

## North Carolina State University

### Impact Highlights

- NCSU was concerned about the quality of service experienced by its enterprise Web and network customers.
- Keynote helped NCSU improve and maintain the guaranteed experience of its paying customers.

*"To provide the perspective it needs on the performance of its Web applications as experienced by users, NCSU specifically wanted an unbiased observer, a leader in the field: Keynote."*

### North Carolina State University Delivers A+ Performance With Keynote

Just like any enterprise IT department, the Information Technology Division at North Carolina State University at Raleigh (NCSU) is concerned about the quality of service experienced by its enterprise Web and network customers and needs to know how its network is performing for its users. Students pay an educational technology fee that guarantees them adequate file space and Internet access. In order to meet its guaranteed responsibility to its paying customers and deliver the optimum experience, the University's IT division uses Keynote to track the performance of its Web applications.

NCSU's IT division serves as the University's primary ISP, responsible for hosting 80+ sites and managing the academic computing environment and online experience for about 40,000 active user accounts (including on-campus students, professors, distance learners, etc.) that generate about seven million hits each day. Although Web access is given high priority, the university-wide system handles a wide range of applications (student computing

labs, enterprise email services, streaming media, etc.), with file sharing representing the students' greatest use of network bandwidth.

NCSU compares its network performance to that of the public Internet in order to assure its customers superior service, and to identify and troubleshoot problems affecting users, whether internal or beyond the university's Internet gateway. The IT group makes this comparison in two ways: by comparing the results of the Keynote private agents to those of the Keynote public agents on the Internet measuring the same URLs; and by comparing its measurements to the results of the Keynote Business 40 Index (KB40).

To provide the perspective it needs on the performance of its Web applications as experienced by users, NCSU specifically wanted an unbiased observer, a leader in the field: Keynote. In fact, Web application performance is considered so important at NCSU that it is a key factor in the service level objectives the IT division submits to its upper management.

"This university IT division acts as both an ISP and a hosting company and each scenario presents different

*"Keynote has been invaluable as a diagnostic tool," said Nicholas. "The MyKeynote interface gives us tremendous value. It delivers a variety of performance reports, by backbone, etc.; it can identify bottlenecks over time; and it gives us the evidence to work with our backbone providers to solve problems. Keynote gives us an end to end picture of our Web performance, but you can also drill down and find specific problems. It does a great job of reporting the numbers—in a useful, understandable way."*

performance issues," said Harry Nicholas, assistant director for UNIX and Web services. "We have written into our service level objectives that the availability of our university home page and our online courses will exceed the Keynote Business 40 Internet Performance Index. To measure service level objectives you need results that are not only accurate, but also impartial. Accurate data is the hallmark of academic research so it was natural for us to turn to Keynote to get reliable, independent data about the performance of our Web applications. Quality of service for our customers has always been important, but before Keynote it was never easy to measure. Keynote made it easy."

And how do NCSU's Web applications do? Availability of NCSU's homepage is five to seven percent better than the availability of the KB40 Index as reported by Keynote; performance is as good as the KB40.

The use of both Keynote public and private agents, the linchpins of Keynote's Web Test & Measurement Services, has helped NCSU's IT division to pinpoint some significant performance problems and maintain that stellar performance. In addition, NCSU's Creative Services group uses Keynote NetMechanic® for on-demand integrity and HTML link testing for site design.

### **Keynote Private Agents: A Perspective on Internal Performance**

NCSU needed to know what was going on beyond its gateway on the public Internet and how Internet events affected its users. In addition, it needed to know how its Web

applications performed for users on its own network. NCSU has deployed a Keynote private agent on its network to provide a view of the Internet gateway and how well it delivers to customers. This agent tests four Web services: the university's homepage at [www.ncsu.edu](http://www.ncsu.edu); the main page for online courses at [courses.ncsu.edu](http://courses.ncsu.edu); and the third measures a page from a sister institution. A fourth metric measures each of the sites on the Keynote Business 40 Index, reflecting the experience of users on the NCSU network accessing the public Internet.

Keynote private agents, a key element of Keynote's Web Test & Measurement products, test and manage the end-to-end performance of e-business applications and systems, Keynote private agents are a turnkey, outsourced service that, combined with a family of measurement appliances, can be installed quickly and easily placed anywhere, whether inside the firewall on internal networks and VPNs, or in any location on the Internet not currently measured by Keynote. In this way customers can efficiently and securely obtain private measurement data affecting the performance of their networks. IT departments can correlate performance inside and outside the firewall, understand how internal device failures affect end user performance, and manage end to end performance of their Web-based applications from the end user perspective—all from a single console.

"Keynote has been invaluable as a diagnostic tool," said Nicholas. "The MyKeynote interface gives us tremendous value. It delivers a variety of performance reports, by backbone, etc.; it can identify

bottlenecks over time; and it gives us the evidence to work with our backbone providers to solve problems. Keynote gives us an end-to-end picture of our Web performance, but you can also drill down and find specific problems. It does a great job of reporting the numbers—in a useful, understandable way.”

In addition to the private agents, NCSU uses other Keynote Web Test & Measurement products to measure its homepage and courses page, as well as a third measurement directed where needed on an ad hoc basis. In this way, NCSU established a baseline for the performance of its homepage measured by private agents on its internal network compared to the homepage performance measured by Keynote’s public agents on the Internet. The private agent provides a first line of trouble identification, indicating immediately whether performance problems are internal to the NCSU network or external on the Internet, and directing IT’s trouble-shooting efforts in the right direction without delay. Alerts automatically give the IT group immediate notice when performance thresholds are exceeded.

Using Keynote Web Test & Measurement products, the IT division has been able to prove the merits of its decision to build a Web farm, and document its reliability and high performance. NCSU departed from the university norm in building its server farm, which allows them to more affordably and efficiently add power while keeping and leveraging existing resources. NCSU’s 40-machine farm is connected via 100Mb Ethernet to a fiber backbone.

## **Keynote: An A+ For Valuable Performance Troubleshooting**

Keynote proved its value immediately by providing evidence to a state consortium that a gateway capacity constraint was the source of a performance problem affecting use of the statewide university system, which serves 16 sister institutions. (North Carolina State University is part of the University of North Carolina system.) Performance started to slow and worsen at the end of the Spring semester as network use increased. It was assumed that the problem must be on the NCSU network and the responsibility of the IT division. Using Keynote measurements and diagnostics, however, the IT division discovered that anyone trying to access any of the statewide university sites was affected, not just visitors to the NCSU site.

They were then able to show the North Carolina Research and Educational Network that a capacity constraint was bottlenecking the gateway to the entire statewide system. As a result, the NCSU IT division was given additional funding to add bandwidth and solve the performance problem for the statewide network.

Again, Keynote’s results supported the IT group in a sticky situation when a University executive making a presentation in another city couldn’t gain access to the NCSU Web site, and assumed that the university’s site was down. Upon reviewing Keynote’s numbers the IT group was able to pinpoint the problem to the backbone provider in the city where the presentation was taking place.

## About Keynote

Keynote Systems (NASDAQ "KEYN") is the global test and measurement company for mobile communications and online business performance. As an independent and trusted third-party, Keynote provides IT and marketing executives with an unbiased view into their Internet services from around the world. For over a decade, we have been providing measurement data and testing capabilities that allow companies to understand and improve their customer's online and mobile experience.

Keynote Systems, Inc.  
777 Mariners Island Blvd.  
San Mateo, CA 94404  
Main Tel: 1-800-KEYNOTE  
Main Fax: 650-403-5500  
product-info@keynote.com

Keynote gave the IT group a very fast mean time to repair in another unusual incident when an employee inadvertently altered and redirected the university's homepage URL and IP address. Monitoring Keynote results as usual, the IT staff started to see the error rate increase rapidly. According to Nicholos, "Keynote was critical in identifying the growing trend in errors and pinpointing the reason for the problem." By correlating multiple traceroutes worldwide, the IT group was able to quickly determine why the IP address was not resolving correctly, and redirect the address and URL entries to return traffic to its normal routing and performance levels.

The IT group also needs to support the various departments responsible for the 80+ sites in the system, and field their inquiries when problems arise, using Keynote's quantitative results to assure department heads of the performance and availability of their sites. NCSU has used Keynote since 2000, and has been so pleased with Keynote that they're not interested in considering other options. "Keynote is essential to us in monitoring Quality of Service for our customers," said Nicholos. In addition, it gives them leverage and evidence of performance problems that the university Network Operations Center needs to address. After recognizing the value time after time of Keynote's numbers, alerts are now directed to the NOC for their action when required. In fact, they now have someone in the NOC focusing exclusively on Quality of Service.

NCSU has found Keynote essential in identifying specific problems, as well as for routine monitoring and performance comparison. "Keynote has been its most valuable to us as an early warning system," said Nicholos. "Since it's always there and always testing, we know our baseline performance numbers and, if we see a persistent change upwards (delivery time) or downwards (availability), we know it's time to dig down further to pinpoint and diagnose the a problem."

By using both Keynote public and private agents internally and externally on the public Internet, and comparing 'apples to apples' metrics from both, NCSU has been able to improve and maintain the guaranteed experience of its paying customers, ensure the service level commitments to those customers and to upper management, reduce downtime during performance crises through high frequency monitoring and notification, and reduce operational costs associated with problem investigation.

1-800-KEYNOTE  
(1-800-539-6683)  
www.keynote.com

© Keynote Systems, Inc.  
All rights reserved. The Mobile & Internet Performance Authority and Perspective are registered trademarks of Keynote Systems, Inc. Other trademarks are the property of their respective owners. CS1016v1

**KEYNOTE**<sup>®</sup>  
The Mobile & Internet Performance Authority™