

# DELL™

A Dell Technical White Paper

## Unified Server Configurator: IT and Systems Management Overview

By Shelli Allgood, Anand Narayanan, Hai Phung, Pritesh  
Prabhu and Ganesh Viswanathan



## Unified Server Configurator: IT and Systems Management Overview

THIS WHITE PAPER IS FOR INFORMATIONAL PURPOSES ONLY, AND MAY CONTAIN TYPOGRAPHICAL ERRORS AND TECHNICAL INACCURACIES. THE CONTENT IS PROVIDED AS IS, WITHOUT EXPRESS OR IMPLIED WARRANTIES OF ANY KIND.

© 2008 Dell Inc. All rights reserved. Reproduction of this material in any manner whatsoever without the express written permission of Dell Inc. is strictly forbidden. For more information, contact Dell.

*Dell*, the *DELL* logo, and the *DELL* badge are trademarks of Dell Inc.

# Table of Contents

- Introduction .....2
- Unified Server Configurator Components and Architecture .....2
  - Figure 1: Unified Server Configurator Network Settings Screen .....3
  - Figure 2 Unified Server Configurator Update Repository Selection Screen .....4
- Unified Server Configurator Features.....4
  - Figure 3: Unified Server Configurator Main Menu .....5
- Intelligent and Efficient Updating Process.....5
  - Figure 4: Platform Update process .....6
  - Figure 5: The available updates are auto-detected .....7
- Operating System Deployment.....8
  - Figure 6: Flowchart displaying Unified Server Configurator’s OS install process .....9
- RAID Configuration .....10
  - Figure 7: Flowchart of Unified Server Configurator’s RAID configuration process.....11
- Embedded and Easy to Update Diagnostics .....11
  - Figure 8: Unified Server Configurator Diagnostic function.....12
- Unified Server Configurator Repair and Recovery.....12
- Summary.....13

## Unified Server Configurator: IT and Systems Management Overview

### Introduction

Systems management has typically been a key part of the IT administrator's job. Being able to install an operating system, updating firmware to satisfy function and policies requirements, configuring devices and getting the most out of an IT network are integral aspects of this role. Over the years, Dell™ has provided many tools to assist the administrator. Starting with tools such as DSA, Systems Build and Update Utility, and DTK that shipped on multiple CDs, Dell then developed a single software tool DVD, *Systems Build and Update Utility*. Storing, retrieving, and using these multiple disks in their many versions has, however, had an increasingly negative impact on Customer Experience.

As a clear response to these problems, Dell now provides the Lifecycle Controller, a flash chip embedded on the system itself with the Dell Unified Server Configurator application (USC). The Lifecycle Controller allows the IT administrator to dispense with media altogether, allowing operating system deployment with local embedded driver repositories, firmware updates, hardware configuration, and platform specific diagnostic routines. Since the USC is available even when the operating system is not functional or even installed, it allows added flexibility in provisioning the system and customizing it to suit the customer's requirements. Additionally, since the tool is integrated and embedded, formatting or a reinstalling the operating system does not remove the tool, thus saving the administrator significant time and money.

### Unified Server Configurator Components and Architecture

With the introduction of the latest PowerEdge Servers, Dell now offers Embedded Management, which dramatically reduces the time it takes to perform several common management tasks. Embedded Management is comprised of several interdependent components, including Lifecycle Controller and the Unified Server Configurator interface.

The Lifecycle Controller is a flash chip embedded in the system itself providing persistent, tamperproof storage for systems management components. These components include, but are not limited to: system BIOS, firmware, drivers, OpenManage Tools. Users can access these components through the Unified Server Configurator interface, also stored on the Lifecycle Controller.

The Unified Server Configurator's (USC) main features include operating system deployment, firmware updates, hardware configuration, and diagnostics. The tools suite allows the administrator to perform a complete set of provisioning functions from a single interface. This paper will provide information on the functionality available through the Unified Server Configurator interface.

At an architectural level USC runs in the Unified Extensible Firmware Interface (UEFI) environment. The UEFI specification was created to allow for replacement of an aging system BIOS, but has come to provide create framework for many powerful applications that run without an operating system. The UEFI specification includes the Trusted Computing Group (TCG) protocol that allows for Trusted Platform Module (TPM) measurements and secure updates which USC leverages to its fullest extent. Additionally UEFI, and as a consequence USC, has a well-evolved network stack and a stronger point and click graphical environment that makes user interaction much easier. USC is thus much more powerful and easier to use compared to other pre-operating system tools available in the market.

Network support within the USC application allows the user to configure the embedded network interface either to obtain an IP address through DHCP, or to configure the settings statically. Built-in support for DNS and DHCP

## Unified Server Configurator: IT and Systems Management Overview

make this pre-operating system a powerful environment. Additionally the application environment provides support for text-based and SOCKS Version 4 proxies through its interface, allowing customers to connect to the network through their proxy servers, and providing secure downloads to the system. See Figure 1 for a screen shot of the Network Settings screen within the Unified Server Configurator.

Figure 1: Unified Server Configurator Network Settings Screen

The screenshot displays the 'Network Settings' screen in the Unified Server Configurator. The interface is dark-themed with a sidebar on the left containing 'Language & Keyboard' and 'Network Settings'. The main content area is titled 'User Settings (Step 2 of 2)' and 'Network Settings'. It instructs the user to 'Select the Network Interface Card (NIC) to configure for use with ApplicationName.' The 'NIC Card' dropdown menu is set to 'eth0'. Below this, it asks 'How would you like to set the IP address for this NIC card?' with the 'IP Address Source' dropdown set to 'DHCP'. Under the 'Static IP Properties' section, there are four input fields: 'IP Address', 'Subnet Mask', 'Default Gateway', and 'DNS Address'. At the bottom of the screen, there are three buttons: 'Back', 'Finish', and 'Cancel'. The top left corner shows the Dell logo and 'UNIFIED SERVER CONFIGURATOR', and the top right corner shows 'Lifecycle Controller enabled' with a help icon. The bottom left corner indicates 'UEFI v2.1'.

USC also comes with a pre-packaged task scheduler to allow for batching up of updates. This batch processor, the System Services Manager (SSM), is automatically invoked when the user requests multiple updates. The intelligence in the SSM allows it to defer reboots, reducing the number of reboots required to perform the updates. Additionally, the SSM provides a method for operating system-based Dell update packages to be applied in a synchronized way; updates are scheduled securely on the SSM for execution on next boot up.

## Unified Server Configurator: IT and Systems Management Overview

Figure 2 Unified Server Configurator Update Repository Selection Screen

**DELL** UNIFIED SERVER CONFIGURATOR Lifecycle Controller enabled ?

Platform Update (Step 1 of 2)  
Select Update Repository

Select the location for the repository that contains the update catalog and packages. The repository can be located on a USB device or on a File Transfer Protocol (FTP)

Repository Location

FTP Server

Address

Proxy Server

Proxy Port


Proxy Type

Proxy User Name

Proxy Password

USB Device

UEFI v2.1 Back Next Cancel

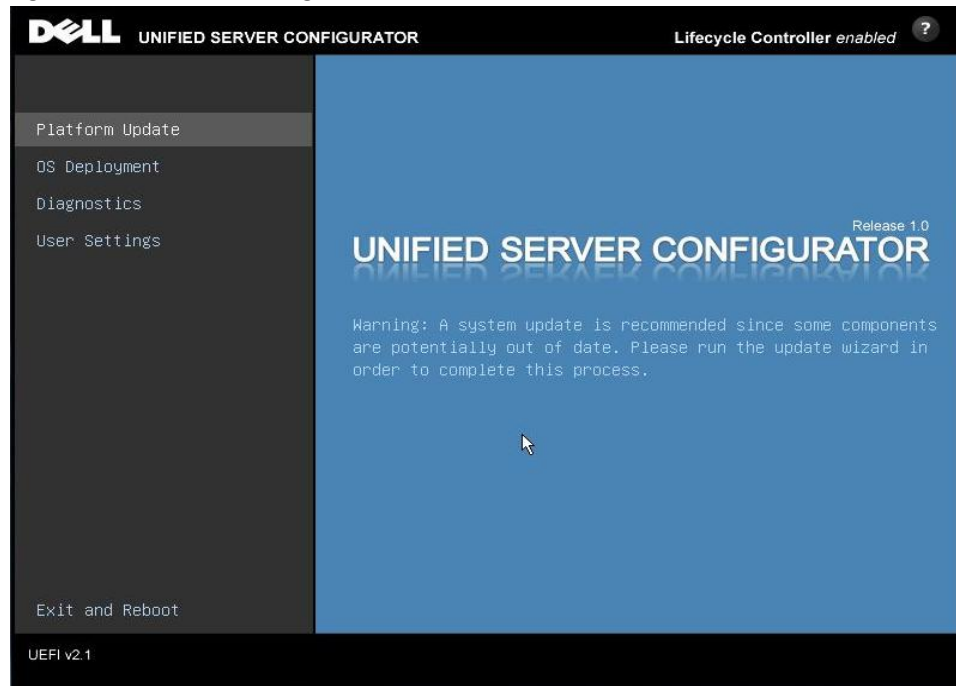
Finally, the USC comes with context sensitive help. The user can access immediate and relevant help for the current screen by clicking the  button.

### Unified Server Configurator Features

The USC offers a single access point for several common system management functions. Because the USC is managed by the embedded iDRAC flash sub-system and run under the UEFI environment, it is not necessary to boot to the OS to run the USC. Boot the system and press <F10> to launch the USC to access the main menu screen in Figure 3.

## Unified Server Configurator: IT and Systems Management Overview

Figure 3: Unified Server Configurator Main Menu



Main Menu Option	Description
Platform Update	Update and keep system firmware or BIOS at the current level
OS Deployment	Install the OS with all necessary device drivers
Diagnostics	Perform hardware specific diagnostic tests
User Settings	Configure language and network settings

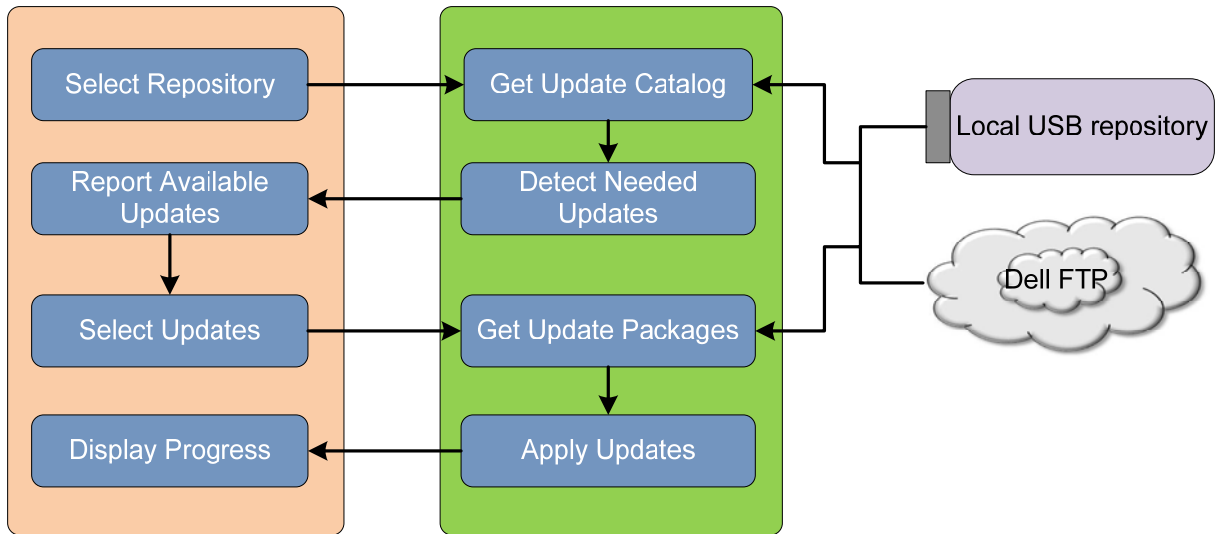
### Intelligent and Efficient Updating Process

Platform Update enables the user to maintain system firmware, Diagnostics, BIOS or system drivers at the most current level, thus maximizing system performance and avoiding unnecessary outages. It is a more secure and convenient process because it operates under the UEFI environment before the operating system loads or is even installed. Platform Update works on all supported servers independent of the installed operating system.

Unified Server Configurator's update process allows the system to be updated from either platform local USB port or a network repository. This flexibility improves the efficiency of the update process when there is network congestion. Upon selecting the update repository, the USC will automatically detect any necessary updates and allows the user either to manually select specific components to update or performs all the system updates identified. See Figure 4 below for the steps in the Platform Update process.

## Unified Server Configurator: IT and Systems Management Overview

Figure 4: Platform Update process



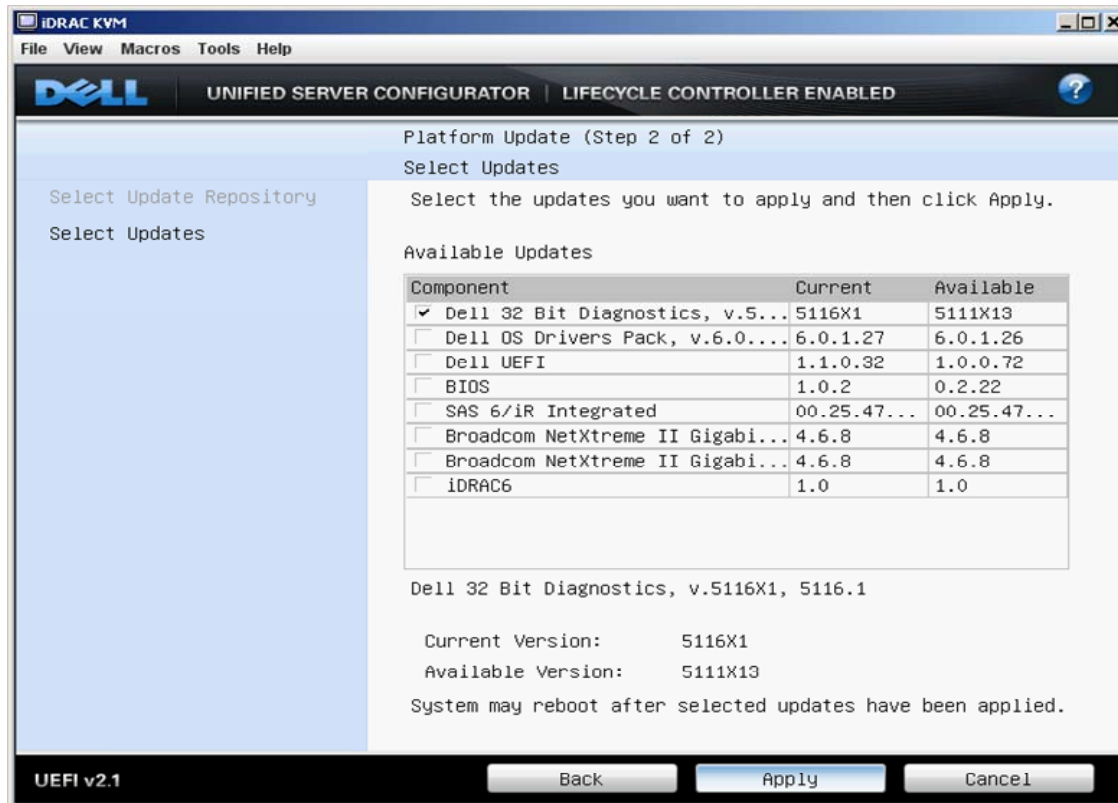
The inventory process starts immediately after the system boots to the USC or after the updating process has completed. It collects and records the current level of system and subsystem firmware to the system Life Cycle Log (LCL). The user is no longer required manually to determine either what has been updated on the system, or the current level of the firmware or BIOS of the system.

Using the data from the LCL, the update process automatically detects the available updates from the provided repository. The process displays the data in a side-by-side table format, showing the current level versus the available level (see Figure 5). By default the update process automatically upgrades all of the components. Alternatively, the user can manually select specific components for upgrade.



## Unified Server Configurator: IT and Systems Management Overview

Figure 5: The available updates are auto-detected



All updates are applied to the system from a central processor known as the System Service Management (SSM) batch processor. Once selected from the comparison report table, the update is registered into the System Service Information Block (SSIB) task list. The SSM processes and executes the task from the SSIB task list. Using the SSM and the SSIB, the process provides greater standardization, consistency, and synchronization throughout the update process.

The purpose of the system update is to keep the system as current as possible, preventing unnecessary down time due to system failures. However, the update process itself can cause significant down time due to most updates requiring a reboot to take effect. As a result, several reboots may sometimes be necessary, causing considerable disruption.

Taking this issue into consideration, the USC update process is designed to minimize the number of reboots by using the update catalog combined with the parameters in the SSIB task list. Unless an update requires an immediate reboot, all reboots are accrued, and the system reboots only once after all updates are completed.

Security is an important consideration to any user, and the update process is designed to ensure both system and data are well protected. The update process uses multiple layers of security validation:

- Data from the outside is stored temporarily in non-volatile storage. The data is then validated using Dell's private key signature to prevent intrusion of contaminated data from outside sources.
- Access control is restricted on the USC, and USC partitions are opened as read only. Only authorized programs are allowed to open the partitions as read/write.
- Only validated data is staged in the USC for application to the appropriate components.

## Unified Server Configurator: IT and Systems Management Overview

- The local repository storage card can be disabled or removed if the Platform Update feature is not required

The update process provides several benefits beyond those available using current tools:

- *Simplified system management experience and greater standardization.* The update process operates from a single point in the pre-OS and under the UEFI environment, which is independent of the running OS and works on all supported servers.
- *Media-less operation.* The update functions are immediately available by booting the system and pressing one keystroke; no external media is required for the update process, eliminating entirely the time required to find the CD, burn the CD, or deal with faulty optical drives or media.
- *Secured process.* The system and data are protected by multiple layers of security validation.
- *Increased automation and efficiency.* The install inventory quickly provides a snapshot of the current updates and level of the system at any given time, eliminating any manual assessment. Available updates are automatically detected and updated without requiring specific user knowledge.
- *Reduced downtime.* The number of reboots is minimized during the update process. Furthermore, since the update process runs in the UEFI environment, the boot time on the system is reduced, eliminating the need to load a fully running operating system.

## Operating System Deployment

The Operating System Deployment wizard assists the user in installing an operating system on the current system. When booted into the USC, the user can choose the “Deploy OS” top-level feature and he is then directed to a wizard that assists in installing the operating system.

If the server has a RAID controller, the user may launch the RAID Configuration wizard and configure a virtual disk as the boot device. If the server does not have a RAID controller, the OS Deployment wizard bypasses the RAID configuration option. See the next section for more information on this feature.

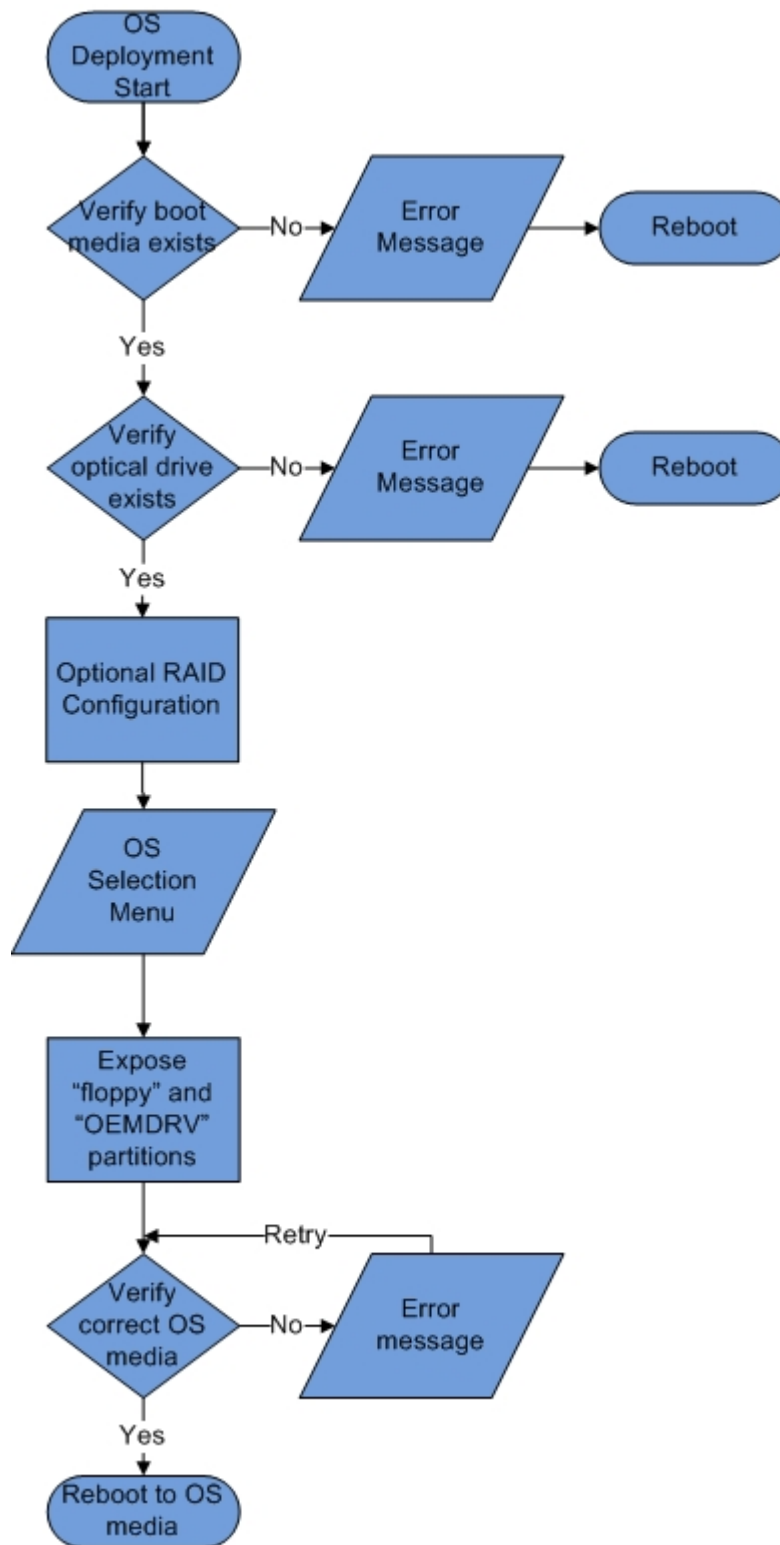
Once the user chooses the operating system to install, the USC assists the installation of all supported operating systems, and provides any drivers that are required for operating system installation. The OS Deployment wizard extracts the appropriate drivers and copies them to staging directory. For systems running Microsoft® Windows®, these extracted drivers are installed during operating system installation. For systems running Linux, the user must install the extracted drivers manually after operating system installation is complete. Dell recommends that the system is updated with the extracted drivers following operating system installation.

After the drivers are extracted, the USC prompts the user to insert the operating system installation media and then verifies the media contents, then clicks **Finish** and reboot the system. Upon reboot, the system boots to the operating system installation media. See Figure 6 for a flowchart of the operating system installation process.

**NOTE:** It is recommended that the Platform Update wizard is run before operating system deployment to ensure the presence of the most current drivers. This ensures that the customer does not install an outdated driver, and does not have to run a post-OS DUP to refresh the drivers installed during the operating system deployment process.

## Unified Server Configurator: IT and Systems Management Overview

Figure 6: Flowchart displaying Unified Server Configurator's OS install process



Benefits include:

## Unified Server Configurator: IT and Systems Management Overview

- **No media requirement**—The USC is media-less. Customers do not need an additional CD or DVD in order to complete operating system deployment.
- **OS installation is native and flexible**—The USC uses the native installers provided by operating system installation media making the installation procedure flexible and extensible to future versions of native installation wizards released for supported operating systems.

Leveraging the iDRAC6 Virtual Media redirection feature, a .ISO image or physical disk can be remotely mounted and presented as a operation System install CD further enabling flexible, remote diskless system management

- **Drivers are updatable**—The drivers carried by the USC are updatable using the Platform Update Feature (see previous section). No manual process required to find out the current version of the drivers.
- **Drivers can be used for the 1:n OS provisioning environment**—The drivers carried by the USC are exposed on a USB drive and can be shared across a network so that they can be used to provision multiple servers. This feature greatly reduces the overhead of setting up multiple servers and enables 1:n OS deployment.
- **Drivers can be copied easily and plugged into the operating system provisioning framework.**

### RAID Configuration

As mentioned in the OS Deployment section, if the server has a RAID controller, the user may choose to launch the RAID Configuration wizard and configure a virtual disk as the boot device. See Figure 7 for a flowchart of the RAID configuration process

If the user chooses to configure RAID, the RAID Configuration Wizard guides the virtual disk creation process. The first screen of the wizard, **View Current Configuration**, shows the user a list of current controllers and virtual disks resident in the system. The user may determine that the virtual disk(s) already exist and exit the wizard to continue with operating system installation, or choose to continue with new virtual disk creation process.

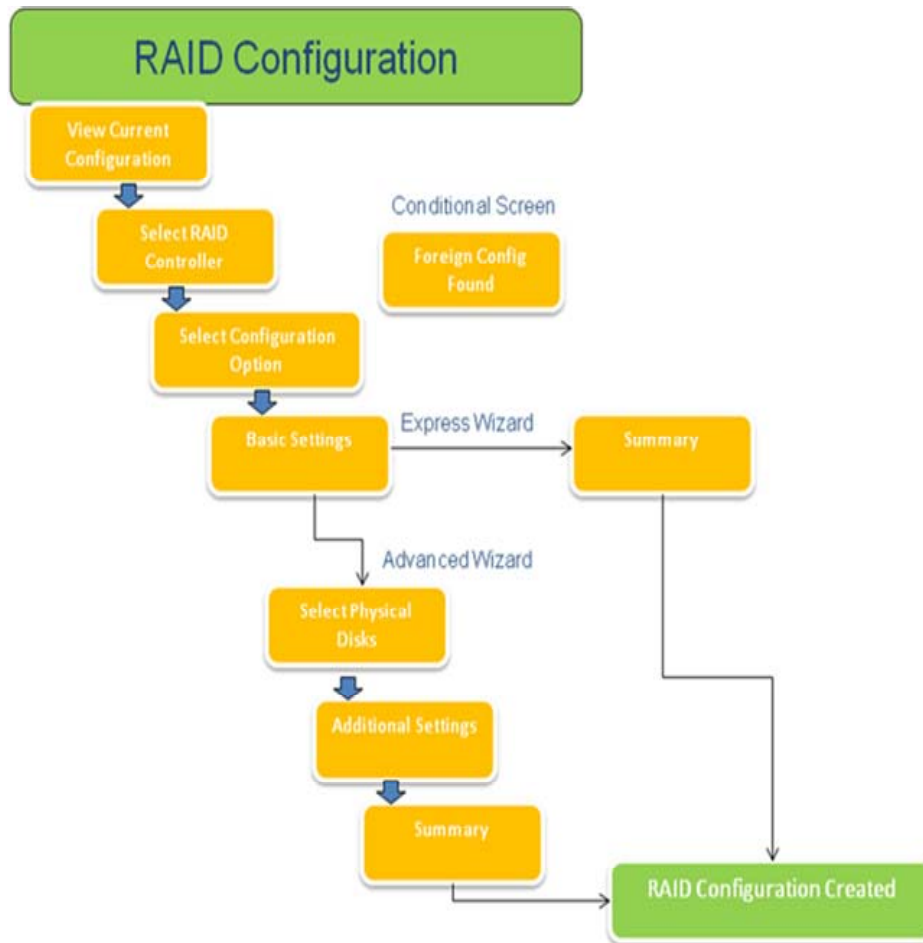
The next screen, **Select RAID Controller**, allows the user to select the controller on which to configure a virtual disk.

Following the **Select RAID Controller screen**, the user is directed to the **Foreign Configuration Detected** screen if the selected controller contains a foreign configuration. A foreign configuration is a set of disks that contain data from another computer or previous configuration. Depending on configuration, the user will have the option to either **Clear** or **ignore** the foreign configuration. Selecting **Clear Foreign Configuration** will result in the erasure of all data on the drives containing the foreign configuration, thereby allowing the drives to be used in a new configuration. Choosing **Ignore Foreign Configuration** leaves the drives in their current state and uses free drives to create a new configuration.

Next the user is directed to the **Select a Configuration Option** screen. Here the user can choose either the **Express** or **Advanced Wizard**.

## Unified Server Configurator: IT and Systems Management Overview

Figure 7: Flowchart of Unified Server Configurator's RAID configuration process



The Express wizard selects the appropriate disks depending upon the RAID type selected for virtual disk creation, and takes the user to the final, **Summary** screen. The user can then review the choices selected during the Express wizard and click **Finish** to create the virtual disk to be used for operating system installation.

The Advanced wizard takes the user to a series of additional screens. First the user selects the RAID type on the **Basic Settings** screen, and is then directed to the **Select Physical Disks** screen to choose the physical disks that will be a part of the virtual disk. After disk selection, the user is taken to the **Additional Settings** screen to define additional parameters for the virtual disk, such as stripe element size, read and write policy, and whether or not to assign a hot spare disk. Similar to the Express wizard, the user is finally taken to the **Summary** screen to review the selections made during the Express wizard process, and click "Finish" to create the virtual disk to be used for operating system installation.

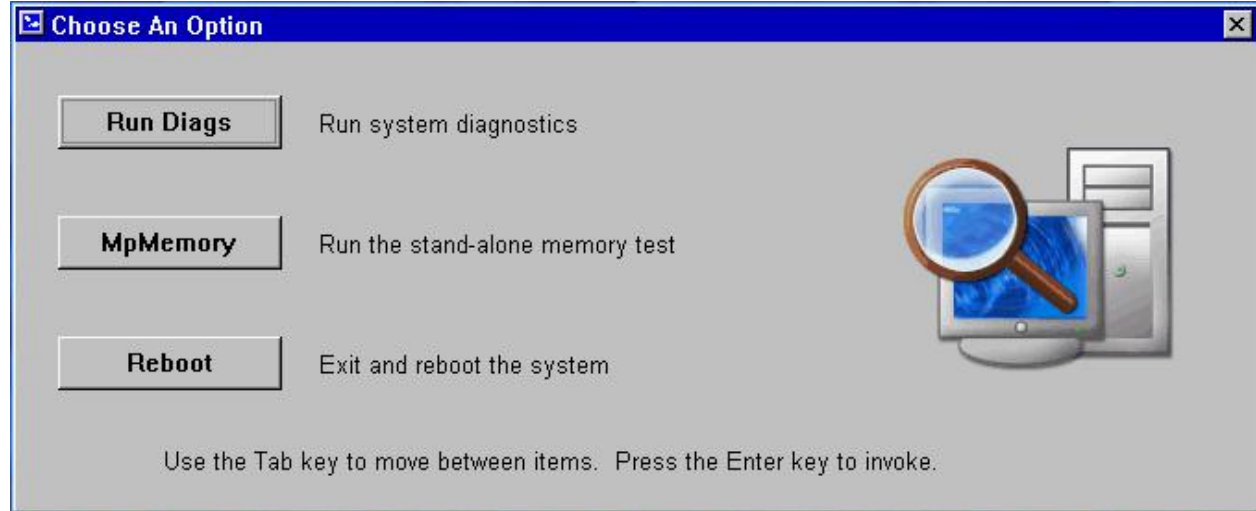
### Embedded and Easy to Update Diagnostics

Diagnostic enables the user to detect the problem on the system hardware and memory problems to reduce the expenses associated with the repair and building of systems. Until now, the user has had to boot to the fixed disk utility partition; or download a utility and create a bootable disk to run diagnostics. With the USC, however

## Unified Server Configurator: IT and Systems Management Overview

diagnostics are stored and run directly from the embedded USC partition. Even systems in a diskless configuration can take advantage of the embedded diagnostics. See Figure 8 for a screen shot of the Diagnostic function within the Unified Server Configurator.

Figure 8: Unified Server Configurator Diagnostic function



Another advantage of having the diagnostics embedded in the USC partition is that the latter can be easily updated from the Platform Update function. The Platform Update process automatically performs the inventory and displays the comparison report table if there is a new version of the diagnostics software available. The update process is secure, and there is no need to reinstall the fixed disk utility partition each time the diagnostics software is updated.

## Unified Server Configurator Repair and Recovery

The USC repair and recovery process restores embedded tools and utilities in the event of a hardware failure or flash memory corruption. Such failures can occur for many reasons, including a power loss or interruption of the USC update process before it has completed. Additionally, this process is used where a faulty motherboard is being replaced. If corruption occurs, then the user will be unable to boot into the USC through <F10> at boot time.

If the message "System service update required" appears upon booting the server, there may be corrupt data on the embedded flash storage, and a USC repair needs to be performed in order to restore USC functionality.

The steps to perform a repair include:

1. Access **support.dell.com** and download the USC Repair Package appropriate to the platform.
2. Connect to the iDRAC using the iDRAC web interface, and log in.
3. Click the **Remote Access** tab on the left.
4. Click the **Update** tab in the right pane.
5. Using the browse menu, select the downloaded USC Repair Package and apply it. The iDRAC will download and deploy the USC Repair Package and restore USC functionality.
6. Reboot the system, enter the USC, and then complete all the mandatory (pre-checked) updates using the Update feature.

Once the process is complete, all USC functionality is restored.

## Unified Server Configurator: IT and Systems Management Overview

### Summary

The USC is a new-generation tool that allows quick and easy access to all system lifecycle management capabilities from a pre-operating system environment. Embedded and integrated into the system, the USC provides customers a quick and persistent way to access this functionality while providing greater flexibility and capabilities. An intuitive user interface, and a point and click environment loaded with features allows the IT administrator to complete his tasks more quickly, thus allowing for greater productivity.

#### Authors:

1. Shelli Allgood is a lead software engineer in Dell Systems Management Software Group in Austin, Texas. Shelli has a B.S. in Computer Science from Baylor University.
2. Anand Narayanan is the software lead for USC and works in the PG software division at Dell. He graduated with a masters in computer science from Texas A&M University and is currently working on his MBA from the University of Texas, Austin. His interests include playing music, soccer and sports of any kind.
3. Hai Phung is a software engineer in Dell System Management Software Group in Austin, Texas. Hai graduated from University of Minnesota in Computer Science
4. Pritesh Prabhu is a software engineer consultant in the Dell Systems Management Software Group in Austin, Texas. Pritesh has an M.S. in Electrical and Computer Engineering from the University of Texas at Austin
5. Ganesh Viswanathan is a software engineer in the Dell Systems Management Software Group in Austin, Texas. Ganesh has an M.S. in Software Engineering from the University of Texas at Austin.