

“ Comparing EMC, HDS and NetApp storage arrays ”

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| CORE BLOCK | EMC VNX | HDS HUS 100 | HDS HUS VM | NETAPP FAS |
|--|--|--------------------------------------|--|--------------------------------------|
| “Pure” Block Capable | Yes | Yes | Yes | No (Block on NAS) |
| Hardware Acceleration | No | ASIC | ASIC | No |
| Front-end connectivity | FC/iSCSI/FCoE | FC/iSCSI | FC | FC/iSCSI/FCoE |
| Back-end connectivity | SAS 6Gbs | SAS 6Gbs | SAS 6Gbs | SAS 6Gbs |
| Conventional Flash Drives | 100/200 GB SLC 200/400 GB eMLC | 200/400 GB eMLC | 200/400 GB eMLC | 200/400/800/1,600 GB eMLC |
| Extreme Performance Flash | No | 1.6 TB Flash Module Drive (150 only) | 1.6/3.2 TB Flash Module Drive | No |
| RAID levels | 1, 0, 3, 5, 6 and 1/0 | 1, 0, 5, 6 and 1/0 | 1/0, 5 and 6 | 4, DP (Double Parity) |
| Controller LUN Balancing | Manual | Automated | Automated | No |
| Simultaneous LUN access from both controllers | Yes (Classic LUNs only) | Yes | Yes | No |
| Simultaneous LUN IO processing from both controllers | Yes (Classic LUNs only) | No | Yes | No |
| Quality of Service | Set upper limits (up to 32) and goals (up to 2) for I/O classes (group of LUNs) for throughput (IOPS), bandwidth (MB/s) and response time (ms) | No | Set upper limits for throughput (IOPS) and bandwidth (MB/s) per array port/HBA with thresholds that disable the limits when high priority array port/HBA IO is low | Cluster Mode (Limits only) |
| Data Encryption on Disk | Host Based (PowerPath) | Controller Based (150 only) | Controller Based | Self Encrypting Drives (not SSDs) |
| Global hot-spares | Yes | Yes | Yes | No (Per controller) |
| External array virtualisation | No | No | Up to 64 PB (Diskless option available) | V-Series only |
| OS disks | Vault Drives (4 disks per system) | Not required | Not required | Root Volume (3 disks per controller) |

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| CACHE & POOLS | EMC_VNX | HDS_HUS_100 | HDS_HUS_VM | NETAPP_FAS |
|-------------------------------------|--|---------------------------------------|---------------------------------------|--|
| SHARED GLOBAL CACHE | NO | NO | YES | NO |
| ADAPTIVE OR PARTITIONED R/W CACHE | ADAPTIVE | PARTITIONED | PARTITIONED | NO |
| SSD R/W FLASH CACHE | SYSTEM-WIDE (SLC DRIVES ONLY) | NO | NO | PER AGGREGATE |
| SSD FLASH CACHE APPLIES TO | ENTIRE POOLS OR CLASSIC LUNS | N/A | N/A | VOLUMES IN AGGREGATE |
| CONTROLLER READ-ONLY FLASH CACHE | NO | NO | NO | APPLIES TO ALL VOLUMES (3200 & 6200 ONLY) |
| POOLS WITH WIDE STRIPING | YES (SYSTEM-WIDE) | YES (SYSTEM-WIDE) | YES (SYSTEM-WIDE) | YES (PER CONTROLLER) |
| POOL AUTO BALANCING | ON EXPANSION AND 24 HOUR TIERING SCHEDULE | ON EXPANSION, DAILY AND MANUAL | ON EXPANSION, DAILY AND MANUAL | MANUAL |
| POOL SHRINKING (REMOVE RAID GROUPS) | NO | YES | YES | NO |
| THIN PROVISIONING PAGE SIZE | 8 KB | 32 MB | 42 MB | 4 KB |
| THIN PERFORMANCE OVERHEAD | DISK METADATA LOOKUPS REQUIRED (CANNOT HOLD ALL METADATA IN RAM) | NEGLIGIBLE (ALL METADATA HELD IN RAM) | NEGLIGIBLE (ALL METADATA HELD IN RAM) | DISK METADATA LOOKUPS REQUIRED (CANNOT HOLD ALL METADATA IN RAM) |
| THIN LUN SHRINKING | YES (WINDOWS ONLY) | YES | YES | YES (WITH OS SUPPORT) |
| ZERO SPACE RECLAIM | NO | MANUAL | MANUAL | MANUAL |

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|--|--------------|------------------------------------|------------------------------------|--------------|
| THICK POOL LUNS (PRE-ALLOCATED) | YES | YES | YES | YES |
| THICK POOL LUNS (PRE-ZEROED) | NOT REQUIRED | YES (FREE SPACE CAN BE PRE-ZEROED) | YES (FREE SPACE CAN BE PRE-ZEROED) | NOT REQUIRED |
| HIGH PERFORMANCE NON-POOL LUNS | YES | YES | YES | NO |