

CASE STUDY

# UC Berkeley Modernizes Network Infrastructure with NIOS DDI



## THE CUSTOMER - UNIVERSITY OF CALIFORNIA, BERKELEY

Founded in 1868, the University of California, Berkeley, is the flagship campus of the University of California system.

It is a public research university with more than 130 academic departments, 80 interdisciplinary research units, and nearly 40,000 students. Full visibility and operational efficiency are crucial to managing the university's network.

## THE CHALLENGE

### Replacing Own Legacy BIND System

While UC Berkeley's IP networking system met the university's basic needs, its network management team found it was utilizing resources inefficiently. Multiple employees were required to maintain the legacy BIND system, which kept operational costs high and ran contrary to the university's reputation as a technological innovator.

Compounding the challenge of an aging network infrastructure was a network that would grow increasingly complex as the number of connected devices continued to climb. With student enrollment expected to increase by 10,000 students by the 2018 – 2019 school year, the impact of service interruptions was increasing and had the potential to impact multi-national and interdisciplinary research projects. Additionally, the BIND legacy IPv4-capable network was unable to handle automated IPv6 addressing, requiring manual servicing of requests to meet the needs of a growing campus. Also, the current DNSSEC deployment required additional work hours for complex scripting when DNS changes were needed, potentially putting the entire network at risk in the event of errors.

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**Isaac Orr**  
Manager of Network  
Operations and Services  
University of California, Berkeley

Isaac Orr manages the network operations and services group responsible for the campus data network at the University of California, Berkeley. “It’s a large network,” he says. “We have around 60,000 wired ports, 4,500 access points, and 115,000 devices connected to the network. The group I manage ranges all the way from field installation technicians to more senior people involved in larger projects, such as deploying networking to new buildings on campus or developing new network services. That encompasses pretty much everything from DNS hosts to iPads and phones on the Wi-Fi network.”

Coincidentally, before Infoblox, the defacto standard used to manage core network services at UC Berkeley was BIND (Berkeley Internet Name Domain), which was developed and built by top experts at the school. “IP networking has been big here since IP networking existed,” Orr shares. “Everything we had was actually custom built in house quite some time ago. The system was based on a PostScript database with PERL scripts.”

Functionality was not a problem; the legacy BIND system worked as it was supposed to, but IT no longer had the resources to maintain and continue its development. Since the last major work had been done on it in 2003, it had begun to lag behind in some of the things that Orr’s internal customers needed. “The BIND-based system was fairly inflexible in terms of making changes,” Orr says, “and having somebody to care for and feed the servers that did all those scripts was consuming two employees’ time—one of them a senior networking person.”

Looking for something more efficient that would lower total cost of ownership (TCO), Orr’s team selected NIOS DDI from Infoblox for the school’s large and diverse network. “Infoblox has a very good reputation in the industry,” says Orr, “and we knew of other University of California campuses that had deployed Infoblox solutions. We also had people within our own group who had worked with it and were impressed.”

“So we already had a pretty high opinion of the product, and when we started comparing it with other solutions in the marketplace, we concluded that it had the fullest feature set and would allow us to do a lot of stuff.” The university purchased both physical and virtual Infoblox appliances running DNS, DHCP, and IP address management (DDI) on the centrally managed Infoblox Grid architecture.

## THE SOLUTION

### A Simplified Solution for Better Integration and Automation

Infoblox has allowed UC Berkeley to better integrate and automate its systems and tools. For instance, the university can now use APIs to integrate NIOS DDI with solutions from other vendors, custom code built by the university, and with legacy BIND. These improved integration and automation capabilities also make it easier for the university to automate tasks using role-based access to allow the virtualization team to control its own zones, simplify DNSSEC assignment, transition to IPv6, and flexibly combine virtual and physical appliances to leverage infrastructure already in place.

In addition, the integration and automation in NIOS DDI enables Orr’s team to manage DHCP and IP address management more effectively. His team can now better access and control a key portal that campus users go through to register the MAC addresses of their devices to their university-wide ID. If someone’s MAC address isn’t registered, that person doesn’t get DHCP or an IP address. If a registered device is compromised, IT can automatically block it from getting DHCP or an IP address.

**Customer:** University of California, Berkeley  
**Industry:** Education  
**Location:** Berkeley, California

#### OBJECTIVES:

- Modernize Aging DDI Network Infrastructure
- Reduce maintenance burden
- Lower total cost of ownership
- Improve automation
- Gain greater efficiency and flexibility

#### RESULTS:

- Faster delivery of services
- Ease of operations
- Lower TCO
- Enhanced integration with legacy and back-end systems
- Improved automation

#### PRODUCTS:

- NIOS DDI

Infoblox also allows Orr's team to sign up for dynamic DNS. A lot of the back-end work involved in this is enabled by APIs. "This simplifies a lot of things for end users," says Orr. "Having an API and an extensible database made it really simple to just uplift everything we were already using and drop it into Infoblox. It was next to nothing to create the application to talk to the database for our user portal."

Infoblox Extensible Attributes is the key enabler. In the distributed environment typical of colleges and universities, individual departments have their own IT operations. For the central IT team, this means that one tech might be the security contact for 300 devices. "We built our own web portal with its own concept of roles since it handles other things than DNS/IPAM information. We extended its concept of roles into Infoblox via Extensible Attributes."

Berkeley's IT team also uses Infoblox's Extensible Attribute fields to track contextual network data and help prioritize its operational actions to identify, prioritize, and remediate issues. The solution tells the security team who is responsible for what network. Information related to that is stored in EAs on the network and host objects in Infoblox," says Orr.

Another feature that has come in handy is Infoblox role-based access control. "Our virtualization team now has control over some of their own subnets and zones to handle address allocation and server naming," Orr says. "It allows them to build automated workflows for provisioning in our private cloud infrastructure."

To help with the migration of data, UC Berkeley leveraged Infoblox Professional Services to implement its new solutions. "We wanted somebody who could actually work with us in terms of converting everything to Infoblox, who understood the product, and who could make recommendations about how it should be deployed and so on," explains Orr. "Infoblox Professional Services was very reasonably priced, and we were very impressed. The person we worked with had a lot of experience in the educational environment, understood what we were trying to do, was very knowledgeable, and at the end of the day, really quite helpful."

Infoblox Support has also helped out immensely. "We worked with the support team to develop some enhancements to the solution," says Orr. "It's always nice when you're working with a vendor and you say, 'hey, we think it should really do this,' and the vendor says, 'you're probably right,' and they make it happen. To me, that's the best sort of support experience you can have with a vendor."

## THE RESULTS

### Saving Time, Money, and Complexity

UC Berkeley was an early adopter of DNSSEC, and for some time, it had been signing all of its major zones. However, this process required multiple scripts that had to be activated to re-sign all those zone files. The activations made making iterative changes to DNS very difficult and less secure. While the process worked, it also created the possibility of errors that Orr says could break the whole system. "The worst-case scenario," he says, "would be that the Berkeley name space would be unresolvable, and from a campus perspective, that would be pretty huge." With Infoblox, UC Berkeley was able to step up to next-level network automation with features like one-click, automated DNSSEC deployment.

UC Berkeley IT was well aware of the need to transition to the new IP address protocol before available IPv4 addresses were exhausted. However, its legacy system could not understand or accommodate IPv6 addresses. There was no way within the custom-built IPAM solution to allocate IPv6 address space, so the IT team was doing it manually and separating DNS servers that did the zones for IPv6.

"If somebody asked us for IPv6, we would provide it," says Orr, "but it wasn't a thing that we could just turn on everywhere and make available. With Infoblox, we can. You have to remember that from our perspective, we look much more like a service provider than an enterprise IT department, so we have to allocate IP address space on campus just as a service provider does. Infoblox is perfect for that, and UC Berkeley is now a leader in terms of IPv6 instead of lagging behind."

UC Berkeley's Infoblox implementation includes a mixture of physical and virtual appliances. "We already had virtualized infrastructure for the DNS BIND servers, so it made sense to deploy virtual appliances wherever we could," says Orr. "But for our Grid Masters, based on scale, that wasn't the right choice, and we have some remote Infoblox devices for redundancy that needed to be physical as well." Managing this mixture of virtual and physical presents no problems since the Infoblox Grid seamlessly manages the two in concert.

When asked about the benefits Berkeley has gained, the first thing Orr mentions is reduction in TCO. "We've saved \$75,000 per year on the senior labor we were using to help manage and maintain the DNS infrastructure."

Time saving comes next. "Five years ago when I started," he says, "if you requested a new host on a subnet that was full, the process took at least two weeks to complete. Now, we're down to three to five days. That's a pretty big change in an organization of this size, and the Infoblox infrastructure was a big part of that."

Then, there's the simplicity of operations. "Infoblox simplifies something that is really quite complex. At the same time, it gives us the flexibility to do the things we need to do. I would definitely recommend Infoblox to peers."



Infoblox unites networking and security to deliver unmatched performance and protection. Trusted by Fortune 100 companies and emerging innovators, we provide real-time visibility and control over who and what connects to your network, so your organization runs faster and stops threats earlier.

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