

Windows 2000 Deployment Overview at the University of Colorado at Boulder

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ABSTRACT

This paper describes the University of Colorado's Windows 2000 deployment project for the Boulder campus, which is in progress as of this writing. Our department, Information Technology Services (ITS), is the primary computing services provider on the campus and is responsible for this project. The paper discusses our actual deployment project, rather than an ideal one, and considers both the technical and organizational issues that we must address.

KEYWORDS

Windows 2000, deployment, strategic goals, planning, political issues, organizational issues.

1. INTRODUCTION

The University of Colorado at Boulder (UCB) began planning its Windows 2000 deployment in February 1999. Our Information Technology (IT) managers recognized that "it" was coming, and wanted to be well prepared for its imminent arrival. ITS also decided to adopt Windows 2000 early since potentially it would help us achieve many of our IT goals in both academic labs and administrative offices. As a Windows 2000 Rapid Deployment Program (RDP) site, we gained access to Microsoft technical information and consulting, which greatly enhanced our project planning. The benefits appear to outweigh the higher costs that go with aggressively deploying a major new release of an operating system, but there are risks. We have a well established

and complex computing environment, with an infrastructure based largely on services provided through UNIX. Microsoft positioned Windows 2000 as an enterprise-wide solution, capable of providing Domain Naming System (DNS), Kerberos authentication, and directory services. The Active Directory (AD) domain requires a centralized deployment, as do DNS and Kerberos. Since we already had these pieces in place, we needed to develop strategies that allowed us to deploy Windows 2000 with full functionality without disrupting existing services.

In addition to the technical challenges posed by Windows 2000, we also faced organizational and political issues. The success of the deployment project depends on a cooperative effort, bringing together our microcomputer specialists, our central and UNIX services, network engineering, and front-line technical support groups. Managing Windows 2000 at the campus level also meant that ITS would provide more centralized administration. Many of the departments on campus, particularly those that manage their own systems, might perceive this as a loss of control. It was therefore desirable to include these local system administrators in the planning process early on. We heard their concerns and let those concerns influence the deployment plan.

2. PLANNING CYCLE

Employing Microsoft's planning paradigm, we developed a roadmap that considered our strategic goals, resource requirements, other campus IT initiatives, support issues, and our current IT environment. Microsoft suggests dividing the project planning into four distinct phases: envisioning, planning, testing, and deploying.

In the first phase, envisioning, you determine what you want your IT environment to be in the future. Starting with an assessment of the current environment, you decide how you'd change it to better meet your organization's needs. It is also useful to establish the scope of the deployment project and define how success will be judged. Examples of the criteria we used for determining success are:

- Minimal disruption to current lab infrastructure
- Campus-wide understanding of the proper role of Windows 2000

- End user ease of use and stability
- Seamless transition from current environment to Windows 2000 environment
- Minimal impact or downtime on current environment
- Production system migration not the main goal
- Successful proof of concept such that the campus can use the designed infrastructure
- Lab management capabilities equal to or better than current setups

This phase also included a risk management plan and the initial high-level conceptual design. Phase 1 took two months and was completed in May 1999.

The second phase, planning, is where you decide how you are going to achieve the goals set in phase 1. The Windows 2000 namespace design was refined, with the goal of creating an environment that was intuitive for users and administrators to locate and manage IT resources. We also developed the initial logical designs for Kerberos (a security scheme developed at MIT) and DNS, focusing on interoperability with existing systems. Phase 2 required four months and concluded with the approval of the Windows 2000 design. This phase took much longer than we anticipated due to the large number of details that needed to be addressed.

The third phase is testing. We began by inventorying all the pieces that needed to be tested and then developing specific tests that we hoped would be meaningful. We established detailed testing procedures to ensure consistency so we would have confidence in our results. Early on we found that it was necessary to test *everything* and to resist the urge to cut corners. The majority of our testing was geared toward software compatibility and interoperability with other non-Windows 2000 systems and services. This phase turned out to be very educational. Our technical staff became much more familiar with the Windows 2000 system and gained valuable hands-on experience. We constructed a test facility to simulate a production Windows 2000 operating environment. This is where we often came to understand the power or limitations of specific systems and features.

The fourth and final phase is deployment. At the completion of this phase, the AD, Kerberos realm, and Dynamic DNS will be implemented and available in a stable form. System administrators will be able to add users and resources to the domain and have access to technical support. By this time we will also have published technical guides, including best practices, for a variety of Windows 2000 technologies and services, and how they are managed at our site.

3. STRATEGIC GOALS

ITS had specific strategic objectives in mind when this project was launched. The deployment of Windows 2000 represents an opportunity to make strides in some specific areas. First, ITS wanted to establish its role in providing technology leadership to the campus. Rather than merely providing support for solutions that have gained acceptance among campus users, we would use our knowledge of the institution's IT requirements and available solutions to set technology directions. Other goals include:

- Move toward standards for desktop computing, despite a lack of enforcement authority. We would do this by demonstrating the value of participation in adopted standards.
- Drive down the Total Cost of Ownership (TCO) for desktop computers through improved system administration efficiency.
- Recognize the mission-critical role of desktop systems and manage them accordingly.
- Support other IT initiatives that have strategic significance, including enterprise-wide directory services, IP addressing through DHCP, print accounting, improved security, single sign-on, and an IT service center.

Many of these strategic objectives were enumerated in our planning documents. We referred back to these stated goals as the project proceeded and used them as a tool in guiding the decision-making process.

4. RESOURCE REQUIREMENTS

Introducing a new operating system at a major university requires a careful assessment of the resources required for both the initial deployment and ongoing support. The project will be front-loaded; that is, a disproportional resource demand will occur up to and including the initial rollout. After that, the required resources will drop to more normal operating levels. The primary resources that are required are financial and human.

In order to ensure success of the deployment, we secured a budget for project expenses. In the early planning stages, expenses were few and limited to low-cost items such as textbooks and magazine subscriptions. We didn't have many opportunities for formal training or conference travel since there wasn't much available prior to the product's release. Once Windows 2000 was released, we incurred expenses on travel for conferences and training, training materials, books, software, and occasionally, new hardware. As we approached our actual deployment, we spent additional money on computers for the domain controllers, and related hardware, software, and more training. The most significant cost item to the campus, excluding staffing, will be licensing the software for the full deployment.

Human resources are the largest expense in our Windows 2000 deployment project. In the early planning phases, our Windows 2000 RDP team consisted of seven IT professionals. These

individuals spent an average of five hours per week meeting and working on issues related to the Windows 2000 deployment. In addition, our Director of IT Operations and several senior-level managers met for 1 1/2 hours each week to discuss Windows 2000 and its effect on the current IT environment and its relationship to other IT initiatives. After Windows 2000 was released, a new support unit was created to formally direct the deployment project and provide on-going support to the campus beyond the release. This team consists of three IT Professionals, two of which work on this project exclusively. The large number of staff involved in the deployment effort is due to the complexity of the operating system and interoperability issues that arise from its enterprise-oriented approach.

5. CONSTRUCTING A TEAM

It became clear to ITS early on that managing the deployment of Windows 2000 and its technologies would require broad technical expertise. In addition to the desktop computing specialists on the original RDP team, we included individuals from our Central and UNIX Services group, IT Service Center/Help Desk, Computer Lab Management, and Network Engineering. The ITS oversight group consisted of the managers of the previously mentioned units, plus our Director of IT Operations, the IT Architect, and the manager of System Security. Such extensive participation was essential due to the far-reaching and complicated interdependencies between Windows 2000 and the existing campus IT infrastructure. It also turned out to be a positive experience for the technical staff, giving many of them their first opportunity to work with individuals from other technical areas.

6. POLITICAL CHALLENGES

Windows 2000 presents a number of political challenges. The manner in which new features and technologies are implemented increases the dependence on a central IT organization. The heavy support requirements for both the desktop and network operating environments may require the reallocation of support resources. And finally, many of the core services that Windows 2000 intends to provide have long been the realm of UNIX system administrators. The impact of these changes should not be underestimated and efforts should be made to promote the necessity and benefits of them.

Since Windows 2000 includes technologies and an overall philosophy of providing a centrally managed environment, local system administrators will be concerned about the potential loss of local control. The domain design and organization will have an enterprise focus. Account management and the creation of objects will also be done centrally with restrictions placed on local administrators. It is therefore important to understand which specific details are areas of concern, and to understand why. Windows 2000 provides an opportunity to move some of these tasks to a central IT organization similar to the way many current services are provided. For instance, at UCB, network access and primary UNIX accounts are centrally managed. We proposed following a similar model for Windows 2000 account

management. We would preserve local administrator's control through the delegation of authority beyond the initial account creation. The scope of a local administrator's authority can be directly tied to the resources they manage in their area, while accounts and other object creation and permissions that have broader significance are managed centrally. This is presented as a model that centralizes only the tasks that make sense for the enterprise and frees local system administrators from these duties. At the same time, authority for creation of other objects and determining permissions for locally controlled resources is given to the local administrator. Most departmental system administrators will view this as either neutral or positive, depending largely on how and when it is presented to them.

Windows 2000 is a complicated operating system that may gain wide acceptance on many campuses. Due to its complexity, the number of individuals required to support it, particularly in the initial deployment, is high. It may therefore become necessary to reassign staff to support the Windows 2000 deployment. This can cause a great deal of tension and is another argument for including existing technical teams by defining a role for them in the new operating environment. If senior IT managers recognize these issues early on, they can proactively head-off conflicts before they arise and may even be able to foster an atmosphere of true cooperation.

Windows 2000's method of directory service, security and authentication, and resource sharing position it as an enterprise solution. As such, it has the potential to conflict with the well-established IT infrastructure that currently exists on many college campuses. The UNIX system administrators who are accustomed to delivering these central services on our campus are not going to be receptive to abandoning systems and methodologies that have been refined over many years. Nor will they like the idea of turning over important responsibilities to desktop computing specialists. Apart from the technical requirements, there is also a level of knowledge—cultural and political—that is required to successfully provide these core services. Our UNIX system administrators are familiar with 24x7 system availability, account management on a large scale, system security and disaster recovery. Changing which unit delivers these services and how it's done is non-trivial and must be approached cautiously. If the organization will move to a Windows 2000-based infrastructure, then it will depend heavily on the current administrators to make it happen. We elected to preserve the UNIX-based infrastructure as much as possible and view Windows 2000 as the newcomer that has to be accommodated by the existing systems.

Windows 2000 presents a number of political challenges that should be dealt with early in the deployment phase. Microsoft's approach to delivering enterprise-wide services will increase the role of a central IT organization. The scope and complexity of the operating system will require more and diverse technical support resources. Some of the core services, like DNS and Kerberos authentication, will challenge the traditional boundaries between UNIX system administration and desktop support services. Deploying Windows 2000 can be disruptive and costly to an organization. At the same time, it can be viewed as an opportunity to take the organization in a desirable direction, using

its technical requirements as a vehicle. Successfully meeting these challenges will depend on IT managers participating in the planning phase and by clearly establishing the roles that each manager and their unit will play.

7. COMMUNICATIONS PLAN

ITS believes that the success of the deployment depends on effectively communicating the project details to the campus. We developed a communications plan aimed at keeping the campus informed of the proposed schedule and status, setting realistic expectations, defining the role ITS would play, educating constituents on the technical issues, and inviting participation in the planning and deployment effort. To accomplish this, we set out to define our potential audiences, what information needed to be conveyed, what method we'd use to deliver the message, and what the frequency of communication would be. Dedicating this much time and energy to communicating isn't something most technical staff are eager to do, but the benefits are obvious.

The specific audiences were identified since many groups would be involved and they would be interested in different levels of information. For instance, we convened a weekly meeting for technical managers within our department that would be asked to support the deployment effort through their areas of responsibility. We brought together representatives from Network Engineering, Central and UNIX Services, UNIX Operations (they handle DNS), Frontline Technical Support, the IT Architect, and the manager of the student computing labs. Our Director of IT Operations sponsored the deployment project, recognizing its importance to the department and securing necessary resources. We identified other groups including campus administrators, departmental network managers, students, and our IT partners.

Once the critical audiences were known, we turned our attention to defining what information needed to be shared. Examples of information that we compiled for distribution are deployment status reports, planning aids for departments, available support resources, best practices and procedures, contact information for project participants, policy statements and technical reference materials. While increasing the workload of the project team, this approach may save us time in the long run and has even helped us improve our process.

We have several channels at our disposal for disseminating information and set about to select the appropriate means for each communiqué. E-mail and e-memos are commonly used. We have made a number of presentations to groups, including administrators, network managers, students and colleagues at other institutions. Focused technical sessions have been done as presentations, meetings, or Q&A sessions, or some combination of all of these. We also constructed a web page to post information in a timely manner and to serve as an archive.

Finally, we looked at the timing element of our communications plan. We wanted to deliver pertinent information promptly

without overloading the recipients. We decided that some information would be released as milestones on the project timeline were reached or as critical issues came up. Other information is sent out on a regular schedule, say monthly, updating status reports or contact information. We also send out information on demand.

The Windows 2000 project team is striving to keep all interested parties informed as the deployment progresses. A number of effective channels are available for the distribution of the project information; the most important thing is to make use of them. We are convinced that the sharing of information with the campus is critical to the success of the deployment project. Developing a communications plan was time well spent and has served as a constant reminder of whom we are deploying this technology for. The feedback we receive from these efforts is useful in modifying our plans to correct issues we may have overlooked. We've come to view communication of the project details as an essential task.

8. TECHNICAL CHALLENGES

Microsoft Windows 2000 represents a major change in desktop and network operating systems. This latest Windows operating system includes many new features and technologies that will potentially benefit users and IT managers on the Boulder campus. Along with the increased functionality comes an increase in complexity. Windows 2000 must be integrated into our existing IT infrastructure to manage and support its method of directory service, security and authentication, and resource sharing.

One of the greatest challenges was adapting a product designed for use in a corporate environment to serve the needs of a campus environment. This was particularly true of designing an AD for UCB. The design challenges revolved around the logical design, user management, delegation of authority, and Group Policy Objects (GPOs).

The first step in designing our AD was to establish the DNS location of the root domain. This is critical since it impacts the location of the Windows 2000 Kerberos realm and the DNS names of all computer objects within the domain. Because of our existing Kerberos infrastructure, we could not place the root domain at *colorado.edu*, so we began considering our options for a domain rooted in a DNS subdomain. This has advantages because of the possibility that our first implementation of an AD on campus could fail and we might have to create a parallel replacement. Such a task becomes difficult if the root domain is located at the highest possible level in DNS. After some debate, we settled on *ad.colorado.edu* for our root domain. This was chosen because it is descriptive, simple, and does not have a product affiliation.

We then set out to design a domain structure that best fit the campus and our needs. To keep management of the AD as simple as possible, we chose to use a single domain model and handle other organizational needs through the use of organizational units.

Once the basic AD design was completed, we focused on users. Because we plan on deploying Windows 2000 in our public labs and leveraging some of the benefits of user-level access control, we decided our domain would include user objects for all of our campus users (approx. 35,000). Use of a single people-space (container for user objects) was a critical decision that will help us deal with the extension overlap in user roles in a campus environment. Unlike most corporations, higher education institutions must handle users with multiple affiliations. For example, there are faculty with multiple appointments, students with multiple majors, and staff who are also students. This environment does not allow for users to be placed into organizational units for individual departments. Most user and access management can be accomplished in this single people-space through group membership and GPOs. Unfortunately, Windows 2000 currently has a membership limit of 5,000 on security groups. This means that any large groups would initially have to be handled using nested groups.

8.1 DELEGATION OF AUTHORITY

Next, we attempted to match the Active Directory structure to the structure of the campus. Our AD emulates the organization of IT management on campus, rather than traditional hierarchy. Since many of the schools, colleges, and departments on the UCB campus lack centralized IT management and infrastructure, we decided to create Organizational Units (OUs) for groups at the highest level of organized IT management. For some units this means at the college level, and for others it means at the department level.

Once an OU is created, it will be delegated to a security group containing the IT administrators for that unit. These administrators will have the ability to create child OUs, security and distribution groups, computer objects, printer objects, and GPOs. This preserves a degree of local administrative control, despite having user objects created and managed centrally. This allows administrators some flexibility while offloading some user administration responsibilities.

8.2 GROUP POLICY OBJECTS

One of the most important management and control features of Windows 2000 is the use of Group Policy Objects. GPOs can be used to control a number of settings based on either the computer or user object. Since they are generally applied via the hierarchy, the use of a single people-space complicates their administration. However, Microsoft provides an option, loopback processing mode, to allow the system to traverse the AD to locate the appropriate user object and apply policy based on both the computer and user objects. The ability to apply GPOs is critical for machines located in our student labs and administrative offices.

8.3 DNS

Three primary DNS scenarios were considered for Windows 2000 deployment at UCB: a Windows 2000 DNS server, creating a BIND subdomain with Dynamic DNS (DDNS) enabled, and enabling the minimum DNS requirements for Windows 2000 on the existing BIND server.

Our team considered the options of using a Windows 2000 DNS server either for the entire campus or for the Windows 2000 subdomain. Using a Windows 2000 DNS server allows for secure updates and some degree of control of the updates. However, UCB has an existing BIND infrastructure that currently serves the campus DNS needs. Moving a critical service to an unproven platform was not considered wise. In addition, our DNS managers were not comfortable with the security and management tools currently available in Windows 2000.

We also considered using a BIND subdomain with full dynamic updates enabled. While this scenario provided full DDNS for Windows 2000, it did not solve the problem of non-secure DNS updates.

Our final scenario calls for keeping our existing BIND DNS servers and only enabling support for SRV records. The domain controllers for the Windows 2000 domain can update SRV records on the BIND servers, but not forward or reverse lookup records. This scenario provides the minimum DNS requirements of Windows 2000 while not allowing for non-secure DNS updates. This scenario does have a large drawback due to the dependence of Windows 2000 on DNS names to located computers and services: it forces UCB to use static IP addressing for the Windows 2000 domain, at least for now.

8.4 KERBEROS

UCB has an existing MIT Kerberos 5 infrastructure used to authenticate dial-up connections, authenticate users for use of public labs, and perform UNIX administration. The existing realm has about 35,000 principals and is maintained by the Central and UNIX Services group within UCB's central IT organization, ITS.

The interoperability of this existing Kerberos infrastructure with Windows 2000 is considered a critical element in rolling out the new operating system. Windows 2000 uses Kerberos 5 as its primary method of authentication and encourages the use of its own Key Distribution Center (KDC). Since we had a UNIX-based solution already in place, we looked for ways to allow Windows 2000 clients to authenticate without duplicating account administration and to be able to use acquired credentials to access resources in either realm.

We identified three potential strategies for establishing a Kerberos realm. We could convert to an entirely Microsoft system, look at third party solutions that would synchronize accounts and passwords between two realms, or maintain dual KDC's, using

trust relationships and simplified method of account synchronization.

Since preserving the existing functionality was critical, we decided to “extend” the existing Kerberos realm to accommodate the new Windows 2000 clients. To do this we established a one-way trust wherein the Microsoft KDC trusted our original MIT KDC. Account synchronization is accomplished by generating Windows 2000 user accounts based on the principals present in our existing Kerberos database. Password synchronization isn’t available in this model. The user doesn’t know their native Windows 2000 password and obtains authentication through the one-way trust. This prevents us from providing support for down-level clients (using NT LAN Manager (NTLM)) but this was not a critical requirement of the deployment on our campus.

9. TESTING AND THE TEST DOMAIN

Over the course of the project, it has become clear that a successful deployment of Windows 2000 is dependent on thorough, systematic testing. In order to do this, we created a domain specifically for testing, called W2KTEST. The project team has used this domain extensively in planning, implementing, and testing a comprehensive UCB Windows 2000 deployment. The domain consists of Windows 2000 domain controllers and multiple clients of various brands and configurations.

The test environment is designed to allow simulating details of an actual departmental rollout. For example, a network manager can build a Windows 2000 file and print server and snap it into the campus active directory to test functionality. In another case, client/user authentication on the active directory may be the focus. While the W2KTEST domain is used primarily by ITS staff, it is also available to other systems managers on our campus so they can conduct their own tests.

The W2KTEST domain currently exists as a pre-production “test” environment. The present purpose of the domain is to simulate as closely as possible our actual planned production environment (*ad.colorado.edu*). In this mode, the domain is much less a test environment than it is a production one. Thus, the current focus for this domain is stability. We will maintain another separate, isolated Windows 2000 domain as a pure test environment where stability is not a primary concern.

Active directory structure within the W2KTEST domain mirrors our planned production directory structure. Additionally, distribution of services mirrors planned production designs (i.e., DNS services are being handled exclusively by a UNIX DNS server). The primary exception in this mirrored environment is in Kerberos account management. Where the planned production design calls for synchronization of the UNIX and Windows 2000 realms respectively, the W2KTEST domain does not include this synchronization.

The importance of testing to the project’s success has become evident. In addition to our own testing, we have encouraged other

campus network managers to use the facilities for conducting tests of their own. An additional benefit of using the test environment is the valuable hands-on experience users gain from it. A lot of discovery occurs in the test environment that would be very risky in the final production environment.

10. PILOT DEPLOYMENTS

Prior to the full campus-wide deployment, we intend to do a limited rollout on a much smaller scale using pilot sites. By selecting pilot sites that will reasonably test the viability of our proposed strategy, we can expedite the deployment process while containing the level of risk. Over the past several months, we have engaged in conversations with a number of network managers, both within ITS and out, who expressed interest in participating as “early adopters” of Windows 2000. Working with these sites lends more resources to the deployment project and offers invaluable experience for finalizing how the actual deployment will unfold.

One of the goals in identifying pilot sites was to represent as many unique environments as possible. We looked for technical and non-technical users, simple and very complex environments, student computing labs, administrative offices and academic departments. We also looked for sites with varied hardware and networking, including laptop systems and sites using wireless Local Area Networks (LANs). The experience gained by working with these pilots will factor into the technical details of the final deployment, help us adjust our schedule to be more realistic, and offer insights into the ongoing support issues that we’ll face after the project is complete.

11. DEPLOYMENT SCHEDULE

Establishing a deployment schedule is necessary to keep the project moving forward and to help shape realistic expectations. It is also essential to come to grips with the fact that a successful deployment on a college campus requires a long-term commitment. The schedule should include the primary deployment phases, the anticipated length of each phase, and the relationship each phase has to other activities and issues. Establishing and communicating a deployment schedule is useful in securing resources, demonstrating an understanding of the scope and complexity of the project, and keeping others informed and interested by following its progress.

The first year of the project was spent on planning, as described earlier. A revised project plan and schedule was developed to coincide with the actual release of Windows 2000 in February 2000. The schedule begins with the design of the domain structure in February 2000, and concludes with the start of the full production deployment in December 2000 (see Figure 1). The amount of time required for a deployment project will vary greatly, depending on the size and complexity of the organization and what level of resources can be committed to the project.

Careful planning early on will yield a realistic schedule that can be used to track progress through completion.

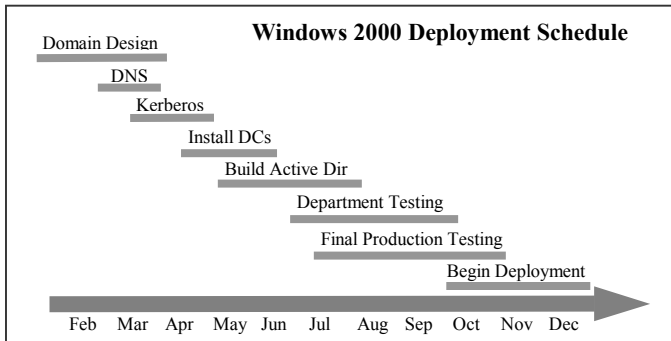


Figure 1: Proposed UCB Deployment Schedule

12. CONCLUSION

The University of Colorado at Boulder began planning its Windows 2000 deployment more than a year ago as a sponsored Windows 2000 Rapid Deployment Project site. Our IT managers anticipated Windows 2000 being a major part of our computing environment in the future, and positioned our department to take a lead role. We have not provided strong leadership for network operating systems in the past, which has hindered our efforts to set standards and provide support. By taking the initiative, we can do a better job of integrating Windows 2000 with our existing services, and introduce new ones. The technical requirements and features of this operating system help us advance other IT initiatives, including Dynamic DNS, IP addressing through Dynamic Host Configuration Protocol (DHCP), print accounting, setting standards for desktop computing, and single sign-on. We would normally proceed more slowly, drawing upon the experiences of other universities and basing our deployment on successful cases. However, because of the systems and services we'd like to improve, there is an equally high cost in proceeding

too slowly.

Many of our critical, central services are provided through UNIX. The current infrastructure works well and there's little to be gained by moving key services to an unproven platform. In addition, Microsoft intends Windows 2000 to be an enterprise solution, with its own implementations for DNS, Kerberos authentication, and directory services. The Active Directory domain encourages centralized management, as do DNS and Kerberos. Having these services already in place complicated our deployment effort rather than simplifying it. We set out to develop strategies to deploy Windows 2000 without disrupting existing services provided by other platforms.

Windows 2000 presents many technical challenges, but the organizational and political issues are even greater. Managing Windows 2000 at the campus level has advantages, but it also may be threatening to departments that are used to handling their own systems. Local system administrators are likely to perceive a loss of control. These concerns can be mitigated through the sharing of information and by including these individuals in the planning process. The scope and complexity of Windows 2000 requires that we bring together a number of campus technical groups. Each group now has a clearly defined role and understands that the success of the deployment project depends on their contribution. We have tried to encourage broad participation so that there are few surprises and a consensus on the final design. Users and administrators are more likely to embrace the new operating environment if they have had a hand in its creation, and they are the ones who will ultimately judge the project's success.

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