

# TRANSFORMING AN ENTERPRISE NETWORK TO OPERATE AT THE SPEED OF SCIENCE

The Oklahoma Medical Research Foundation Connects Science and IT

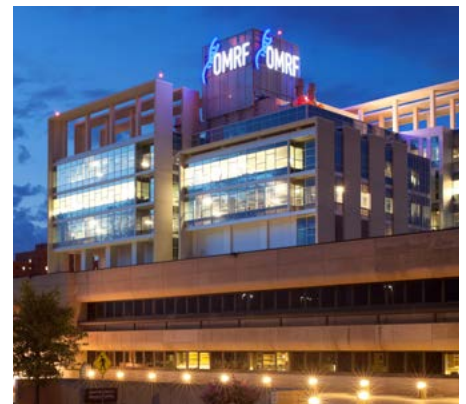
## SUMMARY

The Enterprise network at Oklahoma Medical Research Foundation (OMRF) was a ten-year-old design. It couldn't support the revolution in laboratory technology that has increased research data demands to far exceed the network's 1Gbps throughput capacity. What's more, the problem was about to be compounded as several new scientific laboratory instruments were coming online and would multiply data transmission demands even further. OMRF needed a new flexible and upgradeable network design and had vendor bids to design their next-generation network. However, OMRF wanted to be sure that the design would meet their current and future data transmission needs. So, they sought independent validation from BioTeam.

The validation effort concluded that the design was not sufficient for OMRF's current or future needs. Working in collaboration with BioTeam, OMRF altered the network design to include a multi-enclave, next-generation 10Gbps network, upgradeable to 100Gbps. This new strategy creates separate physical networks to serve the needs of scientific research and enterprise business independently. Not only does the new network design boost performance 10X, the hardware costs are less than half the original quoted price.

## ORGANIZATION OVERVIEW

Founded in 1946, OMRF is a non-profit research institution located in Oklahoma City, Oklahoma. Their mission is to conduct foundational biomedical research that leads to a greater understanding of how to increase human lifespan and quality of life. The research conducted in OMRF laboratories explores potential mechanisms and triggers for human diseases and disorders. Their research has led to a deeper understanding of disease formation, including autoimmune, cardiovascular, aging, and neurological diseases. The Foundation employs 450 staff and 50 principal investigators. Each research area maintains a tight relationship between IT capabilities and scientific progress. OMRF has an IT staff dedicated to meeting the growing needs of science. However, OMRF faces the common challenges associated with scientific research that is large-scale data-driven.



## AT A GLANCE

**Who:** OMRF, a non-profit scientific research institution.

**Challenge:** OMRF has a slow and outdated data network impeding the progress of scientific research.

**Solution:** With BioTeam's assistance, OMRF has changed their networking strategy to include separate networks for science research, enterprise business, and network administration. Together with substantial cost reductions, the new topology will deliver 10X faster scientific data transmission performance.



"What gets us to work every morning is not IT, it's the science conducted at OMRF and the lives we help improve through the Foundation's research."

— BRENT KECK, CHIEF INFORMATION OFFICER AND ASSOCIATE VICE PRESIDENT, OKLAHOMA MEDICAL RESEARCH FOUNDATION



## THE CHALLENGE

OMRF scientists are engaged in potentially life-saving and life-changing research that utilizes the latest in scientific laboratory techniques and technologies. These technologies generate enormous amounts of data and require significant computational analytics capability. As such, the scientists rely on having the right IT capabilities and a high-speed science infrastructure to accelerate discoveries. Like most research organizations, OMRF IT supports an enterprise IT infrastructure that services the Foundation's administrative functions as well as their research infrastructure, including networks, storage, and high-performance computing. However, modern scientific computing needs have grown to dwarf the enterprise needs. New high-throughput instruments like genomic sequencers and Lattice Light Sheet microscopes can generate many terabytes of data with every run. Spikes in data transfer from these devices were consistently slowing network performance for all users. Additionally, without the right infrastructure in place, planned introduction of more sophisticated research equipment would make the problem worse. The Foundation's computational scientists had pushed the network beyond its limits, and the growing demand for network speed, additional storage, and increased HPC was expected to continue.

## CHALLENGE IMPACTS

- Slow downloads and data transfer hindering the speed of science
- Shared instruments unavailable while waiting for data off-loads slowed research
- Potential negative influence on researcher recruiting
- The high cost of quoted hardware from vendor's design
- Addition of new data-intensive laboratory equipment had compounded performance issues
- Need for independent validation that network design will meet long-term objectives



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"Large data transfers had become a serious issue. We had one researcher download 60TB, and it took ten days. While she waited, her research stalled."

- BRENT KECK, CHIEF INFORMATION OFFICER AND  
ASSOCIATE VICE PRESIDENT, OKLAHOMA MEDICAL  
RESEARCH FOUNDATION

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## THE SOLUTION

OMRF IT requested proposals from network technology vendors to replace their data network. Their suppliers responded with plans for new 1Gbps network equipment, which did not add new capability beyond current network speeds. The proposed solution was also quite expensive. This combination of outcomes from the vendors led OMRF to seek an unbiased validation of the proposed solution; Keck turned to BioTeam for this service. They had worked together previously, and he trusted BioTeam's impartial review. He knew that their combination of IT and scientific experience would help point to the best technology options for his scientists in support of their research.

BioTeam conducted a rapid assessment of the OMRF network plan. They looked at the existing topology and vendor proposals and conducted on-site interviews with Keck, his IT staff, and Foundation scientists. A week later, OMRF had a summary report that evaluated the existing and planned topologies as well as research data requirements. The response was fast and the recommendation unexpected. BioTeam had concluded that the vendor-proposed design was vastly insufficient for the Foundation's current needs. They re-architected the design to create three separate networks with up to 10Gb capacity and upgradeable to 100Gb. A science network would isolate the traffic for performance from a separate enterprise network. A third network would provide out-of-band management and would improve both network security and operations. "In contrast to traditional Enterprise IT design, the challenge of Research IT," the report said, "is planning for peak network utilization during burst periods, not the average need."

The BioTeam report introduced a new perspective for OMRF around the relationships between IT and science. "We had been narrowly focused on a solution to simply replace what we had and to resolve our known issues," Keck said. "But our collaboration with BioTeam clarified several issues we hadn't considered. We knew, for example, that our imaging core was already hindered by slow data transfers. However, BioTeam noted the increased use of high-throughput instruments that would continue adding data demands so that even the new network would be overtaxed if the design were not modified."

Working together, OMRF and BioTeam created a new network design strategy and architecture. They would replace the existing 1Gb network with the three physically independent networks.



## IMMEDIATE BENEFITS

### Reduced Expense

The new network design will help reduce projected network expenses to less than half the originally proposed 1Gb network and is substantially below projected VAR prices for 10G networking equipment.

### Better, Upgradeable Network Design

The new design creates a separate 10Gbps science network, upgradeable to 100Gbps. A 1Gbps enterprise network separates enterprise data traffic, and a third management network allows for network administration. The result is better performance for all users, as well as accelerated science research.

### High-Speed External Data Transfers

The Internet2 connection will enable high-speed data transfers and downloads with other academic institutions in hours instead of days.

### Research Funding

Any reduction of IT expense increases potential funding for science. Also, because part of the new network is dedicated to science only, it improves the ability to solicit funds from local grant agencies.

### Recruitment and Retention

Scientific IT infrastructure improvements make for more productive and satisfied scientists. Resources are more current and efficient, and they help support researcher recruitment and retention. First-rate scientific computing capabilities attract first-rate scientists.

### Improved Communications and Relationships

The OMRF IT organization and Scientists have developed a closer collaboration and improved understanding of how IT can better serve the research function.

### The Value of Speed

The process took just 23 days from initial request to final report. As a result, OMRF could pull the plug on a deficient solution and restart with a better way forward.

The design also proposed the addition of a 10Gb Internet2 connection through the University of Oklahoma network to enable high-speed access to public datasets and performant data exchanges with other research institutions.

While the performance of the science network will initially be 10Gb, the design includes a capability to upgrade to 100Gb equipment if warranted in the future. Because 100Gb speeds require fiber optic connections to operate, most organizations need to upgrade their fiber paths to utilize those technologies. Fortunately, OMRF had the foresight to lay fiber between all their buildings. This will ease the deployment of future performance increases by limiting the upgrades to new optics with no new switches or additional fiber construction costs.

Most impressively, the new network, with proposed design changes, will cost less than half of the original supplier equipment quote and replace a design that would not have addressed OMRF critical scientific requirements.

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“Our experience with BioTeam was fantastic. They got us to think outside the box. Their plan will help to save us money and provide a 10X better result. It will help accelerate research and has made our scientists very excited about the change.”

– BRENT KECK, CHIEF INFORMATION OFFICER AND ASSOCIATE VICE PRESIDENT, OKLAHOMA MEDICAL RESEARCH FOUNDATION

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Learn more at: [bioteam.net](http://bioteam.net)

## ABOUT BIOTEAM

BioTeam is a high-performance consulting practice dedicated to delivering both objective and technology agnostic solutions to life science researchers. We utilize the right technologies, customized to our clients unique needs, enabling them to reach their scientific objectives.