



Overview of HP tiered solutions program for Microsoft Exchange Server 2010

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Executive summary

The tiered solutions program for Microsoft® Exchange Server 2010 (Exchange 2010) has been developed to provide customers with server and storage solutions to support different service level needs. For example, the functionality and service level needs of a C-level executive are quite different than those of a part-time mall kiosk worker. Mailbox quotas, client types and access methods, regulatory compliance needs, recovery point and recovery time objectives will vary significantly. The tiered solutions approach is designed to match the appropriate HP servers and storage platforms, along with configuration options within Exchange 2010, to meet these different needs.

There are four levels of tiered solutions, bronze, silver, gold and platinum. The tiers range from basic mailbox services, in the bronze tier, to solutions incorporating high availability features to meet strict service levels and compliance needs in the platinum tier. The tiers match server and storage hardware platforms along with the appropriate Exchange availability features for each of the given tiers. The solutions are designed and configured using HP's server and storage deployment best practices to be production-like configurations. Unlike prior high-water benchmark testing, the tiered solutions are tested to be representative of typical customer scenarios.

The tested solutions provide configuration guidance and performance details on how to deploy Exchange 2010 to address different service level needs. For smaller organizations the tiered solutions can assist in choosing the server and storage platforms best suited to support their business needs. For larger organizations the tiered solutions provide hardware sizing guidance to support different user requirements and service levels. This paper provides an overview of the tiered solution program and highlights the approach to the solution tiers methodology for Exchange 2010. For more information on the published tiered solutions briefs, go to:

<http://h71019.www7.hp.com/ActiveAnswers/cache/70595-0-0-0-121.html> and then search for "tier" to find the tiered solution briefs.

Target audience: The information contained in this white paper is intended for solutions architects, engineers, and project managers involved in the planning and design of Microsoft Exchange Server 2010 solutions. The reader should be familiar with Exchange Server 2010 terminology and best practices. For additional Exchange Server best practices go to:

<http://h71019.www7.hp.com/ActiveAnswers/cache/70593-0-0-0-121.html>

This white paper written in October 2009 is based upon the pre-released version of Exchange Server 2010 and is subject to change.

Introduction

With the release of Exchange Server 2007 (Exchange 2007), Microsoft announced that they were discontinuing the Exchange benchmark program, citing the program had served its purpose, but it also had become limited. Microsoft was concerned that the benchmark test submissions (provided by the vendors) had become impractical, no longer helpful for customers trying to compare solutions and deploy Exchange. Tests were often performed with unrealistic numbers of users with configurations not suitable for production environments. In place of the benchmark program, Microsoft has suggested its partners provide real world performance and scalability studies focused on actual customer scenarios and solutions.

With these concerns in mind, HP has developed the tiered solution program to showcase more realistic configurations and workloads. The tiered solution program is designed to provide customers with sizing and configuration details to support different Exchange service levels. The solution configurations range from basic mailbox services where cost per mailbox is the driving factor to high availability configurations designed to support the most critical users. The different configurations are matched with appropriate HP servers and storage configurations and then tested using production-style configuration settings and workloads. The tiered solutions program was initially developed for Exchange 2007 and provided high availability solutions using Cluster Continuous Replication (CCR) and Standby Continuous Replication (SCR) configurations. However, Exchange 2010 database replication has significantly changed. Exchange 2010 no longer provides Single Copy Cluster (SCC), CCR or SCR features for database availability and has moved to a new, more flexible Database Availability Group (DAG) model. The tiered solutions program has been updated to showcase solutions using the new DAG model.

Exchange 2010 changes that impact tiered solutions

The tiered solutions provide new storage models to assist in planning Exchange 2010 hardware deployments. The service tiers provide basic standalone server configurations as well as solutions with different levels of availability using the new Exchange 2010 DAG feature. The DAG replication model is the mechanism to increase database availability. A DAG can support up to 16 mailbox servers which form the replication domain. Within a DAG, copies of a mailbox database can be replicated to other mailbox servers similar to the replication model of CCR and SCR. Then in the event that the active database copy goes offline, a replica copy can be quickly brought online to limit service downtime.

The DAG replication model supports both (unplanned) failovers and (administrator initiated) switchovers at the database level, unlike CCR which requires the entire server to be failed over. The DAG concept also integrates the SCR multi-server database replication process, but enhances it with the new active manager component. The active manager monitors all of the active databases within a DAG and in the event of a database failure, determines which of the database copies to make the active copy. The DAG availability feature also supports combining the Hub Transport (HT) and Client Access Server (CAS) roles on to the Mailbox server. Unlike CCR which supports only the mailbox role, the DAG configuration removes the cluster limitations and allows multi-role configurations.

In addition to the new replication model, Microsoft has made significant improvements in Exchange 2010 database disk I/O. Some of the key improvements in the Extensible Storage Engine (ESE) database include continuing the movement away from bursty, smaller data I/O patterns in Exchange 2007 to larger, less frequent data I/O transfers in Exchange 2010. The database page size has also been increased to improve database cache read performance along with more sequential database writes. These new database I/O pattern changes allow for new storage configurations including low cost Serial ATA (SATA) and Midline Serial ATA (MDL-SATA) disk technologies configured as Just a Bunch of Disks (JBOD).

Hardware platforms

One of main goals of the tiered solution is to match the appropriate ProLiant server and StorageWorks storage platforms to specifically address different Exchange service level needs. The platforms specified in this section represent the hardware platforms recommended for Exchange solutions.

Servers

The HP ProLiant server family is offered in three different form factors.

- HP ProLiant Modular Line (ML): Flexible, expandable tower and rack/tower options are available for growing businesses in one-and two-socket, entry and enterprise-class feature sets.
- HP ProLiant Density Line (DL): Powerful servers in one, two, four or eight socket designs are optimized for rack-mounted server environment
- HP ProLiant BladeSystem servers (BL): Compact and powerful, designed for With these concerns in mind performance, management, density, and total cost of ownership (TCO) savings requirements of tomorrow's data centers delivered today.

Within the ProLiant server families, the following server platform series are best suited for Exchange solutions.

- The DL100 and ML100 series entry level platforms are ideal for smaller Exchange environments where hardware cost is a significant consideration
- The DL300, ML300, and BL400 series enterprise level platforms are designed to support both small and large Exchange environments where increased server availability and management are key considerations
- The DL500, DL700, and BL600 series enterprise level platforms are designed for customers looking for four or more processor sockets ideally suited for virtualization solutions

New for ProLiant G6 platforms is a comprehensive set of embedded technologies.

- The HP Sea of Sensors – automatically track thermal activity across the server through a collection of 32 smart sensors. The sensors dynamically adjust system components such as fans, memory and input/output processing to optimize system cooling and increase efficiency.
- The Common Power Slot design – helps minimize power waste by allowing customers to choose from four power supplies to match their specific workload.
- HP Dynamic Power Capping – reallocates power and cooling resources in the data center by dynamically setting or “capping” the power drawn by servers. By precisely identifying power requirements for each server and setting a limit based on that usage, customers can reclaim over provisioned energy to improve data center capacity.

For more information go to www.hp.com/go/proliant

Storage platforms

HP offers a portfolio of StorageWorks storage systems for Exchange, storage systems range from JBOD SATA disks configurations to mission critical XP Disk Arrays.

- StorageWorks Modular Smart Array (MSA) family is designed to support both direct attached storage (DAS) drive enclosures and entry-level SAN disk arrays.
- StorageWorks 600 Modular Disk System (MDS600) has been designed to provide direct attached storage capabilities for the HP ProLiant server blades.
- LeftHand P4000 SAN is designed using storage nodes which can be pooled together to create scalable SANs ideal for growing environments.

- StorageWorks Enterprise Virtual Array (EVA) family is designed for larger environments looking for mid-range and enterprise storage availability and management features.
- StorageWorks XP disk array family is designed for mission critical environments requiring constant data availability. All XP array components are redundant, hot-swappable, and can be upgraded online.

For additional details on the StorageWorks disk storage systems, go to: www.hp.com/go/storage.

Tiered solution matrix

HP has developed the tiered solutions matrix for Exchange to provide guidance on building Exchange 2010 solutions to meet different Exchange service levels and business requirements. Solutions range from basic mailbox services on HP's entry level server and storage platforms to highly available configurations, built on HP's enterprise server and storage platforms. The HP tiered solutions matrix matches server and storage hardware components and configurations along with the appropriate Exchange 2010 availability features for each of the given tiers. There are four tiers in the matrix: bronze, silver, gold and platinum. These tiers provide guidance in matching different mailbox service levels with appropriate HP server and storage configurations. In addition to showcasing the tiers on physical servers there will also be solutions which will virtualize some or all of the Exchange roles.

The bronze tier is designed for deployments where cost is a driving factor. This tier provides basic services without the additional cost of high availability and is targeted towards smaller, cost-sensitive deployments. The bronze tier uses an all-in-one approach by combining each of the primary Exchange roles Mailbox (MB), Hub Transport (HT) and the Client Access Server (CAS) on to a single server. The silver tier is targeted towards smaller environments requiring increased availability but have limited IT budgets. For increased availability, the silver tier provides support for database replication using DAGs, but limits costs by combining the Exchange roles using the all-in-one approach with two servers. The gold tier is targeted towards a wider range of customer scenarios, from small to large organizations, needing a higher level of data protection and availability for their important users. This tier expands the servers and storage high availability options along with dedicated Exchange server roles. The highest level in the tiered solutions matrix is the platinum tier which is targeted towards enterprise deployments requiring the highest levels of data protection for their most critical users. The Platinum tier builds on the gold tier, offering additional database copies and new storage options including RAID-less JBOD¹. The platinum tier incorporates enterprise server and storage hardware platforms with Exchange's high availability features.

Table 1 lists the details of each of the different tiers of service.

Table 1. Tiers of service

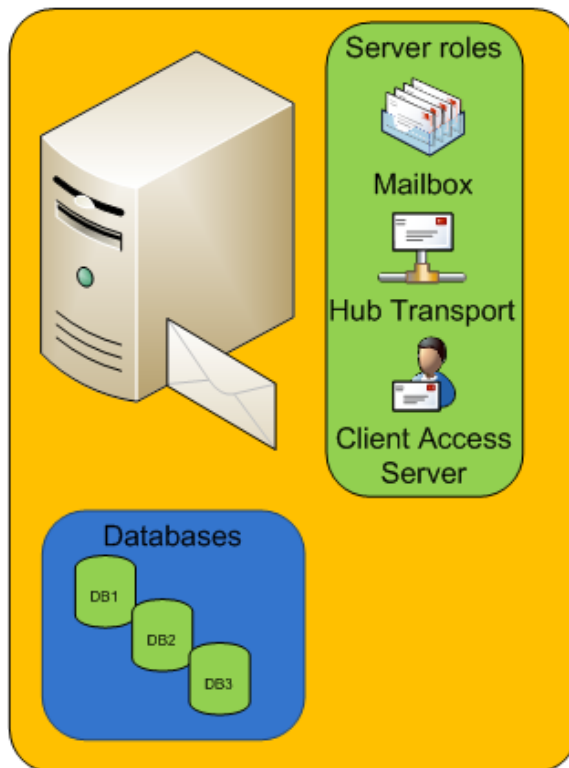
Tiers of service	Data Availability Group	Database copies	Mailbox Server Resiliency	Combined Exchange roles	Disk types	Storage type	Combined LOG and Database LUN
Bronze	No	1	0	MB/HT/CAS	SAS/MDL-SATA	RAID	No
Silver	Yes	2	1	MB/HT/CAS	iSCSI/ SAS/ MDL-SATA	RAID	No
Gold	Yes	2	1	Dedicated	FC/ iSCSI/ SAS/MDL-SATA	RAID	Yes
Platinum	Yes	3	2	Dedicated	FC/ iSCSI/ SAS/MDL-SATA	RAID/ JBOD	YES/JBOD

¹ Minimum of 3 database copies are recommended when using RAID-less JBOD configurations

Bronze tier

The bronze tier in figure 1 has been designed for smaller organizations needing, on premises, low cost mailboxes. This tier is intended for users requiring only basic mailbox services and does not provide mailbox server resiliency. The Bronze tier uses an all-in-one approach, which combines the MB, HT and CAS roles on to a single physical server or Virtual Machine (VM). The bronze tier features solutions using HP entry-level server platforms along with internal and direct attached storage configurations using either MDL-SATA or SAS disks configured with hardware based RAID.

Figure 1. Bronze tier configuration

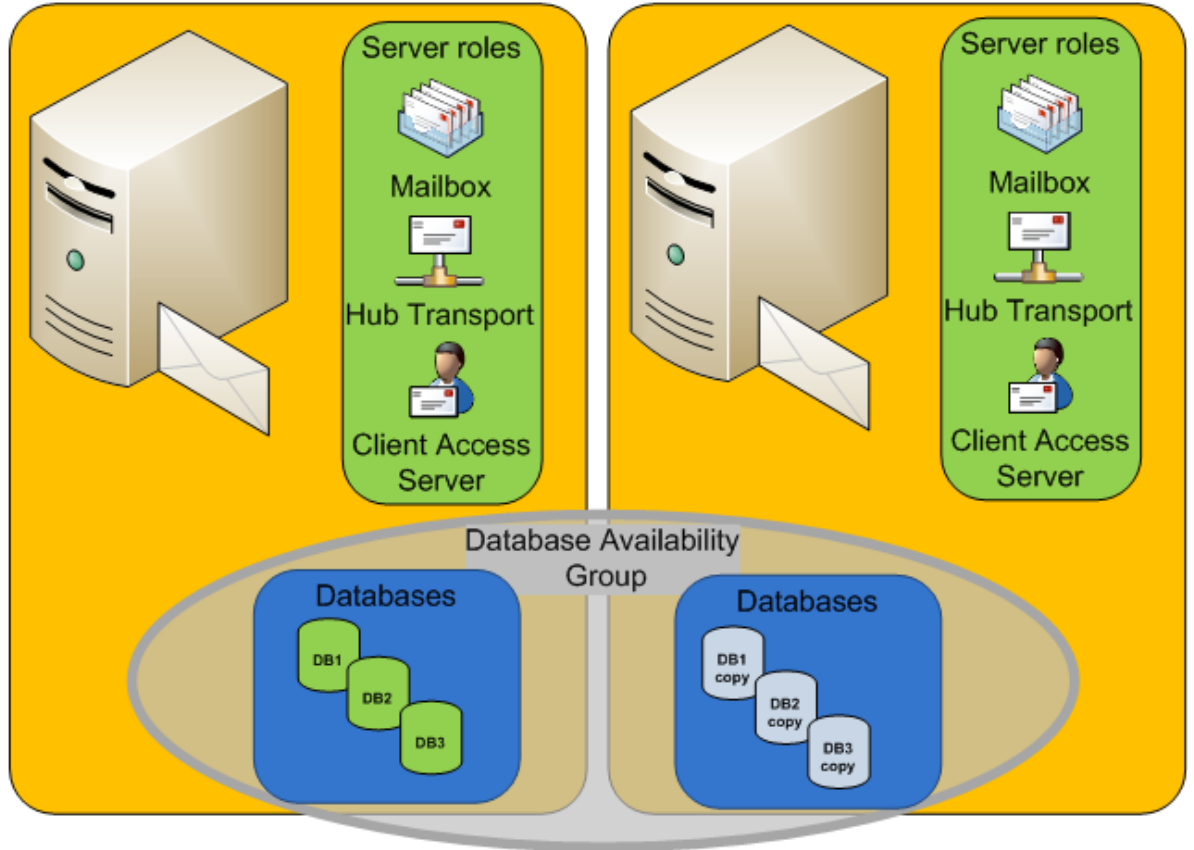


Silver tier

The silver tier in figure 2 has been designed for smaller organizations wanting to limit cost but require Exchange to be configured with increased database availability and redundancy. This tier can be configured with either two physical servers or as two VMs (each located on separate servers). To limit infrastructure costs, the MB, CAS and HT roles are installed on each of the servers. The servers are also configured in a DAG with 2 databases copies allowing for mailbox server resiliency if active mailbox server fails. When the CAS role is combined with the Mailbox server role in high availability configuration, then non-Windows® Network Load Balancing (NLB) solution is required. For this configuration a hardware load balancer or third-party software-based load balancing solution can be used.

The silver tier features solutions using HP entry-level or mid-range server platforms along with internal and direct attached storage configurations using Internet Small Computer System Interface (iSCSI), SAS or MDL-SATA disks² configured with hardware based RAID.

Figure 2. Silver tier configuration

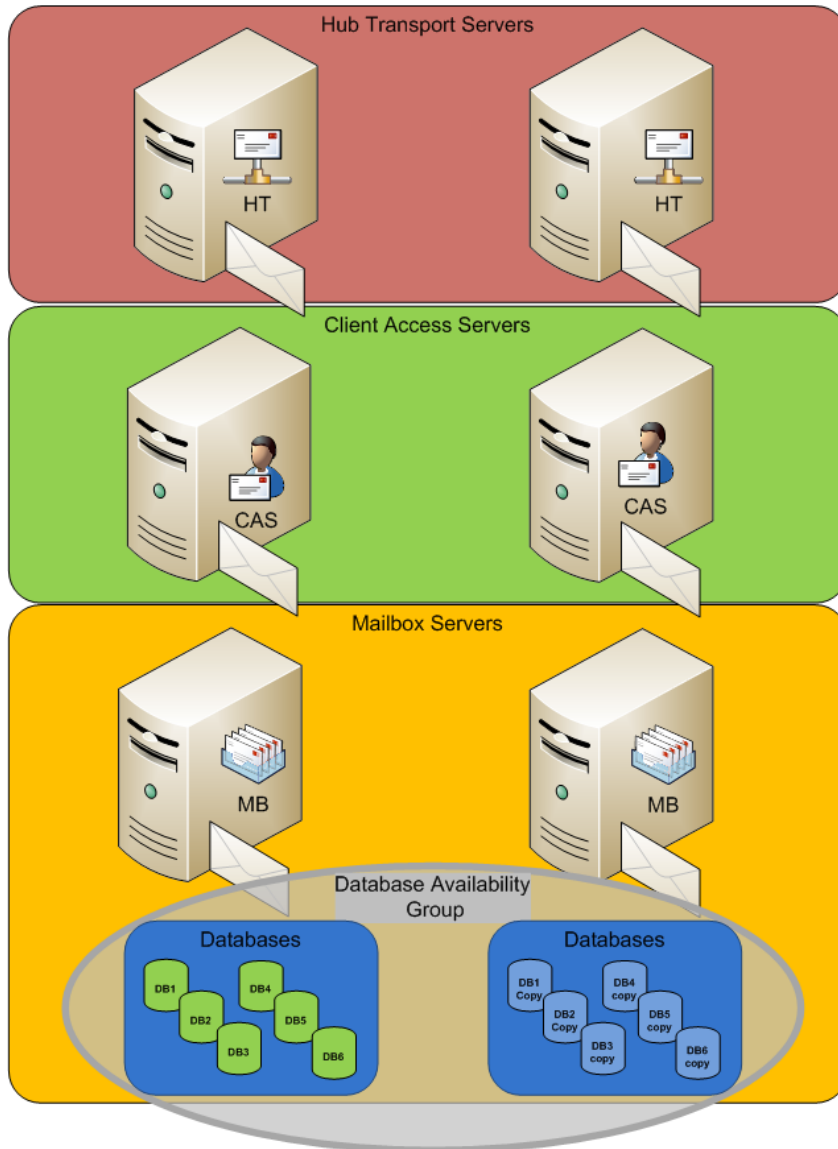


² Virtualized configurations may require shared storage configurations, including SAN

Gold tier

The gold tier in figure 3 has been designed for larger organizations looking for increased availability and redundancy. In this tier, each of the Exchange roles MB, CAS and HT is placed on a dedicated physical server or VM. For redundancy a second dedicated server or VM (located on separate server) is configured for each role. The two mailbox servers are configured in a DAG with 2 copies of the databases providing mailbox server resiliency if active mailbox server fails. The gold tier features HP mid-range and high-end server platforms configured with various storage configurations, including Fibre Channel (FC), iSCSI, SAS or MDL-SATA disks configured with hardware based RAID.

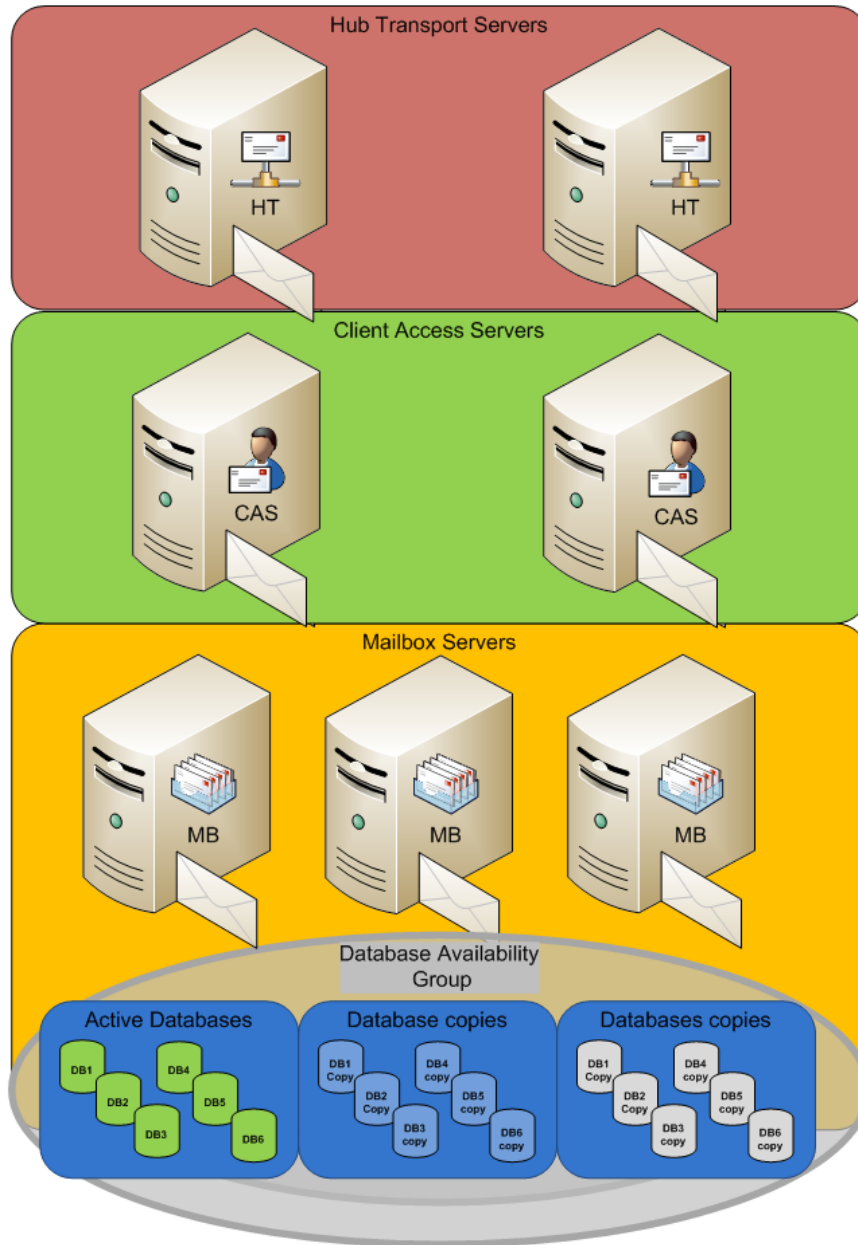
Figure 3. Gold tier configuration



Platinum tier

The platinum tier in figure 4 has been designed for organizations, looking to deploy Exchange in a high availability configuration. In this tier, the Exchange roles are configured on dedicated servers or VMs. For redundancy a second dedicated server or VM (located on separate server) is configured for each role. The platinum tier uses three mailbox servers configured in a DAG with three copies of the databases providing mailbox server resiliency for two mailbox server failures. The platinum tier features HP mid-range and high-end server platforms using either RAID based storage platforms with FC, iSCSI, SAS and MDL-SATA or RAID-less configurations using JBOD MDL-SATA solutions.

Figure 4. Platinum tier configuration

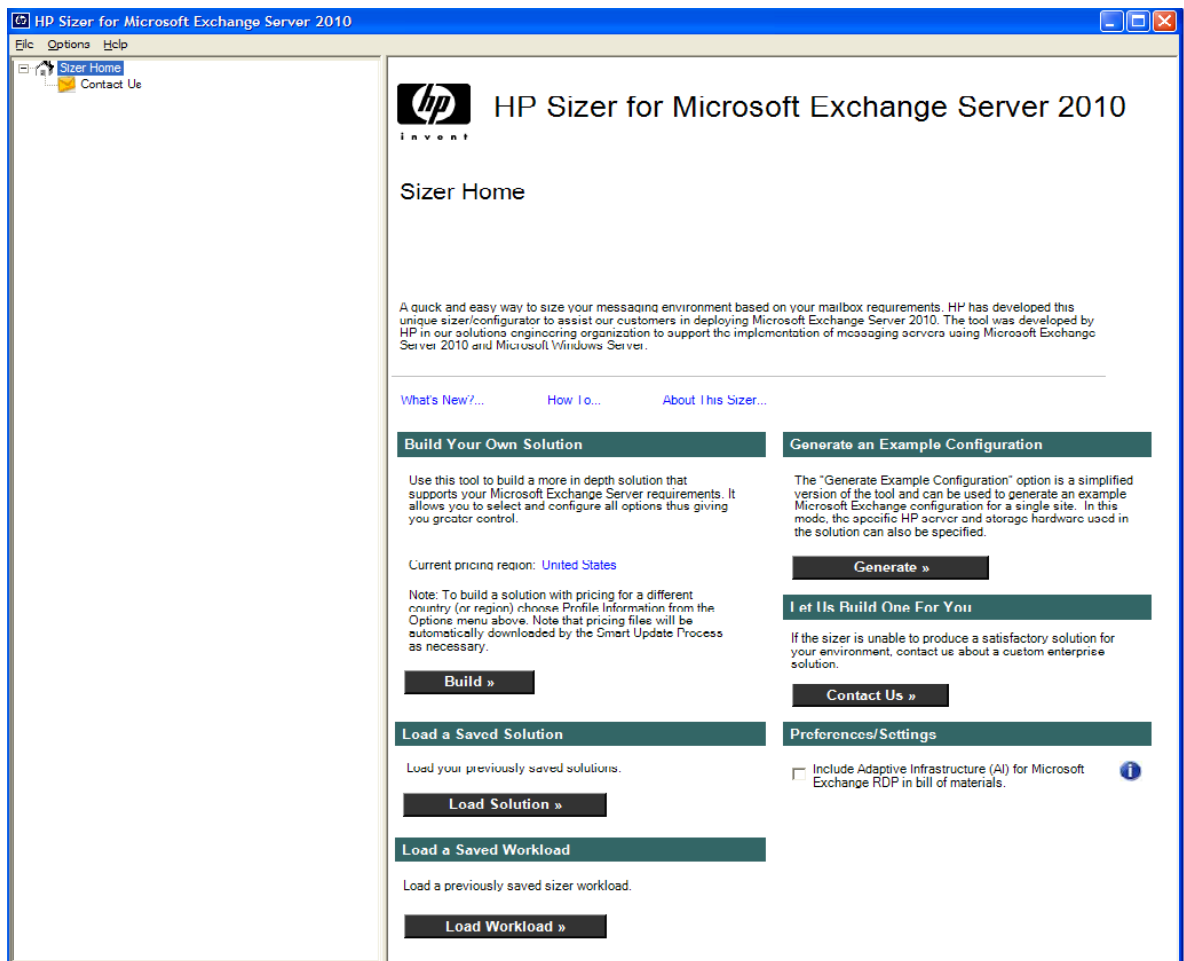


Exchange hardware sizing

The tiered solution testing is sized to support production style workload (instead of high-water benchmarks) to provide more realistic performance results. High-water benchmarks typically operate with unrealistic numbers of users at very high system loads; consequently, they are generally not suited for production.

The tiered solutions will be designed using the *HP Sizer for Microsoft Exchange Server 2010* shown in figure 5. The HP Sizer for Microsoft Exchange Server 2010 incorporates both Microsoft's recommended best practices along with HP server and storage configuration details. Please visit the HP ActiveAnswers website, www.hp.com/solutions/activeanswers/exchange, after the Exchange 2010 launch to download the sizer.

Figure 5. HP Sizer for Microsoft Exchange Server 2010



Testing process

To understand server and storage performance two types of test simulations are performed. The first series of tests use Microsoft's JetStress tool to simulate disk I/O to validate the storage subsystems performance. For Exchange 2010 this is of particular interest when considering new storage designs like JDOB SATA. The second series of tests use Microsoft's LoadGen tool to simulate client message traffic. LoadGen simulates user workload in a fully configured Exchange environment. LoadGen is helpful in validating server and storage performance when comparing different availability features and configurations.

Storage

Key disk counters are measured to validate the storage subsystems performance. Testing measures disk I/O, latencies and transfer rates to validate the storage subsystem has been properly sized for the intended workload. I/O is measured on the database reads and writes as well as log reads and writes. This information is helpful when evaluating different storage solutions featuring RAID and RAID-less configurations.

CPU

CPU and key processes are measured to determine the CPU performance of the tested solution. This information is helpful in understanding how well a server configuration handles the workload. It is also helpful when evaluating the different tiered solutions to determine the effects of adding database availability options.

To understand how CPU resources are being used, the key processes consuming measurable resources are also investigated. The processes are evaluated to measure load at both normal and peak simulations. The processes include Exchange Store, Forefront Server Security real-time scan agents, search indexer and where applicable cluster and replication related processes.

Network

Key network counters are measured during certain DAG replication scenarios, such as initial seeding or reseeding failed database copies. Results will be helpful when evaluating different network configurations including the HP Virtual Connect Flex-10 network topologies.

Exchange

Each tested solution is evaluated during both the normal and peak workload tests to verify that they are within the recommended thresholds for Exchange latencies and queue depths.

Summary

The HP tiered solutions for Exchange provide hardware configuration recommendations and Microsoft Exchange Server 2010 deployment guidelines for various service levels of Exchange. The four solution tiers are designed to cover a wide range of customer requirements ranging from low-cost mailbox services to high availability. The tested solutions provide configuration details and best practices as well as measured performance metrics. These metrics are of particular value when new server and storage platforms are announced in order to understand how these new platforms and features may benefit from Exchange performance and availability features.

The testing process combines a more production-like test simulation along with a properly sized and matched HP server and storage hardware platform. The tiered solutions are then tested and performance metrics are detailed to assist in choosing the right Exchange solutions for your business needs.

For more information

For more information on planning, deploying, or managing Microsoft Exchange Server on HP ProLiant servers and HP storage see:

www.hp.com/solutions/exchange

For HP ActiveAnswers sizing tools and best practices on Microsoft Exchange Server see:

www.hp.com/solutions/activeanswers/exchange

For more information on HP ProLiant servers see:

www.hp.com/go/proliant

For more information on HP storage solutions see:

www.hp.com/go/storage

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