Use Hitachi Virtual Storage Platform G1000 to Deploy 20,000 User Mailboxes with Microsoft Exchange 2010 using Microsoft Hyper-V

Reference Architecture Guide

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Reference Architecture Guide

This reference architecture focuses on the planning, designing, sizing, and deploying of Microsoft® Exchange 2010 with Microsoft Hyper-V® using Hitachi Compute Blade 500, Hitachi Virtual Storage Platform G1000, and Brocade networking. The environment supports 20,000 user mailboxes that are 3 GB in size.

This guide is intended for you if you are an Exchange administrator looking to deploy Microsoft Exchange 2010 in your environment. You need some familiarity with the following to benefit from this document:

- Hitachi Virtual Storage Platform G1000
- Hitachi Command Suite version 7 or later
- Brocade networking
- Microsoft Windows Server® 2012 R2
- Microsoft Hyper-V
- Microsoft Windows Server 2008
- Microsoft Exchange Server 2010

Note — Testing of this configuration was in a lab environment. Many things affect production environments beyond prediction or duplication in a lab environment. Follow the recommended practice of conducting proof-of-concept testing for acceptable results in a non-production, isolated test environment that otherwise matches your production environment before your production implementation of this solution.
Solution Overview

This reference architecture uses Microsoft Exchange 2010 for 20,000 mailboxes that are 3 GB in size. It uses Hitachi compute and storage and Brocade networking.

There are four Exchange virtual machines configured to run on a two-node Microsoft Hyper-V cluster using cluster shared volumes. In the event of hardware failure or planned maintenance, the remaining Hyper-V host continues to support the workloads without any end-user disruption.

Figure 1 on page 3 shows physical topology of this reference architecture.
Figure 1
Key Solution Components

These are the key components required to deploy this solution.

Hitachi Virtual Storage Platform G1000

Hitachi Virtual Storage Platform G1000 family provides an always-available, agile, and automated foundation that you need for a continuous infrastructure cloud. This delivers enterprise-ready software-defined storage, advanced global storage virtualization, and powerful storage.

Supporting always-on operations, Virtual Storage Platform G1000 includes self-service, non-disruptive migration and active-active storage clustering for zero recovery time objectives. Automate your operations with self-optimizing, policy-driven management.

Hitachi Virtual Storage Platform G1000 Architecture

Hitachi Virtual Storage Platform G1000 is a high performance and large capacity storage system. It has improved Hi-Star Net Architecture and an 8-core microprocessor. The storage consists of the following:

- **Controller Chassis**
  - **Channel Adapter** — This controls data transfer between the upper host and the cache memory.
  - **Disk Adapter** — This controls data transfer between the drives and cache memory.
  - **Cache Path Control Adapter** — Using PCI-Express path, this connects between the processor blades, channel adapter, disk adapter, and the cache backup module kit. It distributes data and sends hot-line signals to the processor blades.
  - **Cache Flash Memory** — This is memory to back up cache memory data when a power failure occurs.
  - **Cache Backup Module Kit** — This is a kit to back up cache memory data when a power failure occurs.
  - **Processor Blades** — This consists of the DIMMs and the processor with the chip set. It controls the following using Ethernet:
    - Channel adapter
    - Disk adapter
    - PCI-Express interface
    - Local memory
    - Communication between the service processors
- **Service Processor** — This sets and modifies the storage system configuration, a device availability statistical information acquisition, and maintenance.

- **Drive Chassis** — This is an installable drive unit that connects into the controller chassis.

Virtual Storage Platform G1000 offers these features:

- **Scalability**
  - **Number of controller chassis** — 1 to 2
  - **Number of racks** — 1 to 6
  - **Number of installed channel options** — 1 to 12 sets
  - **Capacity of cache memory** — 32 GB to 2,048 GB
  - **Number of drives** — Up to the following:
    - 2.5-inch HDD — 2,304
    - 3.5-inch HDD — 1,152
    - 2.5-inch SSD (flash drives) — 384
    - FMD (flash module drive) — 192

- **High performance**
  - Supports three kinds of high-speed disk drives at the following speeds:
    - 15k RPM
    - 10k RPM
    - 7.2k RPM
  - Supports flash drives and flash module drive with ultra-high speed response
  - Transfers high speed data between the disk adapter and drives at a rate of 6 Gb/sec with the SAS interface
  - Uses the 8-core processor on the processor blade board, doubling the processing ability
- **Large capacity**
  - Supports hard disk drives with the following capacities:
    - 300 GB
    - 600 GB
    - 900 GB
    - 1.2 TB
    - 3 TB
    - 4 TB
  - Supports flash drives with the following capacities:
    - 400 GB
    - 800 GB
  - Supports flash module drives with the following capacities:
    - 1.6 TB
    - 3.2 TB
  - Controls up to 65,280 logical volumes and up to 2,304 disk drives, providing a physical disk capacity of approximately 4,511 TB per storage system

- **Flash module drive**
  - Has a 6 Gb/sec SAS interface, the same as that the hard disk drives and solid state drives
  - Uses MLC-NAND flash memory, featuring high performance, long service life, and cost performance

- **Connectivity** — Supports the following configurations:
  - RAID-6 (6D+2P)
  - RAID-6 (14D+2P)
  - RAID-5 (3D+1P)
  - RAID-5 (7D+1P)
  - RAID-10 (2D+2D)
  - RAID-10 (4D+4D)
Non-disruptive service and upgrade

- Add, remove, and replace main components without shutting down a device while the storage system is in operation
- Monitor the running condition of the storage system with a service processor mounted on the drive chassis
- Enable remote maintenance by connecting the service processor with a service center
- Upgrade the microcode without shutting down the storage system

Figure 2 on page 8 shows the controller chassis, drive chassis, and its sub-components for Hitachi Virtual Storage Platform G1000.
Figure 2
Hitachi Dynamic Provisioning

On Hitachi storage systems, Hitachi Dynamic Provisioning provides wide striping and thin provisioning functionalities.

Using Dynamic Provisioning is like using a host-based logical volume manager (LVM), but without incurring host processing overhead. It provides one or more wide-stripping pools across many RAID groups. Each pool has one or more dynamic provisioning virtual volumes (DP-VOLs) of a logical size you specify of up to 60 TB created against it without allocating any physical space initially.

Deploying Dynamic Provisioning avoids the routine issue of hot spots that occur on logical devices (LDEVs). These occur within individual RAID groups when the host workload exceeds the IOPS or throughput capacity of that RAID group. Dynamic Provisioning distributes the host workload across many RAID groups, which provides a smoothing effect that dramatically reduces hot spots.

When used with the Hitachi Virtual Storage Platform G1000 family, Hitachi Dynamic Provisioning has the benefit of thin provisioning. There can be a dynamic expansion or reduction of pool capacity without disruption or downtime. You can rebalance an expanded pool across the current and newly added RAID groups for an even striping of the data and the workload.

Hitachi Compute Blade 500

Hitachi Compute Blade 500 combines the high-end features with the high compute density and adaptable architecture you need to lower costs and protect investment. Safely mix a wide variety of application workloads on a highly reliable, scalable, and flexible platform. Add server management and system monitoring at no cost with Hitachi Compute Systems Manager, which can seamlessly integrate with Hitachi Command Suite in IT environments using Hitachi storage.

Hitachi Command Suite

Hitachi Command Suite manages virtualized storage and server infrastructures. With usability, workflow, performance, scalability, and private cloud enablement, Hitachi Command Suite lets you build sustainable infrastructures with leading storage technologies. It helps you flexibly align with changing business requirements and maximize return on IT investments.

Hitachi Compute Systems Manager

Hitachi Compute Systems Manager is the management software for Hitachi servers. Compute Systems Manager can be purchased with an optional Server Management Module, Network Management Module, or Server Deployment Module. Use Compute System Manager, to introduce new servers into your data center environment.
Microsoft Windows Server with Hyper-V

Microsoft Windows Server with Hyper-V is a virtualization platform that helps organizations of all sizes realize considerable cost savings and operational efficiencies. With industry-leading size and scale, Hyper-V is the platform of choice for you to run your mission critical workloads.
Solution Design

This is detailed information on the designing and sizing for Microsoft Exchange Server 2010 to support 20,000 mailboxes that are 3 GB in size using Hitachi compute and storage and Brocade networking.

On the compute side, do the following:

- Configure a two-node Microsoft Hyper-V cluster to run four Microsoft Exchange virtual machines.
- Configure each virtual machine with five vCPUs and 64 GB RAM.
- Install the Exchange mailbox, hub transport, and client access roles as combined roles on each virtual machine.

On the storage side, use 240 × 4 TB 7.2k RPM SAS drives, as shown in Table 1.

<table>
<thead>
<tr>
<th>Drives</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Microsoft Windows Server operating system (VHDX)</td>
</tr>
<tr>
<td>92</td>
<td>Active databases</td>
</tr>
<tr>
<td>92</td>
<td>Passive databases</td>
</tr>
<tr>
<td>8</td>
<td>Active logs</td>
</tr>
<tr>
<td>8</td>
<td>Passive logs</td>
</tr>
<tr>
<td>24</td>
<td>Restore (Exchange native data protection)</td>
</tr>
<tr>
<td>12</td>
<td>Hot spares</td>
</tr>
</tbody>
</table>

Table 1. Drive Configuration

On the Exchange side, configure four Microsoft Exchange virtual machines in a database availability group cluster for mailbox high availability, as shown in Table 2.

<table>
<thead>
<tr>
<th>Virtual Machine</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange VM1</td>
<td>DB1-10 as active databases</td>
</tr>
<tr>
<td></td>
<td>DB11-20 as passive database copies</td>
</tr>
<tr>
<td>Exchange VM2</td>
<td>DB11-20 as active databases</td>
</tr>
<tr>
<td></td>
<td>DB21-30 as passive database copies</td>
</tr>
<tr>
<td>Exchange VM3</td>
<td>DB21-30 as active databases</td>
</tr>
<tr>
<td></td>
<td>DB31-40 as passive database copies</td>
</tr>
<tr>
<td>Exchange VM4</td>
<td>DB31-40 as active databases</td>
</tr>
<tr>
<td></td>
<td>DB1-10 as passive database copies</td>
</tr>
</tbody>
</table>

Table 2. Microsoft Exchange Virtual Machine Configuration
Each database supports 500 mailboxes. This design balances the CPU and memory resources to provide better performance. In the event of a failure the passive copy activates on the remaining servers.

Table 3 lists the hardware components for the solution.

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Description</th>
<th>Version</th>
<th>Quantity</th>
</tr>
</thead>
</table>
| Hitachi Compute Blade 500 chassis | - Up to 8 server blades  
- 2 management modules  
- 6 cooling fan modules  
- 4 power supply modules  
- 2 Brocade 5460 Fibre Channel switch modules  
- 2 Brocade VDX 6746 DCB 10 GbE switch modules | A0170/00 | 1 |
| 520H B2 server blade | - Half-size blade  
- 2 × 12-core Intel Xeon E5-2697 v2 processors at 2.70 GHz  
- 320 GB RAM  
- 20 × 16 GB DIMMs  
- 2 hot-swappable 2.5 inch SAS drives  
- 1 Emulex 10 GbE onboard CNA  
- 1 Hitachi 8 Gb/sec Fibre Channel mezzanine card | 04-15/10-31 | 2 |
| Hitachi Virtual Storage Platform G1000 | - Dual controller  
- 32 × 8 Gb/sec Fibre Channel ports  
- 982 GB cache memory | 80-01-01-00 | 1 |
| DBX disk box | - 240 × 4 TB 7.2k RPM SAS drives | n/a | 5 |
| Brocade VDX 6720-24 | - 24-port 10 GbE switch | 2.0.1b | 2 |
| Brocade 6510 | - 48-port 8-16 Gb/sec Fibre Channel switch | 7.0.1.a | 2 |
Table 4 lists the software components used for the solution.

### Table 4. Software Components

<table>
<thead>
<tr>
<th>Software</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi Command Suite</td>
<td>8.0</td>
</tr>
<tr>
<td>Hitachi Compute System Manager</td>
<td>8.0</td>
</tr>
<tr>
<td>Hitachi Dynamic Provisioning</td>
<td>Micro-code dependent</td>
</tr>
<tr>
<td>Microsoft Windows Server</td>
<td>2012 R2</td>
</tr>
<tr>
<td>Microsoft Windows Server</td>
<td>2008 R2</td>
</tr>
<tr>
<td>Microsoft Exchange</td>
<td>2010 SP3</td>
</tr>
</tbody>
</table>

**Hitachi Compute Blade 500**

This is detailed information on the server chassis, server blades, and switch modules configuration.

**Chassis Configuration**

The Hitachi Compute Blade 500 chassis has redundant management modules to provide high availability access to manage the chassis, server blades, and switch modules. The hot-swappable power and fan modules allow for nondisruptive maintenance.

**Server Blade Configuration**

Configure the onboard Emulex 10 GbE converged network adapter card on the server blade configured as follows:

- Four logical NICs on channel 0
- Four logical NICs on channel 1

Install the Hitachi Fibre Channel 8 Gb/sec mezzanine card on the server blade at mezzanine slot 1. Configure the card for multiple paths from server to storage ports.
Network Switch Module Configuration
The server chassis comes with two Brocade VDX 6746 10GbE DCB switch modules installed into the chassis at slot 0/1.

Configure the uplink for link aggregation.

Connect the uplink to two Brocade VDX 6720 switches using Brocade Virtual Cluster Switching and Inter Switch-Link Trunking technologies.

Each switch has 24 ports with 8 external and 16 internal ports.

For performance enhancement and security, configure the networks using the following VLANs.

- **Management network using VLAN 243** — Used for server chassis, server blades and storage management traffic.
- **MAPI network using VLAN 100** — Used for Microsoft Active Directory®, DNS, Exchange servers and client traffic.
- **Replication network using VLAN 101** — Used for log shipping and database seeding traffic.
- **Live migration network using VLAN 102** — Used for live migration traffic

SAN Switch Module Configuration
The server chassis comes with two Brocade 5460 Fibre Channel 8 Gb/sec switch modules installed into the chassis at slot 2/3. The Brocade 5460 switch module has 26 ports with 6 external and 20 internal ports.

For redundancy and performance, configure and assign multiple I/O paths to the following storage ports:

- 1A/2A
- 3A/4A

Microsoft Exchange Sizing
This is detailed information on the compute and storage sizing for Microsoft Exchange using the following profile:

- 20,000 mailboxes
- 75 KB average message size
- 3 GB mailbox size
- 100 messages sent and received per day
- 2 database copies
Determining Compute CPU and Memory Requirements

The Exchange 2010 Mailbox Server Role Requirements Calculator and Processor Query Tool v1.1, using two 12-core Intel Xeon E5-2697 v2 processors, determined the computing CPU and memory requirements.

Microsoft recommends disabling hyper threading because it causes capacity planning and monitoring challenges. As a result, the expected gain in CPU overhead is likely not justified.

Using 24-core, the Processor Query Tool recommends 957 as the spec rate value. Based on the calculator results, allocate five vCPUs and 64 GB to each of the four Microsoft Exchange virtual machines.

Note — Microsoft recommends additional 10% CPU overhead for Exchange virtual machine running in a Hyper-V environment.

Determining Storage I/O and Capacity Requirements

The Exchange 2010 Mailbox Server Role Requirements Calculator determined the storage I/O and capacity requirements.

To ensure that Microsoft Exchange can provide sufficient overhead for periods of extremely high workload, Microsoft recommends adding 20 percent overhead for production scenarios, for a total of 0.12 IOPS.

The calculator recommends $224 \times 4 \text{ TB}$ drives for Exchange databases, logs, and restore. Add an additional four 4 TB drives for the Microsoft Windows Server operating system with Hyper-V VHDX and $12 \times 4 \text{ TB}$ drives for hot spares.

To support this Microsoft Exchange solution, you need a total of 240 drives.

Table 5 lists the host I/O and throughput requirements from the Exchange 2010 Mailbox Server Role Requirements Calculator.

<table>
<thead>
<tr>
<th>Table 5. Calculated Host I/O and Throughput Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Host I/O and Throughput Requirements</strong></td>
</tr>
<tr>
<td>Per Database</td>
</tr>
<tr>
<td>Per Server</td>
</tr>
<tr>
<td>Per Database Availability Group</td>
</tr>
<tr>
<td>Per Environment Group</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>Total Database Required IOPS</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>1200</td>
</tr>
<tr>
<td>4800</td>
</tr>
<tr>
<td>4800</td>
</tr>
<tr>
<td>Total Log Required IOPS</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>257</td>
</tr>
<tr>
<td>1027</td>
</tr>
<tr>
<td>1027</td>
</tr>
<tr>
<td>Database Read I/O Percentage</td>
</tr>
<tr>
<td>60%</td>
</tr>
<tr>
<td>60%</td>
</tr>
<tr>
<td>60%</td>
</tr>
<tr>
<td>60%</td>
</tr>
<tr>
<td>Background Database Maintenance Throughput Requirements</td>
</tr>
<tr>
<td>7.5 MB/sec</td>
</tr>
<tr>
<td>150 MB/sec</td>
</tr>
<tr>
<td>600 MB/sec</td>
</tr>
<tr>
<td>600 MB/sec</td>
</tr>
</tbody>
</table>
Table 6 lists the disk capacity requirements from the Exchange 2010 Mailbox Server Role Requirements Calculator.

### Table 6. Calculated Disk Capacity Requirements

<table>
<thead>
<tr>
<th>Disk Space Requirements</th>
<th>Per Database</th>
<th>Per Server</th>
<th>Per Database Availability Group</th>
<th>Per Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Space Required</td>
<td>1896 GB</td>
<td>37922 GB</td>
<td>151688 GB</td>
<td>151688 GB</td>
</tr>
<tr>
<td>Log Space Required</td>
<td>54 GB</td>
<td>1082 GB</td>
<td>4329 GB</td>
<td>4329 GB</td>
</tr>
<tr>
<td>Database LUN Space Required</td>
<td>N/A</td>
<td>52143 GB</td>
<td>208570 GB</td>
<td>208570 GB</td>
</tr>
<tr>
<td>Log LUN Space Required</td>
<td>N/A</td>
<td>1353 GB</td>
<td>5412 GB</td>
<td>5412 GB</td>
</tr>
</tbody>
</table>

For more information about IOPS planning, see the Microsoft TechNet article "Understanding Database and Log Performance Factors."

For more information about capacity planning, see the Microsoft TechNet article "Understanding Mailbox Database and Log Capacity Factors."

### Dynamic Provisioning Pool Configuration

The following dynamic provisioning pools and volumes are configured using the following best practice guidelines:

- 4 TB 7.2k RPM SAS drives
- RAID-10 (2D+2D) for the following:
  - Microsoft Windows Server operating system,
  - Microsoft Exchange database and log files
- For best performance, do the following:
  - Place the Windows Server operating system, database, and log files in separate dynamic provisioning pools
  - Place database and log files in separate pools and volumes
- RAID-10 offers the best in performance and reliability
- Reserve an additional 12 drives for hot spares

Table 7 has the dynamic provisioning pool configuration.

### Table 7. Dynamic Provisioning Pool Configuration

<table>
<thead>
<tr>
<th>Dynamic Provisioning Pool</th>
<th>Number of Parity Groups</th>
<th>Number of Drives</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool 0</td>
<td>1</td>
<td>4</td>
<td>Microsoft Windows Server operating system</td>
</tr>
<tr>
<td>Pool 1</td>
<td>23</td>
<td>92</td>
<td>Exchange databases for active</td>
</tr>
<tr>
<td>Pool 2</td>
<td>23</td>
<td>92</td>
<td>Exchange databases for passive</td>
</tr>
</tbody>
</table>
Storage Port Configuration

For multipath I/O, connect the following compute and storage ports to the Brocade 6510 switches, as follows:

- Switch module 2 port 1 to switch 1 port 1
- Switch module 3 port 1 to switch 1 port 2
- Storage port 1A to switch 1 port 3
- Storage port 3A to switch 1 port 4
- Switch module 2 port 2 to switch 2 port 1
- Switch module 3 port 2 to switch 2 port 2
- Storage port 2A to switch 2 port 3
- Storage port 4A to switch 2 port 4

Table 8 has the multipath I/O configurations.

Table 7. Dynamic Provisioning Pool Configuration (Continued)

<table>
<thead>
<tr>
<th>Dynamic Provisioning Pool</th>
<th>Number of Parity Groups</th>
<th>Number of Drives</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool 3</td>
<td>2</td>
<td>8</td>
<td>Exchange logs for active</td>
</tr>
<tr>
<td>Pool 4</td>
<td>2</td>
<td>8</td>
<td>Exchange logs for passive</td>
</tr>
<tr>
<td>Pool 5</td>
<td>6</td>
<td>24</td>
<td>Exchange restore</td>
</tr>
</tbody>
</table>

Table 8. Multipath I/O Configuration

<table>
<thead>
<tr>
<th>Hyper-V Host</th>
<th>Hyper-V Port Name</th>
<th>Storage Port</th>
<th>Storage Host Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyper-V 0</td>
<td>Hyv0_port1_1</td>
<td>Storage1_1A</td>
<td>Hyv0_port1_1_ Storage1_1A</td>
</tr>
<tr>
<td></td>
<td>Hyv0_port1_2</td>
<td>Storage1_2A</td>
<td>Hyv0_port1_2_ Storage1_2A</td>
</tr>
<tr>
<td>Hyper-V 1</td>
<td>Hyv1_port1_1</td>
<td>Storage1_3A</td>
<td>Hyv1_port1_1_ Storage1_3A</td>
</tr>
<tr>
<td></td>
<td>Hyv1_port1_2</td>
<td>Storage1_4A</td>
<td>Hyv1_port1_2_ Storage1_4A</td>
</tr>
</tbody>
</table>
Volume Configuration

When creating the volumes, isolate the database and log on different dynamic provisioning pools for better performance. The log volume is 10% of the total database volume.

Provision 16 × 2.4 TB volumes and present them to both Microsoft Hyper-V hosts as clustered shared volumes. Create the following:

- **Databases** — 80 × 2 TB fixed VHDX virtual disk
- **Logs** — 80 × 200 GB fixed VHDX virtual disk

Using a fixed disk provides better performance, so this is recommended for use with Microsoft Exchange. Use Table 9 to configure the volumes and virtual disks for the hosts and virtual machines.

**Table 9. Volume and Virtual Disk Configuration**

<table>
<thead>
<tr>
<th>Dynamic Provisioning Pool Number</th>
<th>Virtual Machine Name</th>
<th>Clustered Shared Volume Number</th>
<th>CSV Size (TB)</th>
<th>VHDX Size (GB)</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MBXCAS1</td>
<td>1</td>
<td>24</td>
<td>2000 GB per DB</td>
<td>DB1-10 (active)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>2</td>
<td>2.4</td>
<td>200 GB per LOG</td>
<td>LOG1-10 (active)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>3</td>
<td>24</td>
<td>2000 GB per DB</td>
<td>DB11-20 (passive)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>4</td>
<td>2.4</td>
<td>200 GB per LOG</td>
<td>LOG11-20 (passive)</td>
</tr>
<tr>
<td>1</td>
<td>MBXCAS2</td>
<td>5</td>
<td>24</td>
<td>2000 GB per DB</td>
<td>DB11-20 (active)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>6</td>
<td>2.4</td>
<td>200 GB per LOG</td>
<td>LOG11-20 (active)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>7</td>
<td>24</td>
<td>2000 GB per DB</td>
<td>DB21-30 (passive)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>8</td>
<td>2.4</td>
<td>200 GB per LOG</td>
<td>LOG21-30 (passive)</td>
</tr>
<tr>
<td>1</td>
<td>MBXCAS3</td>
<td>9</td>
<td>24</td>
<td>2000 GB per DB</td>
<td>DB21-30 (active)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>10</td>
<td>2.4</td>
<td>200 GB per LOG</td>
<td>LOG21-30 (active)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>11</td>
<td>24</td>
<td>2000 GB per DB</td>
<td>DB31-40 (passive)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>12</td>
<td>2.4</td>
<td>200 GB per LOG</td>
<td>LOG31-40 (passive)</td>
</tr>
<tr>
<td>1</td>
<td>MBXCAS4</td>
<td>13</td>
<td>24</td>
<td>2000 GB per DB</td>
<td>DB31-40 (active)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>14</td>
<td>2.4</td>
<td>200 GB per LOG</td>
<td>LOG31-40 (active)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>15</td>
<td>24</td>
<td>2000 GB per DB</td>
<td>DB1-10 (passive)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>16</td>
<td>2.4</td>
<td>200 GB per LOG</td>
<td>LOG1-10 (passive)</td>
</tr>
</tbody>
</table>
Microsoft Hyper-V Design

This is detailed information on the Microsoft Hyper-V and virtual machine configurations.

Microsoft Hyper-V Configuration

Install Microsoft Windows Server 2012 R2 on the local drives on each server blade with the following:

- Use a RAID 1 configuration
- Add a Microsoft Hyper-V role

Configure the Windows Server operating system for the virtual machines and Exchange data on the storage area network. Then, present both to the Hyper-V hosts as cluster shared volumes.

Configure the network adapters as NIC teaming, using the default settings for performance and redundancy.

- **Team mode** — Switch Independent
- **Load balancing mode** — Dynamic
- **Standby adapter** — None (all adapter active)
- **NIC team1 using Network Adapter 0/1** — Management traffic
- **NIC team2 using Network Adapter 2/3** — Exchange MAPI traffic
- **NIC team3 using Network Adapter 4/5** — Log shipping and database seeding traffic
- **NIC team4 using Network Adapter 6/7** — Live Migration traffic

Virtual Machines Configuration

Configure four Microsoft Exchange virtual machines as a combined mailbox, client access, and hub transport roles.

Table 10 has the virtual machine, vCPU, vRAM, and vNIC configuration on each host.

<table>
<thead>
<tr>
<th>Host</th>
<th>Virtual Machine Name</th>
<th>vCPU</th>
<th>vRAM (GB)</th>
<th>vNIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyper-V 0</td>
<td>MBXCAS1</td>
<td>5</td>
<td>64</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MBXCAS2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyper-V 1</td>
<td>MBXCAS3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MBXCAS4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Microsoft Exchange Database Availability Group Configuration

With a two-node Microsoft Hyper-V cluster, each host supports two Microsoft Exchange virtual machines. In the event of a server blade failure, the virtual machines on that host automatically live migrate over to the remaining host, which then supports all four Exchange virtual machines.

Configure each server blade with enough resources to sustain a failover scenario:

- Two 12-core Intel Xeon E5-2697 v2 processors for CPUs
- 320 GB memory.

Configure four Exchange virtual machines in a database availability group, as follows:

- **Exchange VM1**
  - DB1-10 as active databases
  - DB11-20 as passive database copies

- **Exchange VM2**
  - DB11-20 as active databases
  - DB21-30 as passive database copies

- **Exchange VM3**
  - DB21-30 as active databases
  - DB31-40 as passive database copies

- **Exchange VM4**
  - DB31-40 as active databases
  - DB1-10 as passive database copies

Each database supports 500 mailboxes. This design balances the CPU and memory resources to provide better performance.
Figure 3 shows the database distribution for a four-member database availability group configuration.
Conclusion

This reference architecture guide describes how to deploy a 20,000 mailboxes that are 3 GB in size using Microsoft Exchange Server 2010 with Microsoft Hyper-V. The solution provides high availability and flexible scalability.
For More Information

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