Virtualization

Technology forms a front line of defense when enterprises require continuous availability for business-critical applications and data. As a result, IT efforts are intensifying to establish protection from sudden disruption or downtime in mission-critical applications such as e-mail, Internet presence, enterprise resource planning (ERP), and customer relationship management (CRM). Although high-availability clustering provides local protection, critical applications also require geographical protection. And the stakes for preserving business continuity are high: among organizations that experience a major loss of business data, a significant number face critical problems and only a few are able to overcome them.

The first step in creating a business continuity plan is to identify critical applications and functions that must be protected. Next, organizations delineate the recovery time objective (RTO), which specifies the maximum allowable time to restore each critical process. Then, they define the recovery point objective (RPO), which targets the maximum acceptable amount of data at risk of loss after an adverse event occurs. Time to data (TTD) is the time required for retrieving backup data and delivering it to the recovery site.

RTO and RPO are key measures that drive the configuration of a disaster recovery implementation, which also affects its cost. Figure 1 shows the relationship among RTO, RPO, and TTD.

Implementing automated replication for cost-effective disaster recovery

By Fabian Salamanca and Javier L. Jiménez

Dell™ Advanced Infrastructure Manager (AIM) software and Dell Compellent™ storage together help create a reliable disaster recovery platform that supports multisite replication and optimizes business continuity cost-effectively.

Dive deeper: Multisite replication

A successful business continuity plan helps ensure availability of business-critical applications. Download this Dell technical white paper, and discover how Dell AIM and Dell Compellent storage provide an efficient disaster recovery platform using multisite replication.

dell.to/s9UZI0
Reduced RTO and RPO can translate into an enhanced business continuity response and a cost-effective disaster recovery implementation.

One approach to creating a cost-effective business continuity deployment leverages Dell Advanced Infrastructure Manager (AIM)—a component of the Dell Virtual Integrated System (VIS) portfolio— together with Dell Compellent Storage Center™ storage area network (SAN) arrays. This architecture is designed to provide reliable data replication, OS image integrity, and fast workload migration. The example configuration described in the section “Efficiently implementing disaster recovery” deploys Fibre Channel for OS image and data access, IP and Ethernet networks for long-distance wide area network (WAN)–based replication using Internet SCSI (iSCSI) connectivity, and AIM to manage the provisioning of workload identities and network configuration.

**Flexibly managing recovery and workload mobility**

Dell AIM helps IT organizations build a next-generation data center by providing rapid workload mobility and recovery management across physical and virtual machines in heterogeneous environments. IT administrators can deploy AIM to create a cost-effective IT infrastructure that easily changes—physically and virtually—as circumstances demand. It helps increase IT asset utilization, can recover services quickly if problems occur, and enables services to be scaled rapidly to support business needs.

AIM creates a dynamic and flexible cable-once data center infrastructure by coordinating end-to-end network, storage, and computing resources. AIM captures workload images—persona—in central storage that include the OS, the optional AIM agent software, application software, and storage and networking settings—including either iSCSI or Fibre Channel—and other settings for running an application on either a virtual or a physical server. Included persistent identification settings help ensure the persona has access to the same resources no matter what changes may occur in a data center managed with AIM.

AIM network-booted personas can boot on any validated resource, and AIM helps ensure that whichever resource is running the persona, that resource has the required network and storage access. For example, at any given time a network-booted persona can be running on a physical server, such as a Dell PowerEdge™ R610 rack server, and after business hours it can run on either a VMware® virtualization–based or a Microsoft® Hyper-V™–based virtual machine to help reduce power consumption and cooling costs. This dynamic capability enables the workload to use low-cost hardware or virtual machines when the load is expected to be low and retarget to high-performance resources when the load is expected to be high.

All data related to a network-booted persona resides on a SAN, leveraging the integrated management functionality associated with SANs. If a network-booted persona resides within a Dell Compellent virtual storage array, for example, it can benefit from the Dell Fluid Data™ architecture, using Dell Compellent Data Instant Replay™ software for backup and recovery and Dell Compellent Remote Instant Replay™ software for long-distance replication. AIM provides an open approach that works with many data center assets and allows IT organizations to leverage existing investments for increased return on investment (ROI).

**Intelligently managing and replicating enterprise data**

Using Dell Compellent storage helps administrators actively and intelligently manage enterprise data throughout its lifecycle, enabling organizations to constantly adapt to changing conditions. Together, the Dell Fluid Data architecture, storage virtualization, intelligent software, and modular hardware enhance IT efficiency, simplicity, and security for enterprise storage. Built-in intelligence and automation help ensure data is available when and where it is needed, and an open, persistent hardware platform scales in line with business needs to help protect long-term storage procurements.

Leveraging Remote Instant Replay for Dell Compellent array replication across multiple sites helps reduce the cost and complexity of replication while redefining backup and recovery. Because this approach is designed to keep all locations active, IT organizations can maximize utilization—enabling even legacy and entry-level systems to be leveraged as appropriate.

**Efficiently implementing disaster recovery**

Together, Dell AIM and Dell Compellent storage offer rich complementary features that form a cost-effective foundation for...
business continuity planning. At the Dell Customer Briefing Center in Mexico City, Mexico, and the Dell Solution Center in Round Rock, Texas, Dell engineers configured a simulated disaster recovery scenario comprising two sites that support production operation of workloads, replication, and disaster recovery. The main site ran a persona using the Red Hat® Enterprise Linux® 5 64-bit OS on a Dell PowerEdge R610 server that was booting from a Dell Compellent Storage Center SAN. The volume containing the persona was replicated to the disaster recovery site in Dell Compellent Remote Instant Replay. Both sites were connected using a Layer 3 network using Dell PowerConnect™ 6224 switches.

Following a simulated disaster, the replicated data for the volumes was promoted to boot volumes on the disaster recovery site; AIM then configured the persona to boot on a VMware ESX 4.1–based virtual machine. The configuration at both sites consisted of the following components:

- ESX virtual machine running Dell AIM release 3.4.1
- Dell Compellent Series 40 controller
- A 3.5-inch Serial Attached SCSI (SAS) drive enclosure
- Dell PowerConnect 6224 switch for LAN and WAN access
- Brocade SilkWorm 300 Fibre Channel switch

Enterprise Manager software in the Dell Compellent Management Suite can be used to implement Remote Instant Replay in a disaster recovery environment. The disaster recovery scenario was designed to meet replication requirements for a comprehensive Remote Instant Replay configuration. Note: By default, data is replicated from the source volume to the lowest storage tier of the destination volume.1

The persona that represents the workload must be created at both sites; it runs the Red Hat Enterprise Linux 5 64-bit OS, and Fibre Channel access is configured using the direct SAN access option in AIM.

Administrators can implement SAN zoning using the World Wide Name (WWN) of the host bus adapter (HBA) that is assigned to the persona.

At the remote site, the persona was configured to boot using an iSCSI image; as a result, there is no need to use the exact same hardware that is used at the main site, and for this scenario there was no need to use Fibre Channel hardware at the remote site. At the main site, the persona runs on a physical PowerEdge R610 server, whereas at the remote site a server running ESX 4.1 is used to boot the persona on an AIM-managed virtual machine.

Easily testing a disaster recovery process
To simulate a failure at the main site, either the server can be powered off or the persona can be stopped from the Dell AIM console. The first step following the disaster or failure is to get to the data restoration point (see Figure 1). Administrators can use the Instant Validation and Recovery Wizard to recover the Dell Compellent array volume from the replicated data.

To tackle the RTO issue, administrators can use AIM to easily implement a disaster recovery script. For example, a generic command-line interface (CLI) wrapper and AIM shell script will simplify the development and execution of AIM CLI scripting, and a separate text file including AIM-related commands is the only input necessary for this wrapper (see Figure 2).

Because several tools available to administrators can be used to implement similar functionality, AIM can be integrated with several open platforms. The output in Figure 3 shows execution of the disaster recovery script.

Although this script represents a simple start persona, additional tasks can be included to restore the operating environment of a

---

1 For more information about replication requirements when using Enterprise Manager to replicate volumes between Dell Compellent Storage Center arrays, see chapter 9, “Managing replications,” in “Storage Center Enterprise Manager user guide,” Revision B, Dell Inc., April 2011, support.dell.com/support/edocs/systems/compl_em/en/em_em_userpdf.
production workload. For example, test and development environments can be gracefully shut down to make room for business-critical applications that require the additional compute capacity. In addition, creating, configuring, and virtually cabling new networks can be automated before starting hundreds of personas, which can follow a specific order to correctly sequence the start of dependent workloads.

**Cost-effectively automating disaster recovery**

Because RTO is related to the processes required to restore operations after data has been restored, Dell AIM helps reduce this target by automating and validating tasks related to resource management, synchronization of virtual and physical resources, workload assignment, networking configuration, and storage access. Enterprise Manager software in the Dell Compellent Management Suite provides an easy, wizard-driven approach to replication and disaster recovery that helps administrators manage the RTO target. RPO can benefit from advanced Dell Compellent storage features such as replication, deduplication, bandwidth simulation, and bandwidth shaping.

Together, AIM and Dell Compellent storage help simplify the disaster recovery process and optimize RTO and RPO targets. The architecture offers a cost-effective and efficient foundation for business continuity in environments that simply cannot allow disruptions in the ongoing availability of business-critical applications.

AIM can also impact data centers well beyond application availability. By providing a single management interface for the entire infrastructure, AIM helps dramatically reduce IT staff workload. When combined with other components of the Dell VIS portfolio, such as Dell VIS Creator, IT organizations can be increasingly responsive to end-user needs and help them automate routine processes—enabling IT staff to focus on innovative projects.

**Authors**

Fabian Salamanca is a sales engineer in the next-generation computing solutions domain at Dell.

Javier L. Jiménez is a systems principal engineer at Dell focusing on next-generation computing solutions and the VIS portfolio.

**Learn more**

Dell Advanced Infrastructure Manager: dell.com/aim

Dell Compellent Storage Center: dell.com/compellent