

Expansion of Fibre Channel SAN Storage for PACS

1. Project Overview

This document defines the technical specifications for the upgrade of the existing PACS Storage infrastructure at Hospital using the DELL EMC ME5224 Storage Array solution.

The scope of work includes the supply, installation, configuration, integration, and testing of the DELL EMC ME5224 storage system to enhance the hospital's current PACS storage environment.

The proposed upgrade will comprise the deployment of a DELL EMC ME5224 storage array configured to provide a minimum of 100TB usable storage capacity, along with the required dual controllers, disk enclosures (if applicable), connectivity components, and associated software licenses necessary for seamless integration into the existing PACS infrastructure.

The upgraded storage solution will deliver increased storage capacity, improved performance for PACS imaging workloads, enhanced data protection, and high availability architecture. The system shall support RAID protection, redundant power supplies, redundant controllers, and scalable expansion capability to accommodate future growth in medical imaging data.

The implementation will ensure seamless integration with the existing PACS system, maintaining compatibility with the hospital's IT environment while providing centralized storage management, resilience, and optimal performance.

1.2. Specification

Fibre Channel SAN Storage Expansion for PACS using Dell PowerVault ME5224	
Base	<ul style="list-style-type: none">- Dell PowerVault ME5224 (100 TB)- Dual Active-Active Controllers- Redundant hot-swappable power supplies- Redundant cooling modules- Rack mount kit included- Front bezel included
Host Connectivity (Controller)	<ul style="list-style-type: none">- The proposed storage solution shall support 32Gb Fibre Channel (FC) host connectivity.- The system shall support up to 8 x 32Gb FC ports per array (auto-negotiate to 16Gb).- The storage array shall include dual-active controllers, each providing independent FC connectivity.- The solution shall support redundant SAN fabric connectivity for high availability.- The system shall support multipath I/O (MPIO) for automatic failover and load balancing.
Storage Node Details: Dell PowerVault ME5224 (100 TB)	
Form Factor	2U Base Array + 2U Expansion Enclosure (Total 4U Rack Space)
Disk Requirements	<ul style="list-style-type: none">- The proposed storage solution shall support 2.5" SAS, NL-SAS, and SSD drives.- The system shall use 12Gb SAS backend connectivity.- The solution shall support hot-swappable drives.

	<ul style="list-style-type: none"> - The configuration shall provide a minimum of 100TB usable capacity after RAID. - The system shall support RAID 6 and ADAPT RAID for disk protection. - The solution shall support future expansion through compatible expansion enclosures.
High Availability	<ul style="list-style-type: none"> - The proposed storage solution shall support dual-active controllers with automatic failover. - The system shall include redundant hot-swappable power supplies and cooling modules. - The solution shall support multipath I/O (MPIO) for redundant host connectivity. - The storage array shall support hot-swappable disk drives. - The system shall support non-disruptive firmware upgrades. - The solution shall support RAID 6 or ADAPT RAID for disk protection.
Scalability Requirements	<ul style="list-style-type: none"> - The proposed storage solution shall support expansion through compatible ME5 expansion enclosures. - The base array shall support additional disk shelves to scale beyond the initial 48-disk configuration. - The solution shall allow online capacity expansion without system downtime. - The system shall support scaling up to the maximum supported drive count of the ME5224 platform. <p>The architecture shall support future capacity growth to accommodate increasing PACS imaging workloads.</p>

Performance & Workload Requirements	<ul style="list-style-type: none"> - The proposed storage solution shall support block-level SAN storage optimized for PACS imaging workloads. - The system shall utilize dual-active controllers to ensure load balancing and high availability. - The storage array shall support 12Gb SAS backend architecture. - The solution shall support SSD, SAS, and NL-SAS drive types, including hybrid configurations. - The system shall support auto-tiering (up to three media-based tiers) for workload optimization. - The storage platform shall support up to 12GB/sec read and 10GB/sec write throughput (as per manufacturer specifications). - The solution shall support scalable expansion to accommodate future workload growth. - The system shall provide real-time performance monitoring (IOPS, latency, throughput).
Management Software	<ul style="list-style-type: none"> - The proposed storage solution shall include an integrated web-based management interface. - The system shall provide centralized management of volumes, RAID, snapshots, and replication. - The solution shall support real-time performance and capacity monitoring. - The system shall integrate with VMware vCenter via plugin. - The solution shall support role-based access control (RBAC) and alert notifications (email/SNMP).

Remote Replication	<ul style="list-style-type: none"> - The proposed storage solution shall support asynchronous remote replication between compatible ME5 series storage arrays. - The system shall support replication over Fibre Channel (FC) or iSCSI connectivity. - The solution shall support volume-level replication for disaster recovery purposes. - The replication feature shall support one-to-many and many-to-one replication relationships. - The system shall allow configurable replication intervals to meet defined Recovery Point Objectives (RPO), subject to network bandwidth and latency. - The proposed solution shall include the required licenses to enable asynchronous replication functionality.
Data Protection	<ul style="list-style-type: none"> - The proposed storage solution shall support RAID 1, RAID 5, RAID 6, RAID 10, and ADAPT RAID protection levels. - The system shall be configured with RAID 6 to provide dual-disk failure tolerance for PACS imaging data. - The solution shall support ADAPT RAID technology to reduce rebuild times and improve resiliency during disk failure events. - The storage array shall support dual-active controller architecture with automatic failover to eliminate single points of failure. - The system shall support re-direct-on-write snapshot technology with up to 1024 snapshots per array. - The solution shall support asynchronous replication over Fibre Channel or iSCSI between compatible ME5 series arrays. - The storage system shall support thin provisioning enabled by default for optimized capacity utilization. - The solution shall support Self-Encrypting Drives (SEDs) with AES-256 Full Disk Encryption. - The system shall support FIPS 140-3 compliant drives for enhanced data security. - The solution shall support internal and external key management (KMIP-compatible) for encryption key control. - The storage platform shall support multipath I/O connectivity for redundant data access paths. - The system shall provide real-time health monitoring and alerting for proactive fault detection.
Firmware Code and Patch Management	<ul style="list-style-type: none"> - The proposed storage solution shall support non-disruptive firmware upgrades (NDU) for controllers without impacting active PACS operations. - The system shall support online firmware updates for controllers and disk enclosures. - The storage array shall support automatic controller failover during firmware upgrade to ensure continuous data availability. - The solution shall provide manufacturer-certified firmware and security patches. - The system shall support secure firmware validation to prevent unauthorized or tampered code installation. - The proposed solution shall include active manufacturer support to ensure access to firmware updates, patches, and security advisories.

3.4. INSTALLATION & PROVISIONING

- The entire system shall be upgraded as per manufacturer's recommendations and instructions.
- Installation and provisioning should be provided by the manufacturer certified engineers.

3.5. WARRANTY & MAINTENANCE

- The bidder should provide 3 years comprehensive 24x7x365 Warranty for all Hardware and Software included in the proposed solution.
- A comprehensive SLA must be provided with the proposal.

3.6. TRAINING

- An on-the-job training should be provided to personnel's responsible in operations & management of the system/appliance. The training should include mainly day to day operation and troubleshooting of the system/appliance.

3.7. EXPERIENCE AND DOCUMENTS REQUIRED

- The supplier must have a minimum of three (3) project experiences in delivering Enterprise SAN / Storage Solutions locally, with letters from clients confirming successful project completion.
- The bidder shall provide a Manufacturer Authorization Letter (MAF) from Dell Technologies confirming that the entire scope of the proposed storage solution is backed and supported by the manufacturer.
- The bidder shall provide a minimum of two (2) certified engineers with relevant Dell Storage implementation certifications.
- The following certifications (or equivalent current versions) shall be attached:
 - o Dell Technologies – Implementation Engineer (Storage) x 2
 - o Dell Storage Deployment Certification x 2
- Technical Proposal should include solution design diagram and specification.

3.8. POST DEPLOYMENT

- Hardware specific deployment guidelines from the manufacturer should be provided.
- Detailed deployment diagrams along with the manufacturer standards should be produced on completion of the project.
- All equipment in the project should be registered in the name of IGMH in the relevant Manufacturer portals.