Case Study

Federal and State investment in expanding the Nation's broadband infrastructure puts emphasis on building the "middle mile," the fiber optics conduit between the telecommunications provider and the residential or commercial user. Highway and road rights-of-way provide a critical middle mile for fiber conduit to even the most remote communities.

State transportation agencies typically have practices in place for enabling right-of-way use by utilities, including telecommunications. However, managing the permit process can be involved and costs high for retrofitting miles of roadway with new conduit, especially with multiple telecom providers seeking access.

The Utah Department of Transportation in the last 20 years has been actively working to streamline the path for fiber installation. Utah practices may be of interest to other States.

Office of Infrastructure:
FHWA-HIF-22-040
May 2022

U.S. Department of Transportation
Federal Highway Administration

UDOT Takes Active Role in Facilitating Broadband Deployment

This case study discusses the Utah Department of Transportation's suite of measures to cooperate with the region's telecom companies and facilitate fiber conduit installation.

Introduction

To support Federal and State investments in extending broadband infrastructure, the Utah Department of Transportation (UDOT) developed several measures to make fiber conduit installation easier, quicker, and more cost-efficient along State highways and roads.

Practices include a dedicated fiber optics office within UDOT that serves as a one-call shop for all fiber optics requests and activities. In addition, the agency communicates regularly with regional telecommunications ("telecom") providers to coordinate opportunities for including fiber projects in existing or planned road construction projects.

UDOT installs fiber conduit systems itself, often as part of other road construction projects, then shares use of that fiber asset with telecoms in exchange for other services. This practice, known as resource sharing, allows UDOT to increase connectivity to Intelligent Transportation Systems, such as road cameras, weather stations, signals, and message signs. The trades are "a complicated dance, but doable if you can figure things out," said Lynne Yocom, UDOT Fiber Optics Manager.

Yocom said that through arrangements with telecom stakeholders, UDOT has installed more than 3,250 total miles of fiber, saving an estimated $105.8 million in avoided costs.

A trench for fiber conduit along I-84 in Utah. Photo: UDOT

Background

UDOT's fiber optics efforts have evolved since the State hosted the Winter Olympics 2002 in and around Salt Lake City. Five years before the event, the Olympics Committee had requested a reliable communications network to support athletes, media, coordinators, spectators, and traffic at the numerous venues. UDOT installed just over 400 miles of brand new-conduit and fiber optics, which provided a fiber optic connection to the traffic devices. UDOT also partnered with other State agencies, utilities, and private organizations to provide additional support for the event and future needs.

That experience amplified how achieving broadband delivery depends on extensive coordination, especially given Utah's rugged and rural terrain. Utah is made up of mountains, canyons, valleys, and desert plateaus. It is home to popular ski areas, vast national and State parks (Zion, Canyonlands, Bryce Canyon, and Arches), and tribal lands.

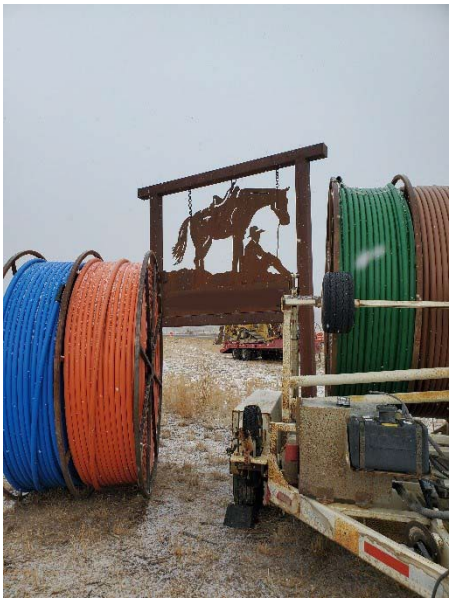
A change in Utah law in 2006 consolidated all executive branch IT support into a new Division of Technology Services. Fiber optics support remained with UDOT in the Traffic Management Division. UDOT had also developed an extensive Intelligent Transportation System (ITS) network that ran on the fiber optics.

Implementation

UDOT operates on the premise that the principal expenses of installing fiber are labor, construction, and permitting. Also, the agency has found that it is easier and preferable to open up a road just once rather than retrofit it later.

UDOT developed the following practices to minimize fiber construction costs. UDOT:

- Finds and communicates opportunities for telecoms to piggyback fiber installation onto other road construction projects. This includes posting every road construction and fiber installation project online. "Every region sees where the requests are, and we try to align projects," Yocom said. UDOT educates telecom providers to recognize which road projects on the maps would also be candidates for fiber conduit.
- Engages telecoms in Statewide Transportation Improvement Program (STIP) planning. UDOT also sends representatives to telecom conferences to discuss broadband projects and provide information and assistance.



Conduit staging in Utah. Photo: UDOT

- Installs empty conduit during certain road construction projects. UDOT also lays conduit as part of new pathways around State traffic signals. "Conduit is cheap," said Yocom. "When you tear up a whole intersection and are redoing it, throwing in a few boxes of extra conduit costs nothing compared to what you're tearing up. Future cost savings for everybody? Huge."

- Encourages innovative "trades" with telecoms in exchange for fiber or other services elsewhere. These agreements are allowable under Utah legislation. (See below for more about how Utah's trades work.)
- Stages junction boxes, conduit, and fiber throughout the State – at UDOT sheds that have available space – to support current and future broadband deployment. This makes projects more viable for some telecoms because the conduit is already there. It avoids time and cost risks in obtaining fiber and then transporting it to a remote location.
- Solicits an annual "wish list" from telecom providers. That list, overlaid with road projects, can enable the telecoms and UDOT to align excavation/implementation activities.

How Trades Work

Trades are arrangements between UDOT and telecom providers for access to the right of way or for existing conduit. They are allowable by Utah code 72-7-108 that states: "the compensation charged may be cash, in-kind compensation, or a combination of cash and in-kind compensation."

In return for access to the conduit, telecoms may provide fiber or other network services elsewhere. For example, a telecom may extend an existing network to a traffic communications center or provide new Wi-Fi hotspots in rural areas.

UDOT trades existing or planned conduit and fiber on a foot-by-foot basis, and fiber optics on a foot-by-strand basis. Trade agreements are for 30 years with automatic 50-year renewals. Telecoms are responsible for maintenance of all fiber lines and conduit.

Telecoms may prefer to set up an agreement for cash payment instead of in-kind trades. They would then pay a right-of-way fee based on an appraisal of what the trade value would be, drawing on comparable procurement contracts. Some providers, especially the larger ones, have set up cash agreements.

Yocom said the advantages of in-kind trade agreements and partnering for the telecoms are that UDOT is set up to handle environmental clearances, stormwater pollution prevention plans, traffic control plans, and stakeholder coordination. UDOT makes sure all the other construction documentation is in place before construction can begin. This is especially helpful when coordinating with an upcoming planned road construction project. For example, a project can extend its environmental review document limits to cover both the fiber and conduit installation, or one study instead of two.

Benefits

UDOT reported these benefits to its proactive approach and innovative agreements with telecom companies.

- Makes telecoms' access to the right-of-way easier and more immediate. Telecoms seek connectivity quickly when they have a customer. It also makes it more affordable and manageable for even smaller telecom providers, so no single company has exclusive access.
- Avoids costly construction and traffic disruption by aligning broadband projects with other road construction.
- Streamlines process for obtaining environmental and other permits for the work.

- Eases process for installing conduit in even the most rugged and remote areas in the States. Utah has numerous valleys and canyons, which would make it even more costly to dig up the roadbed to install new conduit. Through the practice of laying empty conduit during road construction projects, multiple providers can install infrastructure at a much lower cost.
- Allows the road construction project to keep control of timeline and budget. UDOT came up with its own design for conduit around traffic signals.
- Significant payback to the State by leveraging its additional capacity in urban areas for rural areas. The in-kind exchanges go toward improving connectivity for UDOT ITS components: closed-circuit television cameras, road weather information system sensors, traffic sensors, traffic lights, and communication hubs. UDOT found that if the State installed a section of conduit, it could get a telecom to agree to build the next section. This doubles the availability for both parties and makes it more affordable to extend the infrastructure and provide services to rural communities.

Project Example

UDOT's streamlined processes helped it respond to a State request in 2020 to use $30 million in Federal Coronavirus Aid, Relief, and Economic Security Act (CARES Act) (Pub. L. 116-136) funding for a broadband connectivity project. The project supported the State and CARES Act goal of building roadway fiber optic infrastructure to connect rural communities for critical needs, including telemedicine, distance learning, and telecommuting.

In Millard and Sevier Counties, UDOT installed 117 miles of fiber along I-70, from Cove Fort to Eagle Canyon. It also set up Wi-Fi hotspots at seven locations. In Box Elder County, UDOT installed 42 miles of fiber along I-84 from Tremonton to the State line. Wi-Fi hotspots were set up at three locations.

UDOT started the project in October 2020 and completed it by March 2021, a quick turnaround in large part because of the fiber conduit UDOT already had in place as well as a streamlined process for obtaining the appropriate contracts and permits. "They gave us $30 million and we built 167 miles in six months," Yocom said. "We have now partnered to extend those middle-mile builds an additional 50 miles. This enables communities along the way to be eligible to build last-mile fiber connections through grant programs available today."

Fiber conduit being installed along I-84 in Box Elder County, Utah. Photo: UDOT

UDOT Considerations for Other Agencies

UDOT offers these suggestions for other States seeking to implement or improve their fiber optics programs:

- Give stability to the fiber optics program within the DOT; also use other department resources. The UDOT Statewide Fiber Optics Team is currently four fulltime employees and seven RFQ contracted employees, with access to four ITS project managers. UDOT also reaches out to and coordinates with permits, right of way, preconstruction, planning, structures, legal, and legislative departments.
- Reach out. Communicate opportunities for broadband installation on planned road construction projects and create relationships with State telecom stakeholders.
- Be willing to be creative toward agreements and solutions.
- Understand how utilities work and be fair, which promotes a good working relationship.
- Know your State laws and policies and how what you do is covered by them.
- Share any standards or specifications with stakeholders or other agencies. For example, UDOT makes "Standard Specifications and Standard Drawings" publicly available (udot.utah.gov, https://www.udot.utah.gov/connect/business/standards).

Looking Ahead

As of 2022, Utah's fiber optic network spans more than 3,252 miles along Federal, State, local and private transportation corridors. Of these miles, 37.4 percent are UDOT-owned and 62.7 percent are resource-shared fiber, according to UDOT reports.

These investments in fiber optics "give the roads infinite possibilities," Yocom said. UDOT is experimenting with listening to road sounds with optical sensing, such as listening to the traffic up two of Utah's canyons. For example, snowplows are noisy, but electric cars are not. The tone of the road changes when pavement starts to crack, and UDOT wants to see if they can hear it, Yocom said. "I think we've only scratched the surface of what fiber optics and transportation can do together."

Contacts and Resources

- UDOT Fiber Optics Manager, Lynne Yocom, lyocom@utah.gov
- Utah Broadband Plan. January 2020. Developed by the Utah Broadband Advisory Council and endorsed by the State, https://business.utah.gov/wp-content/uploads/2021/10/Utah-Broadband-Advisory-Council-Plan-2020.pdf
- Utah Broadband Center in the Governor's Office of Economic Opportunity, https://business.utah.gov/broadband
- UDOT Standard Specifications and Standard Drawings, online at udot.utah.gov: https://www.udot.utah.gov/connect/business/standards

- Utah Fiber Communications Infrastructure Map: https://horrocks.maps.arcgis.com/apps/webappviewer/index.html?id=096d0a7dd31a4be289b9623935308fc9
- UDOT 2021 presentation to the Western Association of State Highway and Transportation Officials (WASHTO), *Fiber Optics: It's more than deployment*.

Relevant Utah Laws

- Utah Code 72-7-108, https://le.utah.gov/xcode/Title72/Chapter7/72-7-S108.html
- Utah Code 63N-3-501 (2020), https://law.justia.com/codes/utah/2020/title-63n/chapter-3/part-5/section-501

The Federal Highway Administration (FHWA) promulgated Broadband Infrastructure Deployment regulations at 23 CFR Part 645, Subpart C, through a final rule published on December 3, 2021 (86 FR 68553). UDOT instituted the measures described in this case study before the regulations became effective on March 3, 2022.

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Availability — This case study may be found at www.fhwa.gov.

Key Words — Broadband deployment, Utah Department of Transportation