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SAN/iQ 7 PRODUCT OVERVIEW

LeftHand Networks is proud to announce the new version of its flagship storage software platform, SAN/iQ 7. SAN/iQ 7 introduces many new features and enhancements, as well as a new software product, the SAN/iQ Multi-Site HA/DR Solution Pack. The following table summarizes the new software released under the SAN/iQ 7 umbrella of products:

Product	Description
SAN/iQ 7	<p>Base software platform that runs on SAN/iQ enabled enterprise class x86 servers. Designed to work for Mid-tier and Enterprise customers in single data center environments.</p> <p>Included in SAN/iQ 7:</p> <ul style="list-style-type: none"> • SAN/iQ Operating System • SAN/iQ Managed Snapshot • SAN/iQ Storage Clustering and Virtualization • SAN/iQ Remote Copy
SAN/iQ Multi-Site HA/DR Solution Pack	<p>Add-on software that runs on top of SAN/iQ. Designed to work for Mid-tier, Enterprise, and Service Provider customers with multiple data center environments where the customer synchronously replicates the data between the multiple data centers (sites).</p> <p>Included in SAN/iQ Multi-Site HA/DR Solution Pack:</p> <ul style="list-style-type: none"> • Multi-site SAN Synchronous Replication features • Multi-subnet iSCSI Clustering • SAN/iQ Network RAID-ADP (Advanced Data Protection)
SAN/iQ Windows Solution Pack	<p>Add-on software for Windows 2003 servers connected to the SAN. The SAN/iQ Windows Solution Pack has been updated for SAN/iQ 7. Bundled into this solution pack are 32-bit (x86) and 64-bit (x64) version of the following components:</p> <ul style="list-style-type: none"> • DSM for MPIO • VSS Provider • VDS Provider



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Feature	Feature Details	Benefits
Thin Provisioning 2.0	SAN/iQ 7 provides the following enhancements to storage provisioning: <ul style="list-style-type: none"> • Automated Space Management • 2nd-Gen Thin Provisioning • Increase Thin Provisioned volume and snapshot utilization to 97%, or greater • Completely Dynamic Storage Allocation • Just-in-Time storage allocation • Seamless Integration with all SAN/iQ features • Advanced Storage Utilization Reporting 	Administrators only need to decide if they want to fully or thinly provision their volumes. SAN/iQ handles all space management operations automatically from that point on. Volumes can be migrated from fully provisioned to thinly provisioned on the fly, and vice versa. Snapshots are always thinly provisioned.
Proactive Self-Healing SANs	SAN/iQ 7 includes support for the following self-healing capabilities: <ul style="list-style-type: none"> • Self-Healing Network RAID • Self-Optimizing Performance 	Self-Healing Network RAID guarantees that the entire set of data blocks on the storage server is examined for read errors at least once each month. In the event that a read error is found, SAN/iQ recovers the data from a known-good replica of the data (requires Network RAID Level-2 or higher). The Network RAID algorithm has been enhanced to perform stripe defragmentation on an 8MB stripe boundary so that volume performance is optimal as the volume ages and/or fills up with data.
Performance Improvements	As with every SAN/iQ release, SAN/iQ 7 includes performance enhancements. Targeted areas of improvement in SAN/iQ 7 include: <ul style="list-style-type: none"> • Network RAID Large Stripes for Sequential-I/O Performance Improvements • Snapshot Performance Improvements 	Network RAID Large Stripes increase performance of sequential read and write workloads by up to 60%. This option is enabled by default for new volumes. Volumes created with prior SAN/iQ versions can be converted via the Command Line Interface. Snapshot performance has been improved by reducing the latency impact on volumes with snapshots. Also, the time to delete snapshots has been significantly reduced (up to 50%).
Ease-of-Use Improvements	The following items are now setup via the Global Configuration feature: <ul style="list-style-type: none"> • Users and Groups • Time Settings 	The Global Configuration feature provides a single point of administration for the storage administrator when setting up the SAN. SAN Administrative User login ids and passwords are set at a Management Group level. Time zone and Time settings (NTP) are configured at a Management Group level. New storage nodes added to an existing group inherit the group settings for users/groups and time.



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Reliability Enhancements	<p>As with every SAN/iQ release, SAN/iQ 7 includes reliability enhancements. SAN/iQ's already remarkable reliability is further enhanced by the following features:</p> <ul style="list-style-type: none"> • Native Disk Hot Swap support across all support platforms • RAID-6 Support • Mixed RAID types in a cluster • Snapshot Recovery from overlapping faults 	<p>If the storage node is running in RAID 5, RAID 10 or RAID 6, the SAN/iQ software does all the necessary things automatically to initiate data rebuilds when a disk is hot-swapped.</p> <p>On platforms that support RAID 6 (DL320s), SAN/iQ has been enhanced to allow for the configuration of RAID 6 for the disk arrays.</p> <p>SAN/iQ allows nodes of different RAID types to co-exist in the same storage cluster. This capability eases storage node additions and/or RAID migrations for the customer.</p> <p>When utilizing snapshots, even if the SAN suffers an overlapping double-fault, so long as a snapshot can be made online, the customer can recover the data in the snapshot.</p>
iSCSI Target Improvements	<p>SAN/iQ 7 includes the following iSCSI target improvements:</p> <ul style="list-style-type: none"> • Reduced SAN Failover Timings • Multiple iSCSI session support (Native MPIO) 	<p>New applications (boot-from-SAN, virtual servers, etc.) demand that iSCSI session failover occur rapidly in order to not miss any I/O operations. Reducing the SAN/iQ iSCSI target failover timings allows iSCSI session failover to occur before any application timeouts elapse.</p> <p>The SAN/iQ iSCSI target has been enhanced to support multiple iSCSI sessions to the same target. This is commonly required for host operating systems to use MPIO when connecting to the SAN.</p>
Snapshot / Remote Copy Improvements	<p>SAN/iQ 7 further simplifies the management of local and remote snapshots with the following features:</p> <ul style="list-style-type: none"> • Remote Copy Disaster Recovery Wizard • Pause / Resume Snapshot/RIPC schedules 	<p>If the administrator ever needs to perform disaster recovery operations with Remote Copy, the Remote Copy Disaster Recovery Wizard walks them through performing the failover operations to get the volumes online in the disaster recovery site. When the original primary site comes back online, the Wizard can be used to failback to the primary site.</p> <p>The SAN administrator can pause Snapshot and/or Remote Copy schedules temporarily based on their business needs. They can then resume the schedule at a later time.</p>



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<p>SAN Setup / Installation Improvements (out-of-box)</p>	<p>SAN/iQ 7 includes the following improvements for initial setup and/or installation of the SAN:</p> <ul style="list-style-type: none"> • New Quick Start Guide eases out-of-box setup • Initial Network Configuration on KVM (Keyboard/Video/Mouse) ports eliminates serial cable requirement for initial network configuration • No default Userid or Password are specified • New SAN Setup Wizard is the only way a customer can create their SAN eliminating configuration errors • Thin Provisioning 2.0 automates all capacity management tasks associated with new volume and snapshot creation 	<p>SAN/iQ 7 significantly improves the initial setup and installation of the SAN. Typically, the training and education associated with initial setup and configuration of a SAN is significant for a customer. SAN/iQ 7 dramatically reduces the training and education costs associated with implementing the SAN, saving the customer money right from the beginning.</p>
<p>SAN Failover Manager for 2-node High Availability</p>	<p>To facilitate automatic high availability with 2-node management groups and to avoid potential split-brain scenarios, SAN/iQ 7 includes the SAN/iQ Failover Manager to provide quorum tie-breaking in the SAN cluster. This is implemented as a Virtual Machine running on VMware Server so that the customer can implement the Failover Manager without purchasing additional storage hardware.</p>	<p>The customer can implement automated SAN quorum management in 2-node configurations. The Failover Manager provides automatic failover and failback for Quorum in the SAN.</p>



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SAN/iQ MULTI-SITE HA/DR SOLUTION PACK FEATURE SUMMARY

Feature	Feature Details	Benefits
Automatic Data Center (Site) Replication	Storage administrators only need to tell the SAN/iQ Multi-Site HA/DR Solution Pack software in which data centers the storage modules reside and the SAN/iQ Multi-Site HA/DR Solution Pack software will handle mirroring those data centers. The SAN/iQ Multi-Site HA/DR Solution Pack software will also enforce data redundancy and availability policies based on the site relationships setup by the customer.	The customer is able to achieve unparalleled levels of data redundancy without any of the associated management complexity. The SAN/iQ software automatically replicates (mirrors) the data on a volume-by-volume basis between the data centers.
Multiple subnet support	The SAN/iQ Multi-Site HA/DR Solution Pack software supports iSCSI clusters that span up to three subnets (sites). The following rules apply to the subnet/site relationships: <ul style="list-style-type: none"> • A site can only contain a single subnet. • A subnet can span multiple sites. 	Customers can architect their SAN infrastructure in a way that makes sense for their networking environment. All other iSCSI SAN implementations require that iSCSI clusters reside in the same subnet (network). This allows customers with multiple data centers or multiple subnets to easily create iSCSI clusters that exist across those subnets.
Multiple VIP support	Based on the number of subnet and site pairs, the SAN/iQ Multi-Site HA/DR Solution Pack software supports multiple VIPs per cluster. For example, if an iSCSI cluster spans multiple subnets, the cluster will have a VIP per subnet.	If the customer has configured an iSCSI cluster to span multiple subnets, the SAN/iQ Multi-Site HA/DR Solution Pack software understands the network topology and places VIPs (virtual IP addresses) only on storage nodes that can host that VIP based on IP subnet and routing rules.
Geographic/Site-Awareness	The SAN/iQ Multi-Site HA/DR Solution Pack software understands the concept of a site, or data center. Based on this information, the SAN/iQ Multi-Site HA/DR Solution Pack software makes the appropriate configuration and operational decisions to always protect data from complete site failure. This is done automatically.	The customer can map their data center configuration into the SAN/iQ software to completely automate all site dependant data availability and fault tolerance decisions within the software.
Network Topology Awareness	Based on the customer network configuration and storage module site designation, the SAN/iQ Multi-Site HA/DR Solution Pack software integrates into the customer's network topology to provide the best high availability SAN solution. For instance, VIPs configured on an iSCSI cluster that span sites can only be hosted on storage modules that are in the same subnet as said VIP.	The customer can implement the SAN into nearly any network topology configuration to meet their business needs. Because SAN/iQ clusters can span multiple networks, the customer does not have to implement specialized VLANs or subnets as part of their SAN implementation.



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High Performance I/O Path Prefencing	<p>If the iSCSI cluster spans multiple subnets (sites), the I/O path for reads and writes are preferred to the storage modules that are local to the application server that is submitting the I/O operations. The SAN/iQ Multi-Site HA/DR Solution Pack software handles all of this automatically. There is no special configuration needed on the application server to enable this I/O pathing functionality.</p>	<p>Based on site and subnet configurations, application server I/O is preferred to the local copy for that server. Reads are always done against the copy of the data that is in the same data center as the application server. Writes are always done against the local copy and then forwarded by the SAN to the remote copy based on the Network RAID Level (2, 3 or 4).</p>
Network RAID-ADP (Advanced Data Protection)	<p>Based on the customers site configuration, SAN/iQ supports the following Network RAID Levels for Synchronous Replication between sites:</p> <ul style="list-style-type: none"> • Network RAID Level-2 (2 Copies of data) • Network RAID Level-3 (3 Copies of data) • Network RAID Level-4 (4 Copies of data) 	<p>Network RAID-ADP replicates the customer data on a per volume basis. The customer has complete flexibility and control to choose the appropriate Network RAID level for the application server data that is hosted on the volume. The customer can tune the reliability and availability of the system to match their business needs.</p>
Automatic Failover AND Failback	<p>The SAN/iQ Multi-Site HA/DR Solution Pack capabilities include completely automatic failover and failback of the data in the sites. This is done without requiring a complete re-sync of the data when the site and/or site connectivity is restored. Only the incremental changed data has to be re-synced once the offline data center is reconnected to the online data center.</p>	<p>LeftHand Networks' unique volume replication technology presents a single volume to the application server and then the SAN/iQ Multi-Site HA/DR Solution Pack software replicates the data between the sites. This enables automatic failover AND failback of the data in the event of a site failure.</p> <p>Competitive SAN solutions typically require manual failover and failback of the data because they use a multi-LUN replication scheme.</p>
Secure Multi-Domain SAN Partitioning	<p>The SAN/iQ Multi-Site HA/DR Solution Pack software enables Enterprises and/or Service Providers to setup a single virtual storage pool (cluster) with multiple departmental / customer sub-pools (sites) to provide segregated network connectivity while being able to leverage a single physical storage pool.</p>	<p>The Enterprise and/or Service Provider can leverage a single storage pool for multiple departments / customers while providing complete network separation of the application server environments.</p>
SAN Failover Manager for 2-site High Availability	<p>To facilitate automatic failover between data centers (sites) and to avoid potential split-brain scenarios, the SAN/iQ Multi-Site HA/DR Solution Pack supports the SAN/iQ Failover Manager to provide quorum tie-breaking in the SAN cluster. This is implemented as a Virtual Machine running on VMware Server so that the customer can implement the Failover Manager without purchasing additional storage hardware.</p>	<p>The customer can implement automated SAN quorum management across sites without needing to implement an additional storage node in the 3rd site. The Failover Manager provides automatic failover and failback for Quorum in the SAN.</p>



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SAN/iQ WINDOWS SOLUTION PACK FEATURE SUMMARY

Feature	Feature Details	Benefits
SAN/iQ Windows Solution Pack 7.0	<p>The solution pack has been updated for SAN/iQ 7, which includes updates to the following components:</p> <ul style="list-style-type: none"> • DSM for MPIO * • VSS Provider * • VDS Provider ** <p>System Requirements: * 32/64-bit Windows 2003 SP1, or higher ** 32/64-bit Windows 2003 R2, or higher</p>	<p>Bundled x86 (32-bit) and x64 (64-bit) versions of the Solution Pack are now available .</p> <p>DSM for MPIO provides automatic path failover for Windows servers while providing superior performance.</p> <p>The Solution Pack has been updated to work with SAN/iQ 7.</p>
DSM for MPIO	<p>SAN/iQ DSM for MPIO is fully aware of all storage modules in the storage cluster. When the Windows server running iSCSI connects to a volume on the LeftHand SAN, an active iSCSI session is established to each and every storage module in the storage cluster.</p> <p>Any of these active sessions can be used to concurrently read and write application data. For example, if the storage cluster is comprised of five storage modules, the LeftHand DSM will establish five active iSCSI data paths for I/O.</p>	<p>The SAN/iQ DSM for MPIO allows a customer to achieve the following:</p> <ul style="list-style-type: none"> • Completely fault-tolerant data paths to their volumes • Superior performance by building an iSCSI session to each storage node in the cluster
VSS Provider	<p>The VSS Provider integrates the SAN/iQ Snapshot capabilities into the Microsoft VSS (Volume Shadow Copy Services) framework to automate snapshot creation on the SAN in a Windows environment.</p> <p>Backup applications can leverage the VSS capability to drive snapshots on the SAN for server-less backup.</p>	<p>The SAN/iQ VSS Provider easily integrates with leading backup software and Windows applications to provide the following customer benefits:</p> <ul style="list-style-type: none"> • Instant backups • Consistent backup images • Server free backups
VDS Provider	<p>The VDS Provider within the Solution Pack for Microsoft Windows allows the customer to provision storage directly from a Windows server. From a single interface (Storage Manager for SANs or DISKRAID) the customer can perform the following tasks:</p> <ul style="list-style-type: none"> • Create Volume(s) • Map volume(s) to server(s) • Login to volume(s) via the iSCSI initiator • Extend the size of a volume 	<p>The VDS Provider offers the following benefits to the customer:</p> <ul style="list-style-type: none"> • Seamless point-and-click storage provisioning to Windows servers • A standard way for provisioning storage with no required knowledge of the SAN • A programmable (scriptable) Command Line Interface (CLI) for volume creation and assignment within the SAN