

# Modernizing and Monetizing DOT Networks Without Fiber Upgrades

The financial windfall coming from recent pandemic relief funding, awards from the FY 2021 Infrastructure for Rebuilding America (INFRA) Grant Program, and the Infrastructure Investment and Jobs Act present a much-needed opportunity for state and local Departments of Transportation (DOTs). Using these funds, DOTs can build and repair bridges, roads, and other infrastructure, as well as modernize the fiber and technology that supports Intelligent Transportation Systems (ITSs) and other operations along our nation's roadways.

Technology modernization also gives DOTs the opportunity to create additional revenue, improve resilience, and better serve the public by engaging in mutually beneficial partnerships with other DOTs, private sector companies, and state agencies. Dense Wavelength Division Multiplexing (DWDM), Software-Defined Networking (SDN), and virtualization pave the way for partnership and monetization by intelligently managing complexity, reducing operational costs, and allowing DOTs to get more from their existing fiber resources. With partnership and monetization as part of an overall business strategy, DOTs can drive innovation, new efficiencies, and a more sustainable future for investments made with one-time funding.

## Obstacles to monetization

The following challenges keep DOTs from managing resources effectively, engaging more often in partnerships, and monetizing their networks.

**Degradation of fiber assets in specific areas.** Harsh environments, mishandling during installation, fiber nicks caused by digging, and other issues can damage lengths of fiber and cause the fiber signal to degrade. This degradation can cause unacceptable signal attenuation (performance) for data communications, which drags down service levels and prohibits optimal use of the fiber.

**Poor visibility into fiber and its usage.** Many DOTs don't have the tools to get clear metrics on network usage patterns, so they can't make informed decisions about resource allocation, network usage fees, service levels, and other aspects of monetization.

**Legacy routing technology.** Instead of dynamically routing network traffic based upon real-time application requirements, legacy protocol technologies route traffic along predetermined paths. This prohibits DOTs from avoiding network congestion and poor performance in high-bandwidth/low-latency applications used by their agency or partners.

## Lack of intelligent network management capabilities.

Without software-based automation, orchestration, and virtualization tools, DOTs cannot easily share excess capacity with other entities. In addition, they must send network teams into the field to address issues that could be handled virtually — and more quickly and cost-effectively — from the main operations center.

**Limited staff.** DOT network engineering and operations teams already have their hands full managing network resources day to day. To monetize fiber, DOTs need to empower staff with better network inventory; automated provisioning, billing and assurance; and other advanced network tools.

## Win-win strategies for cooperative partnerships

With the right technologies and strategies, DOTs can free up more infrastructure and form win-win partnerships that create additional revenue, help close the digital divide, and strengthen resiliency. Another advantage of partnerships is that they elevate project management all around by creating additional layers of risk management related to planning, delivery, and financing.

DOTs typically monetize their resources in the following ways:

- Selling or leasing unneeded fiber resources to carriers, which then sell mobile services that leverage the fiber
- Selling or leasing unneeded fiber resources to state agencies, which can use the fiber to extend broadband services to underserved areas, offer more innovative services, and ensure higher reliability and performance for bandwidth-intensive/latency-sensitive applications

- Partnering with a private company that monetizes fiber resources (for example, by selling services to businesses, residential customers, or citizens broadband radio service) and shares a portion of the revenue with the DOT

A key to successful partnership is building a business case together that clearly defines goals and what 'win-win' looks like for all parties, establishes criteria for what constitutes success or completion of the project, and includes provisions for reviewing project status at pre-determined intervals to prevent projects from snowballing. It's also important to keep in mind that the consequences of risk are different for various entities, which impacts the way each entity will view risks.

"DOTs and their partners must be sure to define what the win-win looks like for all parties. It really matters because once you do that you can begin to get buy-in and support, and you can do some pretty creative stuff. If you don't do that, then the partnership risks meaning nothing more than additional complexity — and nobody needs more of that," says Bob Woolley, a Senior Fellow for the Center for Digital Government who previously served as Chief Technical Architect for the State of Utah.

### Monetizing fiber without making upgrades

The following technologies provide everything DOTs need to modernize and monetize their fiber resources without making fiber upgrades.

**DWDM technology.** DWDM technology is used to combine and transmit multiple data streams (wavelengths) on a single optical fiber strand. By optimizing fiber utilization, it frees up capacity to share fiber with other entities. In addition, it helps fill coverage gaps in areas where the fiber signal has degraded.

**Internet Protocol (IP).** IP is the addressing system of the internet, allowing users to reach people, applications, devices, and other resources. Newer iterations of IP are more adaptive, allowing DOTs to more easily deliver IP-based connectivity for 5G, cloud, edge computing, and other environments by virtualizing and automating IP network management and abstracting the complexity of dealing with multiple IP domains across multi-party environments.

**Intelligent, software-defined environment.** To minimize the impact of new partners on existing network operations staff, DOTs need to automate as much as possible. An

intelligent, software-defined environment leverages visualization tools, analytics, automation, and other powerful tools to optimize data routes, automatically allocate bandwidth on demand, and manage other network services with minimal human involvement.

**Virtualization at the edge.** By virtualizing and automating the provisioning of network resources close to the edge, DOTs can quickly set up connectivity at each network location or ingress/egress point — without dispatching IT staff to each location that needs set up, repair, updates, or modification.

### Cybersecurity, including cybersecurity as a service.

Encrypting in-transit data helps ensure the privacy, security, and integrity of data and helps guard against attacks and network breaches that could impact performance or availability. Managed services leverage expertise, technology, processes, and threat intelligence that would be difficult, if not impossible, for a DOT to maintain on its own.

### Oklahoma Turnpike Authority innovates with digital tolling

The Oklahoma Turnpike Authority is leveraging a public-private partnership to build a variable digital tolling solution that will help build revenue for both partners. Using the turnpike's existing fiber assets, SDN tools, and other technology, the solution will automatically track roadway usage in real time and allow for future integration with DOT ITS (Intelligent Transportation Systems). On the front end, it will support fully automated, cashless toll payments for motorists, which will reduce collisions at toll booths and improve traffic flow.

### Making the most of the moment

With the distribution of various federal funding monies, DOTs have a unique opportunity to modernize and monetize their fiber resources. When considering technology investments that support monetization, it's important to use one-time funding in a way that supports ongoing goals without creating operational burdens in the future.

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