Dell Automated Deployment
Dell Automated Deployment successfully meets the challenges that Dell customers face.

By Jerry Honeycutt
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Abstract
Desktop deployment is disruptive and costly. Dell’s solution—Dell Automated Deployment—addresses the deployment challenges that Dell customers face, making the PC deployment process far easier and more cost-effective than previously possible.
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About Jerry Honeycutt

Jerry Honeycutt empowers IT professionals and technology enthusiasts to deploy, manage, and use popular technologies, including the Microsoft® Windows® and Microsoft Office product families. He frequently publishes technical articles, books, and white papers. He occasionally speaks at public events, and he provides consulting services to businesses around the world. Jerry owns and operates Deployment Forum at http://www.deploymentforum.com/.

As a best-selling author, Jerry has written more than 30 books. His most recent include Windows Vista Resource Kit (Microsoft Press, 2007), Microsoft Windows Desktop Deployment Resource Kit (Microsoft Press, 2004), Introducing Microsoft Windows Server 2003 (Microsoft Press, 2003), and Microsoft Windows XP Registry Guide (Microsoft Press, 2002). Most of his books are sold internationally and are available in multiple languages.

Jerry frequently writes content for a variety of Microsoft product groups and technical centers on Microsoft’s Web site. For example, Jerry has written hundreds of articles and white papers on topics ranging from desktop deployment to Windows Vista. He also writes content for a variety of other technology partners and customers.

In 2000 through 2002, Jerry toured cities throughout the world to teach IT professionals how to deploy the business desktop. These seminars started with best practices for deploying Windows 2000 and Office 2000 and evolved into hands-on workshops where participants deployed Windows XP and Office XP in a lab environment. From 2004 to 2007, Jerry was the content lead for Microsoft's Business Desktop Deployment Solution Accelerator, which is now called Microsoft Deployment.

Jerry often visits corporate campuses to brief companies’ IT professionals about desktop deployment and management practices. Additionally, he has a long history of applying his skills to providing technical leadership to business. He specializes in desktop deployment and management, particularly using the Windows product family. Companies like Sunbeam Products, Capital One, Travelers, IBM, Nielsen North America, IRM, Howard Systems International, and NCR have all leveraged his expertise. He continues writing, training, and consulting to serve the business community.

Jerry graduated from University of Texas at Dallas in 1992 with a Bachelor of Science degree in Computer Science. He also studied at Texas Tech University in Lubbock, TX. See Jerry’s Web site at http://www.honeycutt.com/ or send mail to jerry@honeycutt.com.
Overview

Worldwide, Dell customers face similar PC deployment challenges: Desktop deployment and migration can be complicated and disruptive. A network infrastructure that capably supports daily operations typically cannot handle the increased demands of a deployment. Moreover, deploying to remote branches and employees is problematic because of limited bandwidth and other network constraints.

Many companies don't realize their maximum return on investment (ROI) on operating-system migrations or hardware deployments because predicting and controlling costs is difficult. Deployment is a nonstrategic IT function that requires burst capacity (extra labor and resources required for a short time) that often results in expensive, selective sourcing. In addition, it’s a traditionally labor-intensive process that lacks real innovation. For example, most companies maintain multiple hardware-specific and line-of-business (LOB) images along with hundreds, if not thousands, of applications—all at a high cost. Although tools are available to reduce the time and costs associated with PC deployment, many companies aren't able to take advantage of these tools because they have not fully rationalized their infrastructures.

Dell Automated Deployment addresses the disruptive nature and high cost of PC deployment. It provides a holistic migration solution mapped to customer business requirements—with best-practices program and project management at its foundation. This white paper describes how Dell Automated Deployment addresses these challenges, as well as provides the rationale for each solution.
Customer Challenges

Desktop deployment involves hundreds—often thousands—of PCs, sometimes in distributed locations, and must take place within a short period of time. The nature of these projects presents special challenges, including the following:

- **Management**
  
  Most companies don’t plan PC deployment projects well. Either they take for granted the complexity of the project, or they simply don’t know where to begin. In either case, PC deployment is outside of normal operations, so they’re not familiar with the intricacies of these projects. Also, collecting the asset data necessary to support planning is challenging for companies that don’t already have systems-management infrastructures.

- **Staging and logistics**
  
  PC deployment is logistically challenging for any company. For example, companies must stage images and applications near destination PCs, a process that requires planning, infrastructure, and labor. Also, they must manage the rollout to ensure that it occurs in an orderly manner. Strong logistics demand careful planning, scheduling, and management—all of which are performed better by companies that have experience performing these functions on a daily basis.

- **Image installation**
  
  Companies traditionally install images from a network share, but storing images on the network is costly. First, each image can consume several gigabytes of storage space, and second, companies often replicate images to multiple servers. Synchronizing these image repositories is an ongoing challenge that increases exponentially as images are downloaded across the network to individual PCs, consuming technician time and network bandwidth. Network image installation is difficult to fully automate and usually requires expensive labor to develop customizations and complete configurations post-deployment. Some customers might have Dell load one of their many images in the factory, but this is not optimal—it forces customers to choose a single image during the project’s hardware-ordering phase.

- **Application installation**
  
  Application installation is one of the more expensive tasks in a deployment project. Creating an application inventory, resolving compatibility issues, and repackaging legacy applications are intricate processes. Determining which applications should be installed on a particular PC—and validating license entitlement—is complicated, and automating their installation is a labor-intensive process.
• **User state migration**

User data is the most valuable aspect of the PC; it is fundamentally the reason users have PCs. If users need to restore settings that they can’t remember how to configure, they frequently call support, which results in lost user time and increased support demands. Migrating user settings therefore increases satisfaction and post-deployment productivity, as well as reduces support costs. However, migrating user state data to a network share has similar challenges to image installation (discussed earlier in this list). First, depending on the size of the user state data and the retention time, storage cost can be significant. Second, moving user state data through the network can disrupt bandwidth, and automation of user state migration can be difficult and costly.

• **User support post-deployment**

Support incidents increase significantly during PC deployment projects. Users are unfamiliar with the new computing environment, and they require access to support technicians who can help them return to normal levels of productivity. Therefore, support costs escalate.
Dell Design Principals

Dell Automated Deployment provides solutions for these challenges. It reduces as much as 85 percent of the desk-side labor and logistics associated with deploying a new PC or refreshing an existing PC with a new operating system. Dell Automated Deployment leverages industry-standard and Microsoft technologies—including the Windows Imaging (.wim) file format and Microsoft® Windows® Preinstallation Environment (Windows PE)—for OneTouch installations.

Dell stages images, applications, and automation on new PCs at the factory. Then, Dell Automated Deployment automatically configures the PC, supplemented by the OneTouch interview, for the chosen user profile. To reduce dependencies on onsite labor, Dell Automated Deployment can provide remote monitoring and incident resolution using third-party and Dell remote control technology.

Dell Automated Deployment is based on the following basic principles:

- **Maximize technician multitasking**
  The solution must enable technicians to process many PCs simultaneously. Using manual methods and many interactive methods, technicians must tend to PCs through much of the installation process. Dell Automated Deployment lets technicians begin an installation on one PC and then move on to the next within minutes.

- **Reduce or eliminate network traffic**
  The solution must minimize the impact of installation on network bandwidth. Unfortunately, network bandwidth has not kept pace with the tremendous growth in average image sizes. Image installation and user state migration tools that rely on the network significantly disrupt network usage. Dell Automated Deployment can reduce network traffic from gigabytes per PC to kilobytes.

- **Customize at the destination to simplify logistics**
  To simplify logistics, the solution must bind customizations as late in the installation process as possible. When PCs are customized in staging centers, for example, you lose the flexibility to redirect PCs to other users or adjust the configuration. In addition, logistics can be complex when each PC must be shipped to a specific end user. Dell Automated Deployment customizes PCs at the destination to eliminate the need to manage the delivery of specific PCs to specific users.

- **Automate decisions and manual steps**
  The solution must automate decisions and manual steps as much as possible to provide a self-service process. Accordingly, Dell Automated Deployment can be controlled through profile-based build instructions. If technician input is necessary, the tool collects all required information at the beginning of the process and proceeds with the installation automatically. This process frees the technician to quickly move on to the next PC.
• **Eliminate infrastructure dependencies**
  The solution must minimize infrastructure dependencies that make using the solution in diverse or distributed environments difficult. Deployments that rely on infrastructure can also require changes and investment that might not benefit your day-to-day operations. Because the content superset is staged during the Dell factory build, Dell Automated Deployment does not require or depend on any infrastructure but can integrate with your existing infrastructure, such as systems and change management.

• **Manage remotely**
  The solution must minimize the necessity of onsite labor by using remote management and issue resolution. Occasional problems inevitably arise, and without remote monitoring and control, you must rely on onsite labor to resolve them. Dell Automated Deployment can integrate with third-party technologies to monitor and resolve problems without the cost associated with physically attending to each issue.
Solution Features

Dell Automated Deployment does not require highly skilled technicians to perform the work on site. After setting up PCs, technicians use a specially prepared boot disk to start each PC, answer a few simple questions during the OneTouch interview process, and then move on to the next PC while the installation completes. Dell Services monitors installation so that technicians rarely need to return to PCs on which they’ve already started installations.

The following sections describe high-level solution features. See the section “Tool Features” to learn more about the innovative technology features that differentiate Dell Automated Deployment tools from other deployment solutions.

Data Sources

Dell Automated Deployment configures PCs at the desk rather than at the factory. Doing so simplifies logistics by eliminating the need to target specific users with specific PCs. Instead, technicians can deliver an appropriate PC to the user, and Dell Automated Deployment customizes the PC for that specific user during installation.

Flexible usage of data sources is a key to enabling late customization. At a most basic level, Dell Automated Deployment can prompt technicians for basic information during the OneTouch interview. However, Dell Automated Deployment is an integrated solution that can fully leverage existing data stores to provide installation data, and Dell can help you consolidate or create a new data store for deployment.

Disk Imaging

Dell can design, build, and test operating-system images for deployment or use existing operating-system image files. Image installation can be different depending on the deployment scenario—new PC deployment or an existing PC refresh:

- **Replace PC**
  
  For a replace-PC scenario, Dell preloads the PC images, application packages, and automation tools on the PC at the Dell factory. This is called the content superset. This ultimately allows configuration to occur as late in the process as possible, up to the end user’s desk.

- **Refresh PC**
  
  For a refresh scenario, Dell delivers the content superset on external drives. The PC starts from Dell-created media that begins the deployment automation on the external drive.

Dell’s solution to the disk-imaging challenge prevents using network bandwidth to install PC images. It also eliminates manual configuration on site, reducing deployment time. Dell delivers the content superset, including the disk images, on either an external drive or preloaded on a new PC. Following this methodology prevents network impact during deployment, dramatically reduces deployment time, and scales without cost increase.
Application Loading
Dell stages commonly used application packages within the content superset. Using customer-provided profile data, Dell Automated Deployment matches applications to profiles at the time of installation. Because Dell stages applications within the content superset, installation does not consume network bandwidth. The application install is also much faster than installing from a network. Although Dell Automated Deployment does not require or depend on any infrastructure, it can integrate with existing infrastructure, such as systems management, to load applications should the application packages not be part of the content superset.

User State Migration
User state migration is an important Dell Automated Deployment feature. First, the process migrates users’ data so that they don’t need to recreate important information. Second, users don’t usually recall how to recreate their customizations, so the time spent reconfiguring their PCs is an unnecessary productivity loss, and escalating support costs are an unnecessary expense.

Most deployment solutions rely on the network for user state migration. Before deployment, they save the user state data to a network share, and then restore it after deployment. This process disrupts the network, however, and adds storage costs. Dell Automated Deployment implements user state migration locally, depending on the deployment scenario.

- **Replace PC**

  In replace scenarios, Dell Automated Deployment backs up and restores user state data and settings peer-to-peer. During installation, the technician pairs the source and target PCs as part of the initial setup process. This peer-to-peer connection allows Dell Automated Deployment to perform the user state migration in an isolated fashion but as part of the overall automated scenario.

- **Refresh PC**

  In refresh scenarios, Dell Automated Deployment saves user state data to the external drive that also contains the content superset. As part of the automation, Dell Automated Deployment backs up and restores the user data and settings.

In both cases, user state migration does not depend on network infrastructure. Users’ data and settings are always secure. In replace scenarios, Dell Automated Deployment migrates users’ data and settings peer-to-peer. In refresh scenarios, it stores users’ data and settings locally. Users’ data and settings are never stored in a public location, such as a network share.

Remote Monitoring
Future releases of Dell Automated Deployment will further reduce the necessity of onsite labor by using remote management and exception resolution. Dell Automated Deployment will use Dell remote control technology to monitor and resolve problems remotely. Local technicians will not be required to monitor each installation; instead, they can move on to the next PC with assurances that Dell Services is monitoring the installation. When issues arise, expert technicians will provide end-to-end exception management via remote command centers both within and, optionally, outside the corporate firewall.
Solution Customization
Dell Automated Deployment is highly customizable. Dell can tailor the solution to meet varying requirements by customizing the following deployment elements:

- **Automation**
  Dell engineers can customize the automation in the solution as required.

- **Interview**
  Dell can customize the OneTouch interview to prompt for data that is not in the data store.

- **Data sources**
  Dell can integrate the solution with existing change-management systems for PC build instructions or help you create a new one. The better the solution integrates with the data store, the closer the solution comes to providing a zero-touch deployment.

- **Branding**
  Dell Services can brand the deployment tools with your corporate identity.

Solution Simplicity
Although the challenges a deployment presents are anything but simple, Dell Automated Deployment is designed to standardize and ultimately automate the array of complex steps and decisions associated with deployments. By targeting the key areas highlighted within the Dell Optimization Model, Dell is able to drive down costs, risks, and dependencies while increasing overall customer satisfaction of PC deployments.
Tool Features

Dell Automated Deployment provides a crisp, consistent experience from the beginning of the deployment process to the end. A key reason the solution provides a snappy user interface is that it doesn't rely heavily on script technology; instead, Dell built the tools using compiled code.

Dell Automated Deployment also applies innovative technology solutions to problems that traditionally trouble PC deployment. For example, Dell Automated Deployment helps ensure that the content superset is never stale by synchronizing staged content with updated content. The following sections describe the tool features that differentiate Dell Automated Deployment.

Module Library

Dell Automated Deployment has an extensible architecture that allows Dell Services to add and configure modules to perform common deployment tasks. Example tasks include the following:

- Renaming PCs
- Joining PCs to domains
- Migrating users’ data and settings
- Applying an image

The Dell Automated Deployment module library dramatically accelerates configuration time. It’s more robust and structured than simply scripting deployment tasks, an approach that is error-prone, difficult to quality control, and costly to support. In contrast, the module library is based on a formal plug-in architecture that uses well-known standards. This architecture enables modules to interact with Dell Automated Deployment in a clearly defined way that prevents modules from breaking the overall deployment process. Dell Services builds, tests, maintains, and grows all of the modules for Dell Automated Deployment.
**OneTouch Interview**
When installation begins, the OneTouch interview prompts the technician for information that’s not in the content superset. For example, the OneTouch interview can ask for the user’s name, the domain name, and so on. Figure 1 shows an example screen from the OneTouch interview.

Figure 1. OneTouch interview

**Content Synchronization**
For replace-PC scenarios, Dell Services stages the content superset on PCs at the factory. For refresh-PC scenarios, Dell Services stages the content superset on external drives. Either way, the content superset becoming out-of-date is a risk because Dell Services is likely to update the content between the time it stages the content and the time it performs deployment.
Dell Automated Deployment addresses this issue by synchronizing staged content with updated content during deployment. The OneTouch interview prompts the technician for a synchronization source prior to beginning installation, as Figure 2 shows. Synchronization prevents content from becoming out-of-date by ensuring Dell Services always installs PCs using the latest content.

Figure 2. Content synchronization
Runtime Monitoring
Dell Automated Deployment intelligently monitors tasks for more than just a simple pass or fail status. It also enables Dell Services to specify minimum, expected, and maximum runtimes for each task, as Figure 3 shows. Dell Automated Deployment can then alert Dell Services when tasks fail or are in danger of failing to meet these requirements.

For example, if a task completes quicker than its minimum runtime, the Dell Automated Deployment can notify Dell Services that the task possibly failed. If a task does not complete after its maximum runtime, the solution can notify Dell Services that the task has hung. This layered and proactive exception monitoring allows for management by exception rather than spending time monitoring PCs that don’t require attention.

Figure 3. Runtime monitoring
**Exception Management**
Many deployment solutions fail the entire installation if a single task fails. Dell Automated Deployment doesn’t automatically fail the entire installation. Instead, it notifies Dell Services of the exception, and then it allows the technician to intervene:

1. Dell Automated Deployment notifies the technician, as Figure 4 shows.

![Figure 4. Exception notification](image-url)
2. As Figure 5 shows, the technician has three choices. The technician can resolve the issue and retry the task. The technician can also continue with the next task or roll back to a previous task. After choosing an action, Dell Automated Deployment prompts the technician for information about the exception, including a category and resolution description.

Figure 5. Exception resolution
Dell customers can realize full value from their technology investments by understanding their levels of IT maturity and then determining how to move them to higher levels. To that end, Microsoft defines the Infrastructure Optimization Model for general IT maturity levels, which include Basic, Standardized, Rationalized, and Dynamic. Dell extends this model to the Deployment Optimization Model (DOM) that Figure 6 shows.

<table>
<thead>
<tr>
<th></th>
<th>Basic</th>
<th>Standardized</th>
<th>Rationalized</th>
<th>Dynamic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployment Management</td>
<td>PCs installed individually, no set process</td>
<td>Project managed, standard process and tools</td>
<td>Process managed centrally using quality metrics and knowledge management</td>
<td>Process fully managed using planning and tracking system</td>
</tr>
<tr>
<td>Staging and Logistics</td>
<td>Multiple shipping legs</td>
<td>Central staging with multiple locations</td>
<td>Just-in-time delivery for on-campus workers; staging for remote users</td>
<td>Just-in-time ordering for all PCs from OEM to users</td>
</tr>
<tr>
<td>Image Loading</td>
<td>Departments might delete the standard image upon arrival</td>
<td>Standard core image, scheduled updates</td>
<td>Standard cross-platform image</td>
<td>Standard cross-platform image with department overlays</td>
</tr>
<tr>
<td>Applications Loading</td>
<td>Load from CD</td>
<td>Technician installs from network</td>
<td>Automated electronic software distribution system</td>
<td>User self-installs</td>
</tr>
<tr>
<td>User State Migration</td>
<td>Files copied and settings moved manually</td>
<td>Tool moves files, settings moved manually</td>
<td>Tool moves files and most settings, some manual configuration</td>
<td>Tool moves all files and settings automatically</td>
</tr>
<tr>
<td>Post-Deployment Support</td>
<td>No proactive process</td>
<td>Onsite technician</td>
<td>Less onsite support, more aids, helpdesk, on-call support</td>
<td>Remote issue resolution from command center and online monitoring</td>
</tr>
</tbody>
</table>

**Figure 6. DOM**
The DOM defines the major activities that occur during deployment. Then, the model describes how organizations at each of the four maturity levels perform those activities. The following list describes each of the six activities that Dell defines in the DOM:

- **Deployment management.** Includes the deployment planning and design.
- **Staging and logistics.** Includes purchasing, shipping, storing, and staging PCs.
- **Image loading.** Includes creating, managing, and applying images to new PCs.
- **Application loading.** Includes installing applications on PCs.
- **User state migration.** Includes moving users’ data and settings from their old PCs to their new PCs.
- **Post-deployment support.** Includes support that IT provides to users the first few days after reviewing their new PCs.

Figure 7 summarizes deployment costs, moving left to right through the DOM. Dell worked with IDC to analyze its customers’ deployment costs\(^1\). As a result, Dell understands the structure and costs of each maturity level. For example, the cost saved by moving from the Basic to the Dynamic maturity level is more than $400 per PC. Although IDC research shows that most Dell customers fit somewhere between the Basic and Standardized maturity levels, a customer’s actual savings depends on where that customer fits in the DOM.

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\(^1\) IDC, “Dell PC Deployment Optimization Model,” Randy Perry and Bob O’Donnell, January 2007
Engagement Framework

To help customers better understand their practices and move left to right in the Deployment Optimization Model (DOM), Dell Services created the engagement framework that Figure 8 shows. This engagement framework speeds the adoption of new technology and simplifies the ongoing maintenance and support of existing technology. The Dell optimized deployment strategy is to assess the environment, design solutions to transform processes and technology, implement the deployment via the design, and manage the environment once deployed.

Assess
Strategic guidance to make informed decisions about the scope of deployment requirements and the benefits of an optimized approach.
- Client deployment assessment
- Application compatibility reporting
- Windows Vista readiness assessment

Design
Planning for optimized deployment of customized hardware, including ongoing management and support designed to ensure achievement of business objectives.
- Image build
- Application migration
- Deployment design services
- IT training services

Implement
A managed deployment, delivered on time and within budget, ensuring mitigation of risk, achievement of business objectives, and an enhanced user experience.
- End-user training
- Custom factory integration
- PC refresh or in-place migration
- Support

Management
Lifecycle management of services based on industry best practices, delivering a more stable and responsive service that accurately addresses business needs.
- Application management
- Image management
- Ongoing technology refresh
- Ongoing training

Figure 8. Engagement framework
Summary

How does Dell Automated Deployment compare with other types of deployment solutions? Figure 9 helps answer that question by comparing Dell Automated Deployment to other common deployment methodologies.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Network (Server Based)</th>
<th>Staging Center</th>
<th>Factory Integration</th>
<th>Dell Automated Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible Logistics</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Minimal User Disruption</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Minimal Infrastructure</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Highly Scalable</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Minimal Network Impact</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Supports Remote Users</td>
<td></td>
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<tr>
<td>Supports Branch Users</td>
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<tr>
<td>Supports Last-Minute Changes</td>
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<tr>
<td>Real-Time Exception Management</td>
<td></td>
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</table>

**Figure 9. Deployment model comparison**

Dell Automated Deployment addresses the most important factors that determine the success of deployment. These factors include management, staging and logistics, image installation, application installation, user state migration, and day-after user support. By addressing these factors, Dell Automated Deployment enables faster and more effective adoption of new technology.