

Technology Transition in the Unity Windows Computing Environment

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Executive Summary

- Quality problems, missing features, and poor technical support in critical Novell software have impeded our ability to deliver a reliable, flexible Windows environment well-suited to the needs of the academic community.
- We must make a change because our existing, relatively stable version of Novell's NetWare operating system is unsupported and cannot be maintained indefinitely.
- Given Novell's strategy change towards SuSE Linux, a migration is required. Novell's SuSE Linux operating system does not present the best migration path.
- The campus has strong staff skills in Red Hat Linux and Microsoft Windows. SuSE Linux is not widely used.
- Desktop management software is a key component of the Unity Windows environment. Most desktop management software runs on Microsoft Windows. Novell's ZENworks the only such product that will run on SuSE Linux. However, ZENworks has significant problems that are not resolved even in the latest version. It no longer meets our needs.
- ITD serves a unique combination of a large number of users who have a rapid login/logout usage profile. Thus, we experience performance of Novell products differently than other campus groups as our usage patterns tend to tease out weaknesses that would not be apparent with other usage patterns.
- ITD serves primarily a student population in a distributed management environment, serving 35,000 active accounts over 2,000 workstations across campus. The business and discipline-specific needs of this population cause us to utilize Novell's software in ways that are qualitatively different from units that exclusively support faculty/staff users.
- We will provide training that enables system administrators to perform the core functions necessary in the new environment. Additional training may be desirable but will not be required; we discourage training well in advance of the opportunity to practice the skills.
- Cost implications and funding models have not been finalized; some Microsoft licensing will be needed, we are working with Microsoft to determine the best pricing model. There will eventually be a change in the distribution of costs for the Novell Academic Licensing Agreement (ALA).
- All nine colleges that use Unity Windows indicated that clients are "generally happy" with the existing environment; our next environment will improve upon this success. Outstanding problems with the current environment identified by the colleges will be addressed by this technology change and will position us for the future.
- As we develop and refine the next Unity Windows environment, we will continue to engage in regular review and dialogue with the academic community.

Introduction

ITD provides the Unity Windows computing environment to the NC State campus in support of the academic mission of the University.

We seek to meet the needs of teachers, learners and those who support them. We work to provide a common baseline, and strive to create an environment that is sufficiently flexible and customizable that our colleagues in the colleges and departments will choose to adapt it for use in the multiple disciplines they support.

The goals we have for the common environment are simple. Students should be able to go into any Unity Windows lab – including those customized by different support groups – and have a consistent basic experience. They should be able to log in using their Unity ID and password, have access to core services such as network file space and any available WolfCopy printers, and they should be able to easily and consistently find the applications that are available to them. Wherever possible, students should be able to customize their environment to support their learning styles and personal needs.

The environment should be stable, secure and responsive. System administrators should be able to easily customize and install the environment with a minimum of manual work. They should be able to “get the defaults by default” but control the software and settings that are applied to the workstations they support. When non-emergency changes are planned, system administrators should receive adequate notification and should have an opportunity to comment and collaborate with us. We should provide in-house training so that new system administrators can master the fundamentals of our environment.

When ITD’s Microsys group began designing the Unity Windows environment in 2000, we selected Novell technologies like ZENworks 2.0, NDS 7.x and NetWare 5.0 because they were the best solutions available at that time. They were well-supported, stable and scalable.

Times have changed, and so have Novell’s products. The reliability of the products we use has decreased; the support for the issues we have faced has been of poor quality; and the features we need in order to meet our goals are absent, unreliable, or even removed. Novell’s strategic direction is not consistent with our own. It’s time for a change.

On April 12, 2005 we announced to the campus in the second of our two annual Open Meetings that we planned to begin a multi-year transition away from Novell products due to our dissatisfaction with the quality and functionality of key technologies, including Novell ZENWorks.

In early October, 2005 we began discussing this plan in depth with our colleagues across the University. We have completed the initial step in our communications plan by meeting with the technical staff in nine college-level IT groups to talk about their environments, concerns and ideas.

This report constitutes our next step. In it, we will provide background information about the need for a migration, the training and cost implications, the project's goals and timeline, and a summary of the feedback we have received from the nine participating colleges. This document is being provided to campus IT leaders for review and comment.



Background

Why change?

If we don't change direction soon, we'll end up where we're going. —Professor Irwin Corey

ITD's Microcomputer Systems has a combined total of 50 years of experience with Novell technologies, so arriving at the decision that we needed to change our core technologies was difficult. But, it is our experience with Novell technologies that allowed us to make the assessment that it's time for a change. A number of factors led to our decision.

The first and most important factor is the increasingly poor quality of the Novell products we rely on, particularly ZENworks. ZENworks is the software that allows us to deliver applications to the desktop (the NAL), securely manage user accounts on each computer, and automate the installation of labs (imaging). Novell has told us that our unit is one of the most "hardcore" ZEN shops, because we exploit most of the features at large scale, pushing the software to its limits. We must do this, and must have those features, in order to meet the diverse needs and demands of NC State's academic community. A flexible, distributed environment is not optional.

Over the last two to three years, we found that important ZENworks features did not work correctly, some key functionality was actually removed with later versions, and some promised features never materialized. For example, Novell's Workstation Manager software is supposed to enable the Colleges to easily distribute their own applications to their own workstations. It is unreliable despite many patches. This results in intermittently missing applications for the students, faculty and staff.

The combination of ZENworks and Novell's own network client have required an increasingly delicate balance of changing versions, patches, beta patches, and withdrawn patches. In short, it has become a nightmare to manage.

We have examined the latest revisions of the ZENworks software and promised features are still missing. We believe we can do better elsewhere.

Core services such as our WolfCopy print environment can no longer rely on Novell technology. Hewlett-Packard dropped support for Novell's NDPS printing software at the end of 2004. The Novell replacement does not allow us to provide accounted printing at scale; its technology provides unacceptable speed and reliability. The old Hewlett-Packard software we have been forced to run is unstable and causes abends, requiring us to reboot the servers and causing service outages. This service must move to a different operating system.

In November, 2003, Novell announced plans to acquire SuSE Linux, the number two Linux distribution in the world. In 2004, they began to shift resources away from their own operating system, NetWare, to SuSE Linux, and that shift has accelerated. In an October, 2005 presentation to campus, Novell sales and technical staff stated that the next version of their new operating system (Open Enterprise Server, or OES) will run NetWare only in a virtual environment, intended solely for transitioning to OES/SuSE Linux.

We have resisted upgrading our NetWare 6.0 servers to the latest version, NetWare 6.5, since it shipped in August, 2003. There have been ongoing issues with memory fragmentation and memory leaks in NetWare 6.5, despite multiple service packs over the last two and half years. The problem is that Novell officially ended general support for NetWare 6.0 on November 1, 2005. In an October, 2005 meeting with campus, Novell's sales representatives stated that in the next release of Novell's operating systems, support for any version of NetWare will be limited to a virtual machine running on SuSE Linux. We have to make a move.

As we considered operating system choices, we looked at several factors. We considered alternatives to the ZENworks products, staff skill sets (both ours and those of campus technical staff), the status of problems with SuSE Linux, and our assessment of Novell's track record and strategic direction.

Here are some of our observations:

- Of the top 8 products (by market share) in the client management space, all 8 run on Microsoft Windows servers, and 7 require Microsoft Active Directory (see Appendix 1, page 3 for a list). Only Novell ZENworks runs on NetWare or SuSE Linux, and it requires both Novell eDirectory and Novell's Nsure Identity Manager software (DirXML) to use an Active Directory in a limited fashion (see Novell's online documentation for ZENworks 7 at <http://www.novell.com/documentation/zenworks7/> under Installing in a Windows Network Environment.)

- With respect to staff skill sets, the Microsys group has staff members with substantial knowledge of Microsoft Windows 2000/3 server and Red Hat Linux. Within ITD, there are additional staff members with advanced knowledge of Red Hat Linux. We expect to fill a Microsoft Windows-focused security position this year.
- For the production environments on campus that we are aware of, there is a diminishing NetWare base, a small number of Macintosh server deployments, a substantial Realm/Red Hat Linux environment, a large number of Solaris servers, and several groups running Microsoft Windows/Active Directory. A few current Novell groups are beginning to look at SuSE Linux in order to deliver the applications they support.
- Novell's track record in our environment has been poor. We have received such an unacceptable response from their technical support unit for involved issues that we have cut our purchase of support incidents in half, keeping a few for the occasional minor glitch.
- Novell is facing a challenging transition from NetWare to SuSE Linux. We believe that the technical problems Novell is experiencing with SuSE Linux, particularly with patch management, are somewhat due to the nature of a merger between very different companies. This is also true for the recent 10% staff layoff and the departure of some top SuSE executives, including a co-founder. Their difficulties may resolve with time, but until then we consider a Novell strategy risky.
- We see no reason to introduce a SuSE distribution into the ITD-supported mix without a compelling application or service that cannot be provided on the Microsoft Windows or Red Hat platforms.

Our analysis concludes that for the application deployment/desktop management components, our best technology choice is Microsoft Windows Server and Active Directory. We have some flexibility for certain back-end components, such as file systems; looking at staff skill sets and installed base on campus we would choose between Microsoft Windows and Red Hat Linux to host those components. We do not see SuSE as strategic for our environment.

Why is ITD switching, while others are not?

Systems Administration *Statistics: The only science that enables different experts using the same figures to draw different conclusions.* —Evan Esar

A common question we are hearing is, “Other groups are happy with Novell’s products; why is ITD’s experience so different?”

The quick answer is: other groups use Novell’s products differently, for a different group of users, and some use different Novell products.

The long answer follows.

Usage Profile

Two important reasons that our experience differs from other groups are that we are different in number of people who use our systems, and in the way they interface with our systems. We tend to serve a greater number of simultaneous users, who rapidly log in and out throughout the day.

A group that has a peak of 2,000 simultaneous business users would experience around 2,000 logins each morning, and few throughout the day. For us, a peak of 2,000 simultaneous users may result into closer to 50,000 login events each day, because our users log in for shorter sessions.

While a business workstation typically has one or two unique users, a single workstation in the Library Unity lab may see 3,000 unique users within a month.

These kinds of differences mean that we sometimes experience software performance problems that other do not encounter.

Business Needs

There are different requirements for software capabilities in the academic computing environment than those of most faculty/staff environments, because our business needs differ.

For example, most groups that support faculty and staff allow those users to have full control of their workstations, to allow them to quickly install the software they need. Because the workstations in the academic computing environment are shared by thousands of users, security and uptime requirements mean that we cannot allow them to have full control of the workstations.

Because of differences in usage profile and business needs, we experience different results in software performance than our colleagues do. So, we make different decisions about implementation, and we come to different conclusions about the suitability of software for use in our environment.

Here are a few specific examples of our decisions and conclusions that differ from those of our colleagues.

- **NetWare 6.5 vs. Memory Leaks**

Some groups on campus are successfully running NetWare 6.5, while we have not deployed it. NetWare 6.5 has had problems with memory fragmentation and leaks since it shipped in August 2003, despite several service packs and patches. These memory issues may surface depending on the configuration and use of a server. We use our servers differently from other groups.

We have learned the hard way that memory leaks can affect our environment far more than other campus groups' environments. In one of the most severe cases, there was a memory leak in Novell's directory service (NDS) that caused ITD's servers to run out of memory every 24-36 hours. The leak was relatively small, leaking just a bit each time a user logged in – but we service a lot of logins. No one else on campus was affected (though other large universities were), because of the differences in usage profile noted above.

- **Application Assignment to Users vs. Flexibility for Colleges**

Many groups are able to assign ZENworks applications to users. This works great for business users, where users don't roam much and the environment is homogenous. It allows for a speedy NAL startup time.

In order to offer colleges the flexibility to choose which applications show up in their labs, we had hoped to use the ZENworks feature that allows applications to be assigned to particular workstations rather than to every user.

However, there are significant problems with Novell's workstation manager, the software that allows the workstation to "see" whether it has any applications to install or show to the user. When it fails, the applications that colleges have assigned to workstations disappear from the NAL. Novell has not been able to resolve the problems with its workstation manager software.

Slow NAL startup is the compromise. We had to design a workaround that involves assigning the applications to all Unity users and then making each workstation check each application each time the NAL loads to see if it should display it. Because of extraordinarily inefficient Novell code, the NAL processes these checks remarkably slowly (as little as

4 bytes at a time), causing the infamous “slow NAL” – startups in excess of forty seconds instead of a more reasonable ten or less. This has been problematic in the classroom environment, where a speedy start is critical.

- **NetWare File Systems vs. Future of Integration with AFS**

Some campus groups do not need to access file systems other than NetWare file systems. However, access to AFS is a critical need in the academic environment. Currently we provide access to AFS through WolfCall, a helpful but unsupported utility developed a few years ago by a former staff member in the College of Engineering. We urgently need to move away from WolfCall to a supported method for accessing AFS. Modern versions of OpenAFS and Kerberos for Windows would allow us to do this.

Unfortunately, when we add a necessary (and standard) networking component that OpenAFS requires (the “loopback adapter”), the Novell Application Launcher does not work. This is a problem in Novell’s software. At the moment this means we have to choose between ZENworks and a supported client for AFS.

- **Support vs. Inconsistent Support Experiences**

Some of our colleagues have found Novell’s Technical Services organization to be helpful for the issues they have experienced on the products they use.

Novell is internally organized into different product teams and product support is provided by these teams, not a central support group. The quality of support we have received from the different product teams has varied greatly. We’ve traditionally been much more pleased with eDirectory support than with ZENworks or NetWare operating system support. Differences with support satisfaction will occur with the nature of any particular problem, as well as with the particular product.

Naturally these four examples are illustrative, not exhaustive. We hope they help clarify how it is possible that we find our needs are not being met by Novell’s software, while other groups may be content with the same packages. Different usage profiles and different business needs lead to different experiences with the same software.

Impact

Leaving Novell behind is challenging for us, but not only us. This change affects a lot of people: campus technical staff who have included our environment in their own service offerings; those who will continue to use Novell products after ITD no longer does; people who produce documentation; our ITD colleagues who support the environment we deliver; and the people for whom we do this work in the first place — NC State’s students, faculty and staff.

What training needs will be generated, and how will they be handled?

Change is one thing, progress is another. —Bertrand Russell

Microsoft’s Windows Installer technology (MSI) and Microsoft Active Directory will form the core of our application delivery infrastructure in the next Unity Windows environment. It is clear from our discussions with the technical staff on campus that there are varying levels of expertise and familiarity with these technologies.

We have been asked about what training will be required in order for groups to make a healthy transition. It never hurts to have a thorough understanding of the technologies, but a few caveats are in order. We want to bring these issues up so that departments will have enough information to plan investment of training dollars for the best return. Because we do not yet have a final design for the next Unity Windows environment, it is not yet possible to identify all of the training may be beneficial. We will stay in communication with campus as we progress.

First, we do not expect that all technical staff will need to become proficient in the installation and maintenance of Windows Server or experts in Active Directory, just as we did not expect everyone to be able to manage a NetWare server or troubleshoot eDirectory in our current environment.

People who plan to deliver discipline-specific applications or customize applications will need some specific skills. The ability to work with the MSI format will be important. MSI delivery and repackaging is consistent with Novell’s strategic direction and is supported by ZENworks. This is a skill set that will need to be acquired with or without Novell technologies. It can be applied now, and would be a good place to start through reading, experimenting, and collaboration with the NAG and AppTest groups.

Second, training far in advance of application is ineffective. Following up training with hands-on application is crucial if new skills are to “stick”.

For those departments whose only interaction with Active Directory would be as a consumer of ITD's Active Directory-based services, investing in Active Directory training at this time would be premature as it will be quite a while before staff would have the opportunity to apply their training. In fact there may be some benefit in adopting a wait-and-see approach, as it will be easier to select the best training course the product selection for application delivery and desktop management is finalized.

Third, we will offer training specific to the environment we deliver, as we have done in the past with WolfPrep, ZENworks, antivirus, etc. since our group's inception in 2000. Our expectations will be unchanged: we expect solid Windows desktop technical skills, very basic familiarity with the campus environment (Unity ID/password), and a willingness to learn. We will make sure that everyone will have an opportunity to learn the tools they need to do core tasks. The ability to do complex customizations will require additional work on the part of the staff member, just as it always has.

In summary, we will provide the same sorts of training as we always have; additional training may be desirable but will not be required to use our services; and we discourage training significantly in advance of the opportunity to practice the skills.

We have also been asked about client training and how the environment will be different for end users. There will be some differences for end users. We want to keep differences to a minimum but believe improving the environment outweighs limiting change. We will work with campus to determine what training needs end users will have, and how best to meet them.

How will documentation be addressed?

Vitality shows in not only the ability to persist but the ability to start over. — F. Scott Fitzgerald

The Novell Application Launcher (NAL) has been used in the ITD-provided campus lab environment for more than seven years. Some colleges have used the NAL since its inception. While many things have changed, some features of the environment have been consistent, particularly the NAL.

Replacing the NAL in the Unity Windows environment will impact a significant amount of end user documentation that refers to it. Clearly, ITD will produce and update its own documentation. In addition, we will work with the campus to help develop new documentation in a timely fashion, so that it can be updated in advance of a general rollout of the new system.

The Microsys group produces documentation for system administrators in the current environment and the same sorts of documentation will be provided in the new environment. We will help system administrators understand what has changed and how to best use the features in the new environment.

What are the cost implications for my unit?

Lack of money is the root of all evil. – George Bernard Shaw

We do not have a complete or even especially good picture yet, **so consider the following to be a good faith effort to give you a ballpark estimate of the worst case.** We are working with Microsoft to determine the best pricing and pricing model for the required products.

We expect that we will need Client Access Licenses (CALs) for Windows 2003 server. These licenses can be purchased off the Microsoft Select agreement. Each computer will need one. As of this writing, the student price for a Windows 2003 server per-device CAL with software assurance is \$0.82, and the faculty/staff price is \$7.38.

We are still evaluating products, but it is likely that we will also need Client Access Licenses for Microsoft Systems Management Server for each computer. These licenses can also be purchased off the Microsoft Select agreement. Each computer would need one. As of this writing, the student price for a Systems Management Server per-device CAL is \$1.64 with software assurance, and faculty/staff pricing is \$9.84.

The total for Microsoft licensing under the Microsoft Select agreement would be \$2.46 per workstation in a student lab, and \$17.22 for each faculty/staff workstation.

Another component is the impact on the cost distribution of the Novell Academic License Agreement (ALA). A spreadsheet is included in Appendix 2 that shows the 2004/05 cost distribution. Novell cost distribution has been determined by history and some occasional negotiations for many years, rather than by any easily quantifiable criteria. ITD will be participating in the Novell license at some level until we discontinue Novell services entirely. The results of the Campus Calendaring and Email Initiative (CCEI) process may impact the cost distribution of the Novell ALA.

Project Goals

*"I'm interested in one thing, Neo, the future. And believe me, I know - the only way to get there is together." – Gloria Foster as "The Oracle" in *The Matrix Reloaded* (2003)*

The Microsys group has identified these goals for itself with respect to this project:

- Work together to create a sustainable, dynamic, robust, scalable, stable and secure academic IT environment,
- Improve upon our existing environment and continuously enhance the environment by incorporating the evolving needs of the academic community, and
- Engage in regular review and dialogue with the academic community.

Project Timeline

A goal without a plan is just a wish. – Antoine de Saint-Exupery

Phase 1: Communication & information-gathering

Gather requirements, concerns, desired features, and direction from our clients, colleagues, and management. Communicate findings, direction and plans back, creating a continuing dialogue. In parallel, investigate alternative technologies; analyze costs and impact (financial, labor, training) of selecting any particular technology.

Phase 2: Initial design and testing

Based on feedback from the community, information from other universities and NC State groups, and our own experiences, lay out an initial design for the new environment and begin testing. Document changes to existing environment. Identify skill gaps and ways to address training needs.

Phase 3: Pilot & feedback (limited to a set of test workstations),

This phase is tentatively scheduled for Fall 2006.

Implement new environment in a limited deployment in order to shake out bugs, solicit feedback, and get performance data at a larger scale. Participation in the ITD pilot will be limited as this will not be a full production environment and a significant amount of effort will be required to identify and resolve issues; general deployment would be unwise. However, campus IT groups will have the ability to conduct their own testing and to experiment with the environment.

Phase 4: Revision based on feedback

Phase 5: ITD rollout & early adopters

This phase is tentatively targeted for Spring or Summer 2007.

Gather solid performance metrics, and shake out any bugs that make an appearance at large scale. Early adopters will be able to roll out the environment, though no one will be required implement it.

Phase 6: General rollout

This phase is tentatively scheduled to last roughly through 2008.

Those groups who will continue to use our environment will transition the remainder of their workstations to the new environment. The environment will be in full production.

Phase 7: Discontinuation of ITD-provided Novell services, tentatively and roughly in the 2008 timeframe.

We expect to transition a number of the Novell-based services that we provide to other willing campus groups. Precise plans will depend on the needs of campus and available resources. The campus NDSTech committee is in charge of determining how to maintain the campus-level NDS services that ITD has provided. We expect to work closely with that group to transition services.

Feedback Summary

Microsys has just completed meetings with college-level technical groups which have helped us better understand their environments, their concerns surrounding our transition away from Novell technologies, and their training needs.

We are still meeting with other campus groups. Most of these groups do not generally consume services from Microsys. We will provide a summary of those meetings once they are complete.

Participants

Technical groups in all ten academic colleges were invited to participate in a face-to-face meeting. Of these groups, nine currently use some or all of the services we provide. These nine college-level technical groups agreed to meet with us face-to-face.

The invitations were sent to technical contacts in each department, and we told them that we planned to focus the meetings on technical issues. We told the technical contact that we planned to meet with management separately, after all of the meetings with technical staff concluded. For these initial technical meetings, management involvement was left to the discretion of the technical contact.

Methods

Participants were asked to complete a 29-question web survey prior to a face-to-face meeting. We created the survey so that we develop questions before the meeting, and so that the face-to-face meeting time could be focused on the issues of concern to each college's technical group. Survey questions are reproduced in Appendix 3.

Face-to-face meetings lasted from one to two hours. Some included only technical staff, and other included both technical staff and management.

Results

The surveys and face-to-face meetings with college-level technical staff are summarized and discussed here.

Supported Workstations

Four survey questions asked respondents to quantify the number of Windows workstations that they support or maintain. There is some overlap between open lab and teaching lab seats, as some facilities serve dual purposes.

Four survey questions (1f, 2f, 3f, 4f) asked respondents to quantify the number of Windows workstations that they support or maintain. These questions asked respondents to distinguish between “open computing labs”, “teaching labs”, “faculty or staff Windows desktop machines”, and “Windows workstations for grad students or others such as researchers”.

All respondents reported supporting open labs and faculty/staff workstations. Two respondents reported that they do not support graduate student or other types of workstations. One respondent reported that they do not support any teaching labs.

	N	Min	Max	Mean	Sum
Open Labs	8	45	285	130	1040
Teaching Labs	8	0	120	61	490
Faculty/Staff	9	26	1100	260	2336
Grad/Other	8	0	100	55	440

Table 1. Number of supported workstations reported among 8 college-level technical groups.

Note: One of the larger colleges did not provide estimates for open labs, teaching labs, and grad/other workstations.

Direction

As we plan a significant change to the services we offer, we wanted to know whether we are offering the right services to campus. We questioned whether other emerging services are likely to reduce or eliminate the need for us to offer some or all of the services we currently provide.

We asked several questions intended address the future of Windows computing lab seats and the value of our existing services.

Respondents predicted that Windows lab seat demand will largely stay the same, or in some cases increase over the next three years. Two of the groups report that lab seat demand would remain the same noted that space limitations were a factor.

No group felt that VCL (Virtual Computing Laboratories) would replace the need for Windows lab seats over the next three years. However, some commented that VCL provides a valuable service by providing application access to remote users and to non-Windows clients.

Survey questions 28 and 29 addressed these questions.

	N	Groups
Demand will increase	8	2
Demand stays the same	8	6*
Demand will decrease	8	0
Replace lab seats with VCL	9	0

Table 2. Estimation of Windows lab seat demand for next 3 years among college-level technical groups.

*One group said “stay the same or slightly decrease”

In response to question 25, all nine respondents felt that clients are “generally happy” with the components of the environment we are providing.

The most valued services we provide are, in order of popularity, lab deployment (WolfPrep), application delivery, authentication, file services and authenticated printing (WolfCopy).

	N	Groups Citing Service
Authentication (user accounts)	8	4
Application delivery (NAL)	8	5
File services	8	3
Printing (WolfCopy)	8	3
Lab deployment (WolfPrep/Zen Imaging)	8	5

Table 3. Microsys services reported as “most valuable” among college-level technical groups.

Linux

We asked about Linux server use. This helps us assess campus skill sets, and also allows us to investigate the level of local community support for the various distributions. At this time, most campus groups who run Linux run Red Hat variants (Fedora, Red Hat Enterprise Linux); only one is currently running SuSE.

Issues in the Current Environment

Despite the fact that all groups felt that clients are generally satisfied with our environment, they cited several issues with it (except for one group that saw no problems with our current implementation).

From a client’s perspective, the most prevalent concerns reported were roaming profile issues, closely followed by speed issues.

- These concerns are interesting to us because they are both largely the result of technical weaknesses in Novell's ZENworks and NetWare client.

Survey question 26 asks what the technical group what the biggest problems with the current Novell NetWare/ZENworks environment are from a *client's* perspective

	N	Groups Citing Issue
Not intuitive to use	9	2
Outstanding technical issues	9	2
Profile issues	9	5
Speed issues (NAL, login)	9	4
Time to resolve issues	9	1
No problems	9	1

Table 4. Biggest problems with current environment from a client's perspective among college-level technical groups.

Administrators reported a more diffuse set of concerns, with no more than two respondents reporting the same concern. The top four concerns mentioned in question 27 were:

1. The environment has a steep learning curve,
2. A lack of administrative rights over the user accounts creates some difficulties for faculty/staff users,
3. Sometimes there is insufficient notification of upcoming changes, and
4. Two outstanding technical issues were mentioned.

	N	Groups Citing Issue
Hard to customize	8	1
Imaging speed	8	1
Insufficient change notification	8	2
Lack of rights	8	2
Outstanding technical issues	8	2
Profile issues	8	1
Steep learning curve	8	2
No problems	8	1

Table 5. Biggest problems with current environment from an administrator's perspective among college-level technical groups.

- ⇒ The most pressing outstanding technical issue is a security issue that cannot be resolved under in our current environment. Technical staff need Administrator access on the workstations they support. It is not feasible to create local Administrator accounts by hand on all 2,000+ workstations in the Unity Windows environment. We do not have a reliable way to automate the creation of local Administrator accounts and set their passwords.

Further, when users are granted Administrator privileges using Novell ZENworks policy packages, those users have those Administrator privileges on every workstation, including those in other departments. We used to be able to control which users could log onto a set of workstations, but Novell removed this important feature in ZENworks 4 and above.

This problem can be addressed in Active Directory with some work on our part. It cannot be addressed with ZENworks.

Technical Transition Issues

The four groups that plan to run NetWare servers into the future deliver an average of 109 NAL application distributions, while the other five respondents deliver an average of 25 application distributions.

Most groups that do not run NetWare servers tend to use the NAL to deliver software to their lab environments. Many of the NAL applications delivered by the NetWare server administrators are intended for their faculty/staff environments.

- One of the most significant transition issues will be the migration of these applications to a new format, particularly those applications intended for use in the lab environment.

Training Issues

Training is perhaps the top issue for campus technical groups. We asked a number of questions to investigate the skill sets and comfort levels with various technologies.

Server Operating Systems

Understanding campus skill sets with various operating systems helps us understand both the training needs, and the direction campus is heading. We asked each group about their experience with various server operating systems. We found that eight groups run Microsoft Windows servers, five groups run Red Hat Linux servers, four actively run Novell NetWare servers, one group runs a Novell/SuSE Linux server, and one group runs a server using a flavor of Sun Unix.

Operating System Installation & Imaging

We asked how each group handles the installation of operating systems in labs and in their faculty/staff environments.

In the open labs and teaching labs, the majority of groups use the Microsys WolfPrep service. Among its features is the ability to deliver operating system installs using Novell's ZENworks imaging. We use this to provide images that are pre-installed with the ITD-delivered NAL applications and the software needed to access various ITD services (like AFS).

Questions 1a, 2a, 3a, and 4a seek to determine where WolfPrep is used to install the workstation's operating system. We use this information to assess the potential impact of the change in imaging techniques from Novell's ZENworks imaging to another imaging system.

	N	All	Some	None
Open Labs	9	7	1*	1
Teaching Labs	8	7	0	1
Faculty/Staff	9	0	2	7
Grad/Other	7	1	3	3

Table 6. Use of WolfPrep among college-level technical groups, by environment.

*The respondent answering "some" noted that WolfPrep is used on all but "a couple" of workstations with special hardware needs, as well as some not directly accessible by students.

- ⇒ ZENworks imaging is one of Novell's weakest offerings. In addition to poor performance and buggy code, As mainstream vendors like Dell ship new hardware, months pass before Novell's ZENworks Imaging is able to support that hardware. These issues persist with the latest version of the software.

In the faculty/staff environment, six of the nine groups reported skills with alternate imaging or remote installation methods. We found that a small number of groups are familiar with Microsoft's native methods for OS installation, but many are familiar with other mainstream imaging methods such as Ghost.

- ⇒ We expect that changes in OS deployment and imaging methods within the WolfPrep system will be easily absorbed by system administrators.

For workstations that are not installed with WolfPrep, questions 1b, 2b, 3b, and 4b ask about other techniques used for operating system installation. These figures offer insight into the skill sets of many system administrators. (Many groups cited more than one method, so the totals may exceed the number of respondents. Some respondents use WolfPrep with other methods.)

	Open Labs (n=9)	Teaching Labs (n=8)	Faculty/Staff (n=9)	Grad/Other (n=7)
Active Directory	0	0	1	0
Clone local PC	0	0	1	1
Customize OEM	1	0	4	2
ETSS-provided	0	0	1	0
Ghost imaging	1	1	4	2
Manual install	1	0	3	2
Microsoft RIS +CD	0	0	1	1
Scripted Windows install	0	0	1	0
WolfPrep only	7	7	0	1

Table 7. Operating system installation methods used among college-level technical groups, by environment.

Application Distribution

Application distribution through ZENworks and the NAL is one of the most widely used services that ITD provides. The replacement technologies will include Microsoft's Windows Installer (MSI) and an application deployment system such as Microsoft's Systems Management Server.

NAL use is pervasive. All nine participating groups use NAL application distributions provided by ITD. In addition, eight of the nine groups create their own NAL application distributions in order to meet local and discipline-specific software requirements.

Four survey questions (1c, 2c, 3c, 4c) ask where ITD's NAL-delivered applications are used.

	N	All	Some	None
Open Labs	9	9	-	-
Teaching Labs	8	7	1	-
Faculty/Staff	9	1	3	5
Grad/Other	7	1	4	2

Table 8. Number of college-level technical groups using ITD-delivered applications on all, some or none of their supported workstations, by environment.

Four survey questions (1d, 2d, 3d, 4d) asked whether the technical group develops and installs its own NAL application distributions. One college-level technical group does not build NAL applications at all.

	N	Groups creating NAL apps
Open Labs	9	8
Teaching Labs	8	7
Faculty/Staff	9	6
Grad/Other	7	4

Table 9. Number of college-level technical groups creating their own NAL applications on supported workstations, by environment.

Question 21 asks how many of their own NAL applications the group has currently deployed. This raises a migration question, particularly for those groups that do not intend to continue running their own NetWare environment. The groups that are running NetWare servers provide a substantial number of NAL applications to their faculty/staff environments.

	N	Min	Max	Mean	Sum
NetWare	4	35	350	109	545
Non-NetWare	5	0	70	25	101

Table 10. Number of NAL applications created and delivered by college-level groups, by intent to continue running NetWare servers.

Windows Technologies

We asked questions regarding respondents' familiarity with Windows technologies related to application distribution.

Microsoft's Windows Installer (MSI) packages can be used to install software on Windows workstations. MSI repackaging tools can be used to build and customize application distributions. Six of the nine respondents have experience with MSI deployment. Five of the nine have experience with repackaging MSI applications, using a variety of tools from the free Orca to the full version of AdminStudio.

Questions 22 and 23 address whether the groups have developed expertise in deploying Microsoft's MSI installers (rather than using Novell's snAppShot tool) and whether they have skill in repackaging MSI applications. These are skills that will be important for groups that wish to repackage applications for use in the both the current and future ITD Unity/Windows environments.

	N	Yes	No
Deployed MSI packages	9	6	3
Repackaged MSI packages	9	5	4

Table 11. Experience with MSI deployment and repackaging by college-level groups.

Groups running Active Directory domains expressed satisfaction with the technology. The Active Directory domains are largely used to support faculty and staff users, most of whom were previously serviced by Novell-based systems.

Those running Windows servers had some mixed feelings; security concerns appeared to be the largest issue. We asked the groups to describe their level of expertise that the staff in their department have running Windows servers and Active Directory domains in questions 10 and 12, and experience with Microsoft's Systems Management Server in question 15. Experience with these technologies may mitigate training issues raised by the ITD transition.

	N	Yes	No
Windows servers	9	8	1
Active Directory domain	9	3	6
Systems Management Server	7	0	7

Table 12. Experience with Microsoft technologies by college-level groups.

Groups that have experience delivering applications with technologies other than the NAL may have an easier time with ITD’s transition away from the NAL, and may be able to assist in the development of internal training. Questions 1e, 2e, 3e and 4e ask about the delivery method of any applications available on workstations through non-NAL methods.

	N	By hand	Inclusion in disk image	Active Directory group policy	Other
Open Labs	9	2	2	0	0
Teaching Labs	8	2	1	0	0
Faculty/Staff	8	5	2	2	2*
Grad/Other	6	4	2	1	0

Table 13. Number of college-level technical groups installing applications by various non-NAL methods, by environment.

*One group reported slipstreaming application installs with the OS install, another reported using the ETSS environment for faculty/staff workstations (which is largely NAL-based)

Cost Indicators

We asked some questions concerning each group’s use of NDS and the NetWare server operating system outside of ITD’s offerings.

Of the five groups running NetWare servers, only one plans to change (this group is already running its own Active Directory domain). The four groups that plan to continue running NetWare servers are identically the groups that create NDS accounts for faculty/staff users.

Colleges that do not run NetWare servers do not create their own NDS accounts.

	N	Yes	No
Own NDS accounts	9	5*	4
NetWare servers	9	5	4
Plans to change	5	1	4

Table 14. Number of college-level technical groups providing own Novell/NDS services.

* One group answered yes because they use ETSS-supplied NDS accounts, but do not create their own.

The groups who run NetWare servers provide a wide variety of services to their users. It would require a substantial amount of to move their installed base, if this were desirable.

	Groups providing service
Application delivery	1
Email	2
File	3
Home directories	1
iFolder	1
NDS replication	1
NetWare-hosted applications (i.e. database, SAS)	1
Print	2

Table 15. Number of college-level technical groups providing particular NetWare-hosted services.

ITD currently provides NDS replica services for seven of the nine respondents. Some groups were concerned about how this will be handled after ITD’s migration is complete. ITD will work with these groups to ensure that no service loss occurs as the result of this transition. We do not anticipate that colleges will bear additional costs related to NDS replica services.

- Those who continue to use Novell technologies may be asked by other campus groups to absorb the increased costs resulting from ITD’s ultimate discontinuation of Novell-based services. Appendix 2 shows the cost distribution for the Novell Academic License Agreement (ALA) for the 2004/05 billing cycle.

Faculty/Staff Environments

We asked a number of questions related directly to faculty/staff environments provided by the respondents. While our current environment is primarily aimed at student computing labs, we are investigating whether we can redesign portions of our next environment to better serve faculty/staff users.

Groups that grant users full control to their workstations limit that privilege to faculty/staff users. Eight of the nine respondents permit their faculty and staff to have full control, while one of the larger college groups does not allow full control. The primary reason for allowing it is that faculty/staff users need to be able to install software on their own workstations, and to a lesser extent that there are applications that require this level of privilege. Ownership of the workstation was also mentioned; there are cases in which the technical group is not empowered to put restrictions in place.

Methods of granting full control to the workstations vary very little. Most groups create local accounts on the workstation that are members of the Administrators group. Two groups create Novell ZENworks policies that place user accounts in the Administrators group.

Eight groups support at least some faculty and staff who do not log in with an NDS account at all. These accounts are created manually on the local workstation, through Active Directory, or by the users themselves when they set their machines up themselves.

Groups with faculty/staff who log in without using an NDS account: 8, n=9

How non-NDS accounts are created and managed: manually on local workstation (4), Active Directory (2), faculty/staff self-installs (2), does not apply (1), n=9

One group reports that all of its supported faculty and staff log in using an NDS account with Administrator privileges; this is one of the larger colleges.

- We will review this information and investigate the need for extending Unity Windows to support academic faculty/staff Windows environments. We will consider these needs as we redesign the environment.

Conclusion

“Through the active integration of teaching, research, extension, and engagement, North Carolina State University creates an innovative learning environment that stresses mastery of fundamentals, intellectual discipline, creativity, problem solving, and responsibility.”

– excerpt from North Carolina State University’s Mission Statement

Change is inevitable, and desirable.

It requires effort, and change is never without cost. But, when change is managed well it drives improvement, unleashes creativity and creates opportunities for us to excel.

It’s an exciting time. We have the opportunity to step back and reconsider old assumptions, incorporate experience and feedback, and seek new ways of doing business that will better meet the needs of NC State’s students, faculty and staff. We look forward to designing an environment with the help of our colleagues that will improve on the success of our current model.

We have learned from our colleagues that we will need to work together to manage many aspects of the migration away from Novell technologies to our next Unity Windows environment. There will be technical issues, a need for training for both technical staff and end users, many groups will need to create and update documentation, and we will need to balance costs with benefits.

As we review our own competencies and learn more about those of our colleagues, we are optimistic. We are moving further into the mainstream of campus computing, drawing on the capabilities, experiences and ideas of many people, in many groups.

We are grateful for the time and effort that our colleagues have invested in sharing information with us. It doesn’t quite go without saying that communication is the foundation of our success.

This change positions us for that success.

When we are finished, the new Unity Windows environment will provide us with a flexible infrastructure that will enable our colleagues to meet the specific needs of the colleges and groups that they support, and it will help all of us contribute our best efforts in the service of NC State University’s mission.