



Costs at-a-Glance: Fiber and Wireless Networks

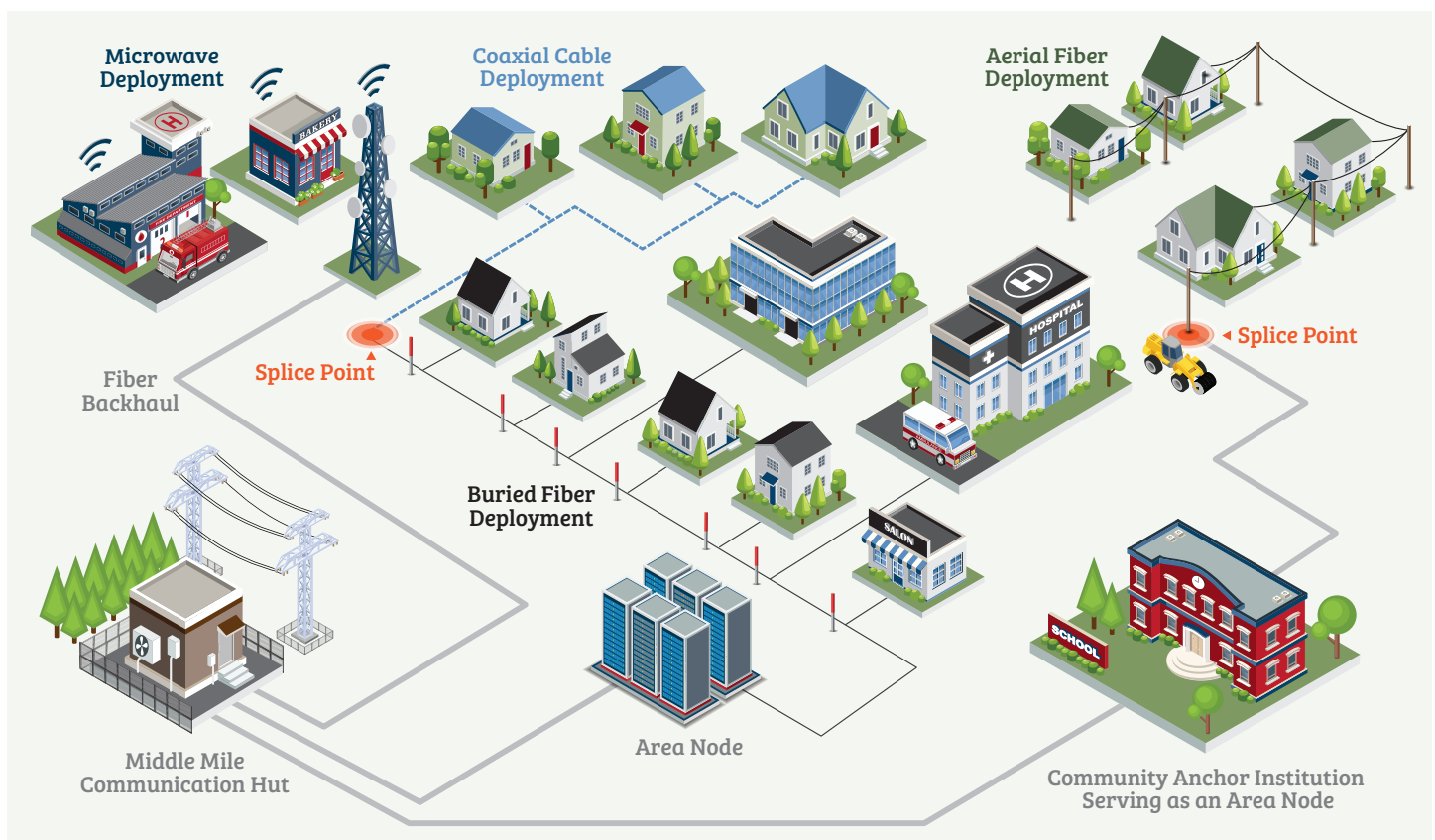
May 2017

BroadbandUSA collected information about network construction expenses to increase awareness of the costs associated with deploying a broadband network. This information can help project leaders engage with providers and network operators in their area. This data is based on cost information collected during the National Telecommunications and Information Administration's (NTIA) recent broadband infrastructure grant program¹ as well as research on current market prices.

For help with specific project budgeting and procurement efforts, contact the BroadbandUSA Technical Assistance team at broadbandusa@ntia.doc.gov.




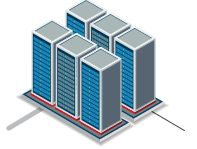
Using the Tool:

The graphic below depicts four of the most common types of network deployments: **Buried Fiber Deployment**, **Coaxial Cable Deployment**, **Aerial Fiber Deployment**, and **Microwave Deployment**. Costs associated with these four types of networks are outlined in the tables below and are color-coded to match the graphic. Please note that network costs can have significant variance, even greater than the cost ranges shown. The costs included in this tool are not comprehensive and each network's expenses will vary based on a number of factors, including community needs, geography and network deployment type.



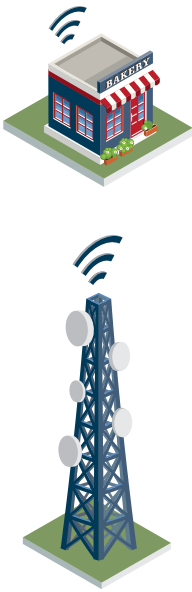

1. This cost information is sourced from NTIA grant recipient data submitted between 2009 and 2015.



Buried Deployment Materials			
Component	Description	Cost Range	
	Fiber	Optical cable that transmits information that is broadcasted over the Internet. The larger the strand count, the greater the bandwidth that the fiber route can sustain. Costs will increase for greater fiber counts and will decrease with volume discounts.	\$0.50 – \$4.00 per foot
	Conduit	Tubing that encases fiber strands along a network route.	\$0.55 – \$2.00 per foot
	Fiber Optic Cable Splice Closure/ Handholes	Weatherproof encasement that envelops the exposed area between spliced cables. These serve as access points to a fiber network and are used for repair or interconnection.	\$100 – \$400
	Vaults	Protective enclosure for network equipment that allows for maintenance and adjustments.	\$1,000 – \$2,000
	Coaxial Cable	Network operators can enter into arrangements with incumbent operators to gain access to last mile coaxial resources in a service area.	Various
Aerial Deployment Materials			
Component	Description	Cost Range	
	Loose Tube Fiber ²	Fiber with internal protective components that make it more resilient (often used for aerial networks).	\$1.00 – \$5.00 per foot
	Messenger Wire	Metal cable that supports aerial fiber.	\$0.30 – \$2.00 per foot
	Snowshoe	Mechanism that secures a fiber slack loop on an aerial network.	\$75 – \$150
Buildings, Equipment & Electronics			
Component	Description	Cost Range	
 	Communication Huts	Protective shelters for network equipment.	\$326,000 – \$342,000
	Generators	Backup power for network equipment.	\$70,000 – \$182,000
	Network Router	Device that directs traffic across an operator's network.	\$15,000 – \$25,000
	Network Switch	Electronic or optical device that opens or closes circuits, selecting paths for traffic over an operator's network.	\$2,500 – \$7,500
	Patch Panel	Device that makes connections between incoming and outgoing communications lines.	\$100 – \$500
	Transponder Card	Network card that acts to receive optical signals, reshape them and advance them through an operator's network.	\$5,000 – \$10,000
	Network Transceiver	Optical device that transmits and receives information, often providing data packet collision detection as well.	\$100 – \$500
	Mounting Hardware, Cables, Battery & Cabinet	Material that allows for the placement of network equipment.	\$300,000 – \$330,000
	Circuit Breaker Kit	Equipment that helps to maintain electricity input and output for network communications resources.	\$75 – \$150
	Battery and Rectifier System	Equipment used to convert power for network electronics.	\$20,000 – \$35,000
Network Node	Physical piece of network equipment that is capable of creating optical signals that are then sent over network resources.	\$220,000 – \$300,000	

2. While loose tube fiber is typically used for aerial deployments, it is not the only fiber option available for aerial deployments.



Wireless Deployment			
Component		Description	Cost Range
	Microwave Relay	Station that receives signals and rebroadcasts them throughout an operator's network coverage area.	\$250 – \$1,000
	Microwave Receiver	Device that receives a signal from an operator's network. Receivers can be mounted directly to a customer's premise to receive service.	\$500 – \$2,500
	Microwave Transmitter	Device that broadcasts microwave data across an operator's network.	\$1,000 – \$10,000
	Site Routers	Routers located at a wireless site to transmit traffic from the site to potential customers.	\$2,500 – \$7,500
	Self-Organizing Network (SON) Device	Device that increases the reliability of the wireless network by automatically utilizing the most efficient network paths.	\$45,000 – \$55,000 (per tower)
	Microwave Antenna	Device that receives and transmits wireless data.	\$500 – \$5,000
	Outdoor Cabinet	Protective enclosure for network equipment that allows for maintenance and adjustments.	\$7,000 – \$11,000
	Backup Power Generator	On-site generator at a communication site to provide backup power to the wireless tower.	\$5,000 – \$50,000
	Backup Power Battery	On-site batteries to store backup power that would be used to support a wireless network if both the power grid and on-site generator were not operational.	\$1,000 – \$10,000
	Tower (appx. 75-foot) ³	Telecommunications tower used to support wireless antennas, transceivers and receivers.	\$7,500 – \$20,000
	Tower (appx. 150-foot) ³	Telecommunications tower used to support wireless antennas, transceivers and receivers.	\$15,000 – \$30,000
	Tower (appx. 250-foot) ³	Telecommunications tower used to support wireless antennas, transceivers and receivers.	\$40,000 – \$70,000
	Network Construction Equipment ⁴		
Component		Description	Cost Range
	Bucket Truck	Utility truck with an extension arm used in the construction of an aerial network to allow workers to reach high places.	\$145,000 – \$220,000
	Mobile Splicing Trailer	Trailer with the equipment necessary to cut fiber links.	\$13,000 – \$27,000
	Fiber Termination Equipment	Piece of equipment used for splicing fiber optic cables.	\$800 – \$3,000
	Mobile Wire Pulling Trailer	Trailer with the equipment to pull fiber through conduit.	\$27,500 – \$68,000
	Air Compressors and Blowers	Equipment used to advance fiber optic cable through conduit.	\$15,000 – \$35,000

3. Estimated ranges do not include deployment costs (e.g., foundation, land, tower construction).

4. Fiber deployment items are used for the deployment of all network types, as even microwave networks will require fiber backhaul.

Please note: This summary does not include cost ranges for the following common costs of network construction projects, as these elements cannot easily be generalized and are highly variable due to factors such as network type, location, topography and size:

- ✦ Construction equipment and labor
- ✦ Rights-of-Way
- ✦ Permits
- ✦ Engineering
- ✦ Data center costs
- ✦ Easements
- ✦ Maintenance/operational costs
- ✦ Splicing and testing equipment and labor
- ✦ Pole Replacement/Repair
- ✦ GIS mapping software and labor

