Messaging and document collaboration platforms continue to emerge as mission-critical applications for many enterprises. Rich feature sets in applications such as Microsoft Exchange Server 2010 have significantly changed the way in which employees utilize messaging—namely, evolving from standard desktop e-mail access to messaging and collaborating from any office or remote location and with any device. Fueled by anytime, anywhere access, expanding bandwidth, and increasingly rich media types, data storage requirements for messaging applications have also experienced compounded growth. These shifts have resulted in many organizations rethinking their storage strategies to meet these demands.

Dell Compellent Storage Center™ storage area network (SAN) arrays help enterprises transform the way in which their messaging application data is stored and managed. These storage arrays leverage the Dell Fluid Data™ architecture, providing built-in storage tiering software that allows for automated data management of growing data stores. The modular, persistent design of Compellent arrays provides flexible, incremental growth and a pay-as-you-grow approach for seamlessly integrating advanced technologies.

Compellent storage arrays also provide integrated software for snapshot capabilities, thin provisioning, storage replication, and data migration. These capabilities are well suited for the demands of today’s data-intensive messaging and collaboration applications.

**Agile tiering for storage workloads**

In October 2011, Dell engineers conducted Microsoft Exchange Server load testing at the Dell Global Solutions Engineering Lab. The testing used a Dell Compellent Storage Center 5.4.3 array with a Series 40 controller configuration; the array was...
attached to four Serial Attached SCSI (SAS) drive enclosures with Dell Compellent Data Progression™ software enabled. The objective was to study the effectiveness of Data Progression and Dell Compellent Data Instant Replay™ software to manage Exchange data sets.

Data Progression software offers automated storage tiering. It maximizes the use of low-cost, large-capacity Serial ATA (SATA) drives while serving the performance needs of applications using fast-disk technology including solid-state drives (SSDs) or 15,000 rpm SAS or Fibre Channel drives. Compellent storage keeps track of the frequency of access to each block of data and automatically migrates the data among multiple storage tiers based on defined storage profiles. Over time, Data Progression moves data to the appropriate tier to maximize performance and capacity utilization.

In the test environment, Microsoft Exchange Server 2010, running on a Dell PowerEdge™ server, was configured with 500, 2 GB user mailboxes. The mailbox server had two volumes on the Compellent storage array. One volume was for mailbox databases and the other was for logs.

Because of its high I/O requirements, the log volume was marked as high priority and configured to use tier 1 storage. Within tier 1, multiple storage classes were defined and leveraged. Data writes were preferably written to fast RAID-10 resources—the outer tracks of drives in a RAID-10 format. Actively read, replay data was stored and read from RAID-5–9 resources—eight data segments plus one parity segment per stripe.

The database volume was configured to use both tier 1 and tier 3 storage, given the expectation that some amount of mailbox data would be actively accessed, warranting tier 1 resources, while other data would age over time. The aged data is suitable for automatic migration to tier 3 storage made up of RAID-6–10 resources—eight data segments plus two parity segments per stripe.

To generate the load on the Exchange server, a Microsoft Load Generator (LoadGen) client was configured to run eight-hour simulations every day over a two-week period. The Exchange server workload simulated 300 messages sent and received per mailbox each day. In addition, a daily replay profile was applied to the volumes hosting Exchange databases. Replays were configured to expire after seven days.

The testing demonstrated the dynamics of Data Progression with Exchange Server 2010. A key observation was the ratio of tier 3 to tier 1 storage used within the Exchange data set. Over the two-week period, capacity utilization across storage tiers was monitored using Dell Compellent Enterprise Manager software. For the Exchange mailbox server, approximately 73 percent of the Exchange 500-user database was migrated automatically to tier 3 storage (see Figure 1). Tier 1 writes go to RAID-10 fast and standard, and replays go to RAID-5–9 fast or standard. Tier 3 replays go to RAID-6–10 fast or standard.

Additional tests on other workload profiles demonstrated that differences in the profiles directly affect how much data is moved from tier 1 to tier 3 storage for database volumes. For example, a heightened active workload profile naturally results in increasing amounts of data being maintained on tier 1 storage.

Size requirements for snapshot-based online recovery

Administrators of Microsoft Exchange Server storage are dependent on storage-based snapshot features for quick point-in-time recoveries. Dell Compellent Data Instant Replay provides a built-in snapshot facility that does not require reserved space for replays and snapshots. It uses pages from the global pool of free space for replays that help eliminate the read and write penalties associated with copy-on-write snapshot capture operations, which is often the case with static storage (see the sidebar, “Dynamic snapshots”).

Sizing replay space is an important consideration when designing a storage infrastructure for enhanced performance. The daily rates of change and the replay retention period are two key factors that can determine the disk space consumed by replays. In the test runs, the Exchange mailbox server database volumes were configured for daily replays and seven-day retention (see Figure 2).
Data management and protection

Dynamic snapshots
Mission-critical messaging applications generate ever-increasing amounts of data, but organizations today cannot afford any downtime for messaging platforms such as Microsoft Exchange Server. Dynamic Exchange environments require application-consistent snapshots to help ensure accurate and complete restore points in the event of data corruption or system failure.

Dell Compellent Replay Manager™ snapshot consistency software helps Exchange administrators avoid time-consuming manual recovery operations, ensure governance using automated Microsoft Windows PowerShell™ scripting, and augment approaches to data center backup with a granular Exchange recovery process.

Replay Manager seamlessly integrates with Microsoft Volume Shadow Copy Service to quiesce I/O between the Exchange server and storage volumes. It takes space-efficient storage area network (SAN)–based snapshots of Exchange data without taking the application offline. And instead of depending on full volume clones to back up server applications, Replay Manager leverages Compellent Data Instant Replay to enable space-efficient, point-in-time copies of Exchange data sets. For more information, visit qrs.ly/uq1p6zz.

<table>
<thead>
<tr>
<th>Replay date and time</th>
<th>Replay size as a percentage of total used capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 3 10/01/2011 12:01:08 am</td>
<td>7.31%</td>
</tr>
<tr>
<td>Day 2 09/30/2011 12:01:09 am</td>
<td>8.48%</td>
</tr>
<tr>
<td>Day 1 09/29/2011 12:01:09 am</td>
<td>6.86%</td>
</tr>
</tbody>
</table>

Figure 2. Data replays on Exchange mailbox server database volumes

For the Exchange server workload profile, the size of each daily replay was generally less than 10 percent of the total used volume space. The active replay uses tier 1 capacity until a replay is taken to capture the changes. Depending on the rate of change and the daily replay space used on tier 1 storage, capacity requirements for tier 1 storage can be affected. Because replay space is allocated from the general page pool, there is no need to pre-allocate space for replays. Dell Compellent Enterprise Manager displays the per-tier volume space used and shows the breakdown of total, historical replays and the active replay. Through additional tests, daily replay data consumed less volume space for less-active workload profiles as would be expected.

Flexible capacity sizing for changing needs
Microsoft Exchange Server 2010 data store, schema changes, and performance improvements allow for practical large mailbox sizes—1 GB and higher. Additionally, Exchange Server 2010 made the elimination of personal archives possible by introducing archive mailboxes that help improve data recoverability, protection, accessibility, performance, compliance, and user productivity. When deploying Exchange Server 2010 on traditional storage platforms, sizing efforts revolve around meeting I/Os per second (IOPS) requirements for peak times and capacity requirements for the entire lifespan.

For example, one scenario to consider is the performance and capacity requirements for an Exchange Server 2010 deployment of 5,000, 2 GB mailboxes, each sending and receiving 150 messages per day. Traditional storage array architectures require having to size for capacity and overhead requirements up front for the entire life cycle of the deployment. This scenario accounts for the intended size and performance requirements of the database, the dedicated restore logical unit (LUN) capacity, and capacity for maintenance operations plus 20 percent capacity and performance headroom. For this example, the configuration of drives and RAID types shown in Figure 3 would be required.

Using Dell Compellent Storage Center arrays and Dell Compellent Data Progression, sizing the entire mailbox capacity is not necessary in this scenario. Data Progression allows for performance and capacity to be expanded as the mailbox database grows, helping eliminate up-front disk capacity procurement. Accounting for maintenance operations, the assumed capacity afforded by the disks and RAID configuration shown in Figure 4 could support 20 percent of the fully populated mailbox databases. In this case, avoiding up-front disk capacity procurement represents a 300 percent initial cost reduction in disk expenditures for tier 1 storage alone.¹

¹ Cost reduction may vary based on the selected application and hardware.

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Dell Compellent Dynamic Capacity™ software. Dynamic Capacity allocates storage automatically only when data is written to disk. By creating virtual volumes that are much larger than available disk space, unused physical storage space stays available for all volumes on a demand basis and provides enhanced savings in power and cooling through efficient use of storage resources. As storage needs grow over time, additional resources can be seamlessly added without downtime.

Within the Compellent Storage Center environment, new mailboxes are thin provisioned by default and grow over time. Additional capacity can be added as needed to offload replays and aging data from tier 1 storage. High-capacity, low-cost tier 3 storage can be used to offload historical data, creating room for incoming writes to tier 1 storage over time. As replays age and expire, tier 3 storage capacity is freed to absorb more recent replays and inactive data from tier 1 storage.

In the Exchange Server 2010 workload simulation, a tier 3 to tier 1 capacity ratio close to 70:30 was required for typical profile deployments, providing significant cost-effective results. The flexibility to add disks to support capacity and/or performance as needed is the foundation for a scalable, resilient, and cost-effective approach to storage for Exchange Server 2010.

**Comprehensive, adaptable storage management**

Enterprises now have a practical, cost-effective way to address ever-expanding volumes of messaging and collaboration data generated by heightened use of mission-critical applications such as Microsoft Exchange Server 2010. Many IT organizations implement approaches to sub-LUN tiering to meet the demands of these applications. However, every approach in this area has not been architected from the ground up for the flexibility, scalability, and automation needed to support high-performance storage. Dell Compellent Storage Center storage arrays are designed to utilize the Dell Fluid Data architecture to provide ongoing awareness of all storage pages in the entire system. Continuous awareness offers organizations the flexibility to achieve an optimal balance between performance and cost.

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**Learn more**

Dell Compellent for Exchange: qrs.ly/gw1p8g3

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2 Cost reduction may vary based on the selected application and hardware.