g. lower costs). As mentioned previously, StarWind can use industry standard commodity switches along with point-to-point cable connections for connectivity between VMware hosts. This helps to reduce costs associated with higher-cost SAN switches and HBAs associated with solutions designed for larger enterprise environments. In addition to lower upfront Capex and recurring Opex costs, being hardware agnostic and a software defined storage management solution enables more flexibility to reconfigure, redeploy as needed to meet changing business needs.

Not everything is the same across different SMB and ROBO environments, which means that there needs to be alternatives to one-size fits all solution approaches. Table-1 summarizes how StarWind Virtual SAN compliments different VMware vSphere versions. This flexibility of different versions enables environments to align the applicable solution to meets their business requirement needs.

	StarWind VSA (Free version)	**StarWind VSA (Paid version)**
VMware vSphere (Free version)	V[5]=VM guest OS / application HA S=Storage HA with two VMware hosts S=Virtual Storage tech support = basic V=Hypervisor tech support = basic	V=VM guest OS / application HA S=Storage HA with two VMware hosts S=Unlimited number scale-out HA hosts S=Local and remote DR replication S=Virtual Storage tech support = 24x7 V=Hypervisor tech support = basic

VMware vSphere Paid version	V=Commercial vSphere features
	   (HA, FT, DRS, etc.)
	S=Storage HA with two VMware hosts
	S=Virtual Storage tech support = basic
	V=Hypervisor tech support = advanced
		V=Commercial vSphere features
		   (HA, FT, DRS, etc.)
		S=Storage HA with two VMware hosts
		S=Unlimited number scale-out HA hosts
		S=Local and remote DR replication
		S=Virtual Storage tech support = 24x7
		V=Hypervisor tech support = advanced

Table-1 *StarWind* and *VMware* functionality across different versions

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[5] V = VMware vSphere enabled or supported   S = StarWind Virtual VSA enabled or supported

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As a software defined storage management solution, StarWind Virtual SAN compliments VMware vSphere to help unlock the value of existing hardware, software and staff experience investments.

The following shows how StarWind Virtual SAN for VMware vSphere enables hardware agnostic hyper-convergence of servers, storage, and network for SMB and enterprise ROBO environments.

Environment	Benefit and Value Proposition
Small Office (SOHO) Small Medium Business	Resiliency is enabled for data protection including snapshots and storage failover along with storage sharing across VMware hosts (and others). Less-hardware overhead (smaller footprint) to buy and maintain means lower costs (Capex and Opex). SMB and enterprise ROBO environments save costs on a smaller footprint, which has positive impact on budgets with flexibility to reconfigure hardware for longer life (e.g. better ROI and total cost of ownership (TCO). For enterprise ROBO, the number of sites multiples environments cost savings.
ISP MSP Cloud and other Service Providers	Service providers embrace re-provisioning commodity hardware. In addition, many providers have no dedicated or proprietary storage hardware. Having small software defined storage management overhead results in a smaller hardware footprint to support higher VM densities. Using less hardware with the flexibility to reconfigure rapidly for changing business needs is also important. This means using servers with internal SATA storage that can be configured as a converged applications platform, redeployed as a compute or a storage server node.
Larger Enterprise ROBO	Enterprise ROBO is essentially SMB environments multiplied many times. Unlike their larger data center siblings, the ROBO environment may have little to no support for hands-on onsite day-to-day and troubleshooting activities. For resiliency and data protection, enterprise ROBO environments can leverage replication of data to a central or core IT data center. One approach is to try and push down a one size fits all from the largest systems to the smallest site using common hardware, software, virtualization and management tools that can result in increased costs. From an acquisitions Capex and recurring Opex perspective, using less hardware removes complexity and associated costs to stretch budgets further without compromise. The result is that costs for ROBO are amplified with each additional site while savings can also be multiplied.

Tips and Recommendations

Reducing cost involves removing complexity, which means leveraging what you have more effectively from a hardware, software, network and staffing perspective. This also means aligning technologies that work with and complement each other. Following are some general tips and recommendations tied to using StarWind Virtual SAN for VMware vSphere environments.

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Attribute	Benefit and value proposition
Economics	StarWind Virtual SAN for vSphere is also a for free solution. This means similar to using the VMware free hypervisor, you also have access to a free version of StarWind Virtual SAN to enable storage HA, storage sharing, replication and other software defined storage management functions. By requiring only two VMware hosts for storage HA, you cut your hardware overhead and associated costs. By using your existing hardware, you can further reduce your Capex costs stretching budgets further. Staffing costs are also reduced by not requiring any special *nix training or staff skills. This results in cost savings without compromising.
Flexibility	Tailor and tune the solution to fit your needs and requirements vs. having to fit into a one size for all type of solution. Enable storage to be shared across vSphere hosts and their guests, as well as other non-VMware systems.
Growth	Support growth in terms of adding more users, additional applications, increased amounts of data protected, preserved and served for longer periods by using available server and storage resources effectively. Key to supporting growth is solutions that provide scaling with stability, without compromise, or increasing overhead. This means scaling of performance, availability (resiliency, durability, HA, BC, DR), space capacity as well as functionality in a cost effective way.
Hardware agnostic	Use what you have already in your server including SATA disk drives and existing GbE LAN networking technology along with freedom to choose new items.
Resiliency	Local HA along with multi-site for business continuance, disaster recovery and overall business resiliency. Utilize the combination of StarWind replica for VMs and StarWind whole LUN or volume local and remote replication for BC, DR and BR.
Scaling	Scale performance, availability and space capacity as needed. Flexibility to choose what additional hardware to use for increased space capacity or performance to meet specific needs while eliminating requirements of expensive one size fits all storage and networking solutions. Scaling also means supporting scale-up (faster servers and storage), scale-out (adding more servers across locations) and scale-down (ability to support smaller environments without compromise, complexity or increased cost.
Staffing	Leverage available staff or others with experience using familiar software management tools to be more productive faster. Eliminates the need for extra staff or expensive training to learn new unfamiliar technologies or their associated languages.
VM Optimized	Optimized complimenting VMware vSphere environments using common server, storage and networking hardware and software tools. This also means filling a gap for small SMB and ROBO environments created by VMware VSAN optimized for larger environments when they discontinued their VSA.

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Summary

There are various challenges, issues and opportunities for different types of environment from small SMB, enterprise ROBO to service provider among others. There are various storage options for supporting VMware vSphere hypervisor environments. However, some solutions may be stretched or squeezed resulting in compromise in other areas.

Software Defined Storage means many different things to various people, however the focus should be around how software defined storage management unlocks the value in the server, storage and I/O networking hardware along with associated software. By unlocking the value of your Capex and Opex acquisitions, you are able to drive your return on innovation (the other ROI) while enhancing your financial TCO and ROI (return on investment).

Using hardware agnostic software defined storage management solutions such as those from StarWind including the free and commercial version compliments both the VMware vSphere free and commercial offerings. Keep in mind that there is nothing wrong with have additional hardware to scale-up or scale-out if it does not add overhead while enabling your business applications. The important consideration is having the right amount of hardware (and software licenses) to meet your needs without carrying overhead that ends up costing you more for both Opex and Capex.

Learn more at StarWind landing page: www.starwindsoftware.com

About the author

Greg Schulz is Founder and Sr. Analyst of independent IT advisory consultancy firm Server and StorageIO (StorageIO). He has worked in IT at an electrical utility, financial services and transportation firms in roles ranging from business applications development to systems management, architecture, strategy and capacity planning with over three decades of applied experience. Mr. Schulz is author of the Intel Recommended Reading List books "Cloud and Virtual Data Storage Networking" and "The Green and Virtual Data Center" via CRC Press and "Resilient Storage Networks" (Elsevier). He is a five-time VMware vExpert. Learn more at www.storageio.com.