

Adsystem Private Cloud Solution Overview

An Adsystem Technical White Paper

Adsystem Virtualization Solutions Engineering



Adsystem Inc.

Experience Working for you.

8401 Colesville Road Suite 450
Silver Spring, MD 20910
800.237.9785 Toll Free
301.589.3434 Voice
301.589.9254 Fax
www.adsystech.com

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July 2011



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Introduction

The Adsystem private cloud is a virtualization infrastructure solution that has been designed and validated by Adsystem Engineering. It is delivered racked, cabled, and ready to be integrated into Adsystem's datacenter or the customer's location. The Adsystem private cloud is offered in two configurations: Private Cloud and Private Cloud w/ Advanced Disaster Recovery. The configurations include Dell ITM PowerEdge™ R510 servers running VMware ESX 4, Dell EqualLogic™ PS4000X iSCSI storage, Dell PowerConnect™ 5424 switches, VMware server that manages the solution by hosting VMware vCenter Server and Dell management tools, and Dell management plug-in for VMware vCenter. The two configurations vary in that in Advanced Disaster Recovery mode duplicates the infrastructure and places the copy at a remote data center where the production data, server and network configuration is replicated to meet customer's high availability needs.

Audience

The document provides an overview of the Adsystem private cloud solution. Customers, including CTOs, MIS Directors and IT managers, who have purchased or plan to purchase a private cloud solution can use this document to understand the overview and scope of the solution.

Solution Overview

The solution discussed in this whitepaper is powered by Dell PowerEdge servers, Dell EqualLogic iSCSI storage, Dell PowerConnect networking, and VMware vSphere 4.1. The solution implements Dell and VMware best practices and utilizes the latest Dell developed vSphere integration offerings that provide management enhancements. Dell Management Plug-in for vCenter is included in the solution which provides integration of hardware management with vCenter. EqualLogic SAN HeadQuarters (SAN HQ) is included in the solution for storage array management. The solution also includes the rack, power distribution units (PDU), and uninterruptible power supplies (UPS).

The solution is offered in two configurations: The variations between the two configurations are the number of replicated sites. The second configuration includes AIM and redundant data center location. Figure 1 below provide a high-level overview of the components utilized in each of the configurations.

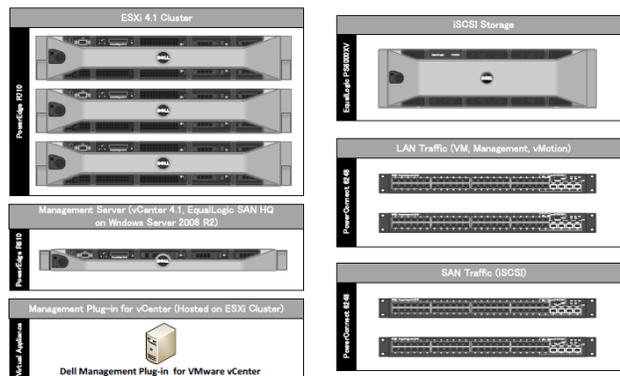


Figure 1: Private Cloud Configuration Overview

Table 1. Component Logical Groups

Component	Description	Role
ESX 4.1 Cluster	PowerEdge R510 servers running VMware ESX 4.1	Host virtual machines (VMs)
iSCSI Storage	EqualLogic PS 4000X with 16 x 600 GB 10K SAS Drives	Provide shared storage for the ESX cluster to host on the VMs
Management Server	Virtual Server hosted on ESX Cluster	Host VMware vCenter Server 4.1 and EqualLogic SAN HQ
LAN Traffic Switches	PowerConnect 5424 switches	Support iSCSI data and
SAN Traffic Switches	PowerConnect 5424 switches	Support iSCSI data and iSCSI management traffic
Dell Management Plug-in for VMware vCenter	Dell virtual appliance hosted on the ESX Cluster	Enables hardware monitoring, inventory, firmware updates, bare metal deployment of hypervisors, and warranty retrieval, all integrated into the vCenter Server user interface

Product Overview

This section provides an overview of the components in the solution.

PowerEdge R510 for ESX 4 Cluster

The Dell PowerEdge R510 uses Intel® 5600 series processors and Intel chipset architecture in a 2U rack mount form factor. These servers provide a graphical and interactive LCD located in the front of the server for system health monitoring, alerting, and control of basic management configuration. An AC power meter and ambient temperature thermometer are built into the server which can be monitored on this display without any software tools. The server features two CPU socket and 18 memory DIMM slots supporting 1, 2, 4, 8 or 16GB DIMMs, to meet the memory demands of a virtualized infrastructure.

Energy-efficient design features include power-supply units sized appropriately for system requirements, innovative system-level design efficiency, policy-driven power and thermal management, and highly efficient standards-based Energy Smart components.

EqualLogic PS4000X for iSCSI Storage

The Dell EqualLogic PS4000X is a virtualized iSCSI SAN that combines intelligence and automation with fault tolerance to provide simplified administration, rapid deployment, enterprise performance and reliability, and seamless scalability. The storage architecture delivers a self-optimizing SAN that is simple to manage and has an all-inclusive software suite to help reduce Total Cost of Ownership (TCO). The PS4000X uses 10,000 RPM Serial Attached SCSI (SAS) disk drives to deliver high performance for databases and online transaction processing applications. With a 16 drive chassis full of 600GB SAS drives, the PS4000X array delivers 9.6 Terabyte (TB) of iSCSI based storage built on fully-redundant, hot-swappable enterprise hardware. Scale out capacity and performance is provided by adding additional arrays. Built-in software functionality includes automated load balancing, snapshots and replication, multi-path I/O, and consistency sets. SAN HQ is also available for Multi-SAN historical performance

monitoring. Advanced data protection features such as Auto Replication and Auto-Snapshot Manager also come standard. The Auto-Snapshot Manager integrates with VMware vCenter and VMware's native snapshot technology to provide intelligent and consistent snapshots. EqualLogic also provides a Multipath Extension Module (MEM) for VMware vSphere to enable multipath I/O for the iSCSI storage. EqualLogic MEM offers:

- Ease of installation and iSCSI configuration in ESXi servers
- Increased bandwidth
- Reduced network latency
- Automatic load balancing across multiple active paths
- Automatic connection management
- Automatic failure detection and failover
- Multiple connections to a single iSCSI target

PowerConnect 5424 for LAN and SAN Traffic

At the heart of the solutions network configuration are two Dell PowerConnect 5424 switches. This managed Layer 2 Gigabit Ethernet switch offers the enterprise-class level of performance required for this configuration. The switches use a stacked configuration that enables connection redundancy and added bandwidth where required. Additionally, its 1Gb uplink enables design and implementation flexibility needed by advanced users.

Dell Hardware Management integrated into vCenter

Dell Management Plug-in for VMware vCenter is included in the solution. This enables customers to:

- Get deep-level detail from Dell servers for inventory, monitoring and alerting— all from within vCenter
- Apply BIOS and Firmware updates to Dell servers from within vCenter
- Automatically perform Dell-recommended vCenter actions based on Dell hardware alerts

AIM Controller

Dell Management Plug-in for VMware vCenter is included in the solution. This enables customers to:

- Get deep-level detail from Dell servers for inventory, monitoring and alerting— all from within vCenter

Solution Capacity and Sizing

The table below provides detailed hardware capacity information for the configuration.

With the solution capacity shown in Table 2, the number of Virtual Machines (VMs) supported by a configuration can be determined according to the CPU, memory, and disk usage requirements for your respective workloads. It's important to note that the nature of the workloads running within the VMs will affect the performance and will ultimately determine the overall number of VMs that can be deployed within the ESX cluster.



Table 2. Capacity and Sizing

Component	Configuration 1
Number of ESX Servers	3
Compute Capacity (total number of processor cores)	36 cores
Memory Capacity	288 GB
Storage Capacity	9.6 Terabyte raw capacity
Number of drives	16 10K SAS drives
Example VM Characteristics	Sample Sizing
Application Server	2 core 2GB RAM 40GB
Domain Server	2 core 2GB RAM 40GB
ICR Server	4 core 4GB RAM 40GB
Report Server	4 core 8GB RAM 40GB
Document Management Server	2 core 2GB RAM 40GB
Test Server	4 core 8GB RAM 200GB
Dbase Server	8 core 16GB RAM 500GB
Replicated Dbase Server	8 core 16GB RAM 500GB
Management Rpt Dbase Server	8 core 16GB RAM 250GB
AdHOC Dbase Server	8 core 8GB RAM 250GB
Custom Rpt Dbase Server	4 core 8GB RAM 250GB

With the available CPU and Memory resources, the Adsystem private cloud configuration is ideally suited for workloads that are CPU and Memory centric, or have a moderate to heavy IO profile. Accordingly, higher VM densities can be achieved with light-IO workloads such as web or application servers.

Additionally, factors such as future planned/unplanned growth of existing VMs, addition of new VMs, extra capacity for high availability or fault tolerance, quality of service (QoS) requirements and service level agreements (SLAs) for your end users and customers, and host or infrastructure maintenance should be considered; and may impact the number of VMs a given configuration can support.

Delivery Model

The solution will be racked, cabled, and delivered to the Adsystem Data Center site, ready for deployment. Adsystem Technical Services will deploy and configure the solution tailored to the business needs of the customer and based on the architecture developed and validated by Adsystem Engineering. The final turn-key virtualization infrastructure solution will be available for customer's use. Figures 2 and 3 below show the two configurations racked in a Dell 42U rack (front side only) with all of the components.

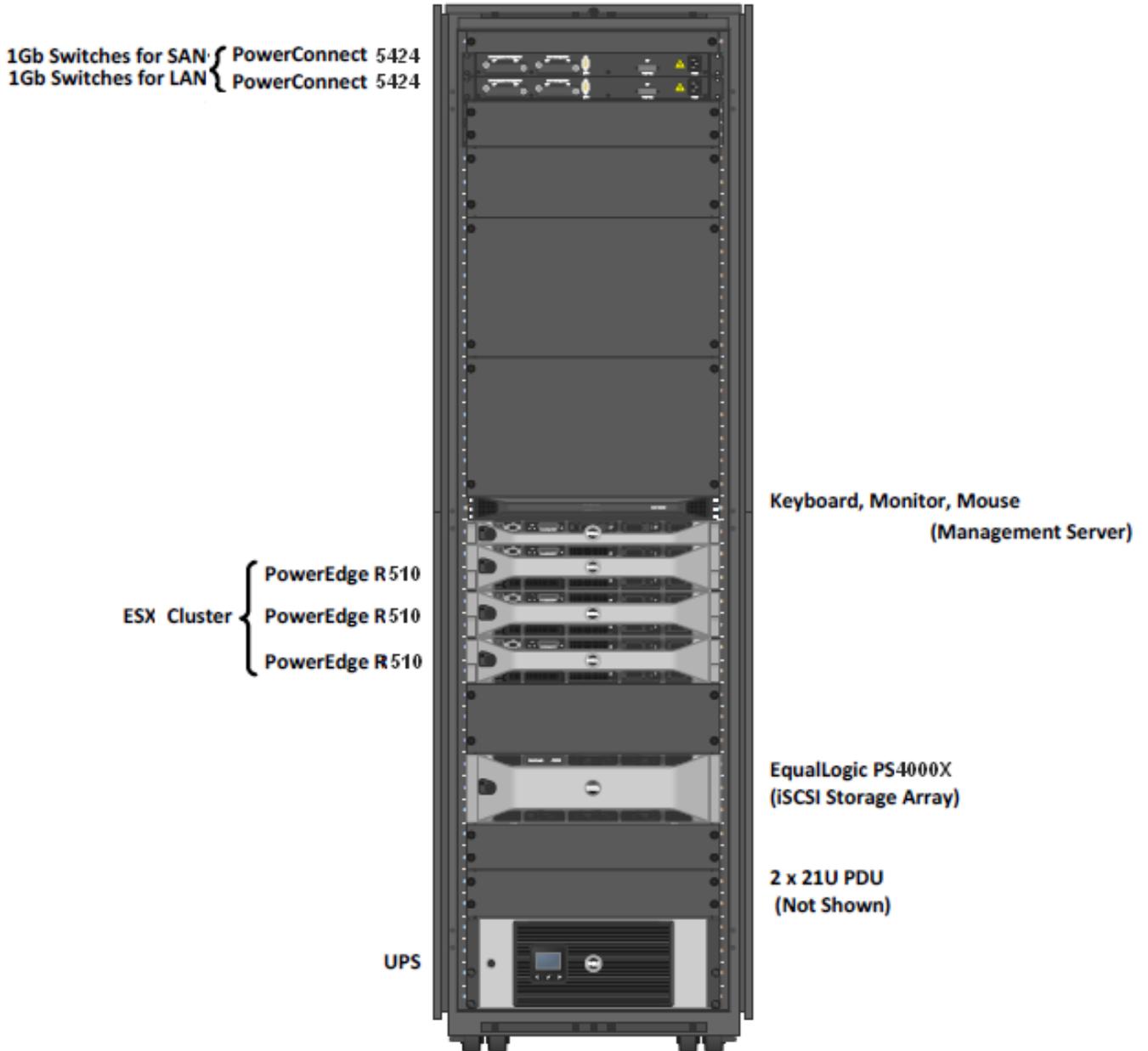


Figure 2: Private Cloud Configuration 1

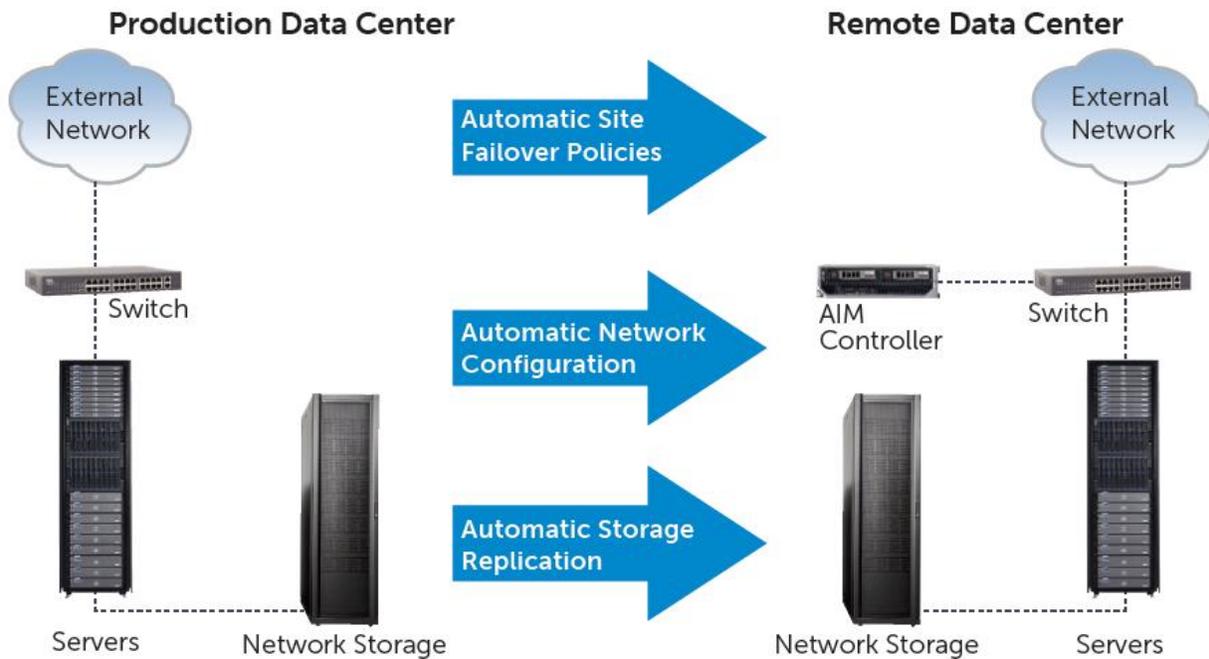


Figure 3: Private Cloud w/ Advanced Disaster Recovery

Design Principles and Solution Capabilities

This section lists the design principles and solution capabilities behind the architecture of the vStart solutions.

No Single Point of Failure

The solution is designed so that there is no single point of failure and redundancy is incorporated into all mission critical components of the solution. Management applications are not architected with this level of redundancy because the mission critical workloads will continue to operate in the event of a management application failure. Network redundancy for the mission critical components is achieved with redundant network interface controllers (NICs) and redundant switches. VMware vSwitches provide failover and NIC teaming functionality across the redundant network interfaces. iSCSI storage redundancy is achieved with redundant NICs, switches and storage controllers. For both network and iSCSI traffic, the redundant NICs are selected in such a way that they are mapped across the LOMs (LAN On Motherboards) and add-in controllers to avoid any single point of failure. VMware High Availability (HA) provides HA for VMs, by restarting the VMs on other ESX servers when an ESXi server failure is detected. The solution also includes redundant power supplies connected to PDUs.

Physical Separation of LAN and iSCSI SAN Traffic

Dedicated NICs and switches are provided for iSCSI storage traffic to isolate the storage traffic from LAN traffic. This ensures minimal latency for storage I/O operations.

Logical Separation of multiple traffic types of LAN



VLANs are used to provide security and logical separation of various traffic types required for virtualization.

Integration into an Existing Data Center

The architectures assume that there is a database configured for VMware vCenter Server, and DNS support is in place to support the solution. It is required to have a Network Time Protocol (NTP) server to synchronize time across various components in the solution and enable VMware HA functionality.

VMware vSphere Features

The solution is designed to enable key features of VMware vSphere:

- Support for VMware HA to enable High Availability for VMs
- VMware vMotion is supported for manual load balancing and zero downtime maintenance
- VMware Distributed Resource Scheduler (DRS), Dynamic Power Management (DPM), Storage vMotion are also supported

Leverage EqualLogic Storage Integration with VMware

As mentioned earlier in the document, EqualLogic is tightly integrated with VMware to provide better performance and manageability. Integration is achieved through various features like EqualLogic MEM for storage network connections multipathing, VAAI integration for better performance and ASM/VE for snapshot capabilities. These features are available as a part of the solution.

Thin Provisioning

The solution enables support for thin provisioning of storage both at the EqualLogic level and at the ESX level. Thin provisioning avoids the inefficiencies of over allocation, limiting the actual physical storage resource allocation to what is utilized now, and enables the automatic addition of storage resources online as the requirements grows.

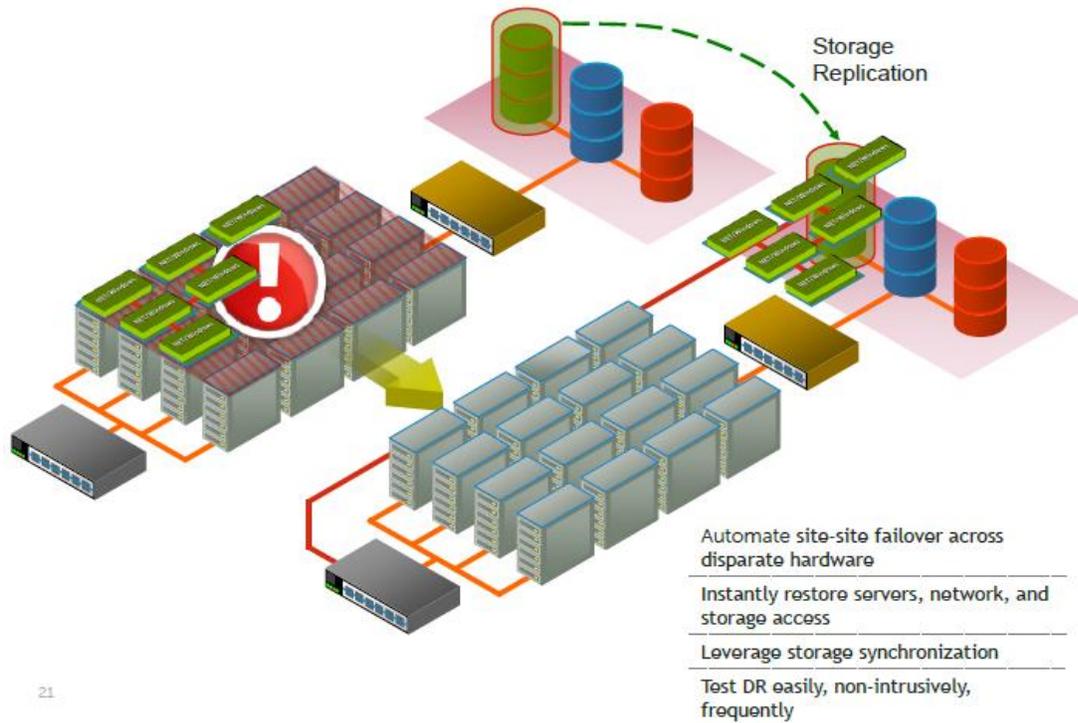
Private Cloud w/ Advanced Disaster Recovery

AIM

Advanced Infrastructure Manager (AIM) is a unified resource management platform that provides workload portability between heterogeneous servers and business service resilience. AIM works with existing infrastructure and cabling to transform your data center infrastructure from static to dynamic, delivering flexibility and operational efficiency.

AIM provides an N+1 availability solution and simplified disaster recovery. A spare server anywhere in the infrastructure can replace any failed server. Dell AIM automatically detects server failures and retargets the failed server's image to an available spare — physical or virtual. Paired with storage replication, AIM can be used to restart workloads at another site in the event of a site outage.

Site to Site Disaster Recovery



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Figure 4: Advanced Disaster Recovery using AIM

The production data center automatically and continuously replicates its central storage to the remote site. AIM seamlessly synchs the data centers with the correct network and storage configurations. AIM monitors the production data center and instantly detects when to boot the remote data center into disaster recovery mode.

Reliability
Dell AIM ensures that when a disaster occurs, your remote data center is prepared to come online – without human intervention.
Speed
Dell enables your disaster recovery data center to go from dead, bare metal to live, networked servers in five minutes or less.
Ease
Dell AIM saves you from having to manually replicate changes across your data centers, and from the errors that manual replication can introduce.

Figure 5: AIM