# Program Information

## Lesson:

### *Communications Network and Applications*

## Training:

## Premises Cabling

## Time frame:

### 30-60 minutes

# Instruction Section

## Learning Objectives:

# Identify practical applications of premises cabling in networks.

# Recognize types of cabling used in networks.

# Explain principles and considerations of Power over Ethernet in computer networks.

## Assessment Tools/Methods:

* Participants should be assessed based on participation in group discussions and activities.

## Learner Prior Knowledge:

## Prior to class, participants will need to read:

## Reference Guide: Networks on Premises Cabling (<https://www.thefoa.org/tech/ref/premises/networks.html>)

## Reference Guide: Power over Ethernet (PoE) (<https://foa.org/tech/ref/premises/POEoverview.html>)

## Prior to class, the participants will need to watch:

## [Premises Cabling Lecture 2: Applications](http://www.youtube.com/watch?v=rjk0CV_Vfm8&list=PL3F0669372E06AE8B&index=2&feature=plpp_video" \t "_blank)

## Instructional Activities:

# Review the topic of on-premises cabling in computer networks.

# Provide a brief overview of what will be covered in the lesson, including both networks on premises cabling and applications of premises cabling.

# Activity 1: Computer Network Architecture Discussion

# As a follow-up to the online reading, engage participants in a discussion about the progression of network cabling architecture.

# Ask participants to discuss the differences between Original Bus Ethernet, Token Ring, Star Ethernet networking.

# Display images from FOA’s Fiber U: Networks on Premises Cabling self-guided reading to reinforce each layout.

A close-up of a cable

Description automatically generated

Bus Ethernet

A diagram of a network

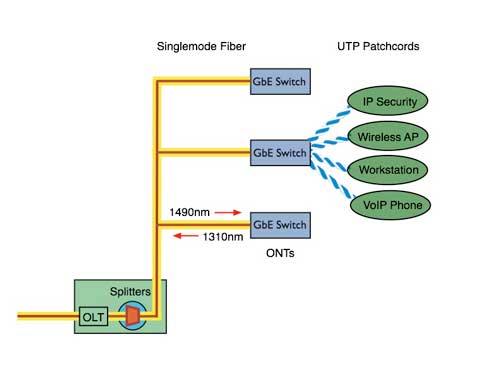
Description automatically generated Token Ring

A diagram of a computer network

Description automatically generated

Star Ethernet

* 1. Ask participants to recall information regarding LAN networks, specifically Passive Optical LAN (POL) and Gigabit Passive Optical Network (GPON).
     1. Display the image of a POL from FOA’s Fiber U: Networks on Premises Cabling self-guided reading after participants describe the layout.



Passive Optical LAN

\*\*\**Example network architecture images are from FiberU’s Lesson 3 resource,* [*https://www.thefoa.org/tech/ref/premises/networks.html*](https://www.thefoa.org/tech/ref/premises/networks.html)*.*

1. Continue discussion with participants, reviewing how different types of cable (UTP, fiber optics, coaxial) were used in the various architectures.
   1. Guide the discussion to include information regarding the progression of UTP in networks.
      1. First generation of networks only used 2 pairs of the cable, one transmitting in each direction.
      2. Gigabit Ethernet required the use of all 4 pairs simultaneously in both directions.
      3. 10G Ethernet required development of Cat 6 cable to 500 MHz bandwidth to work even when using all 4 pairs.

# Activity 2: Premises Cabling Network Applications in Action:

1. Divide the participants into small groups and distribute or display the scenarios and questions on the Premises Cabling Network Applications in Action handout.
2. Assign each group one of the scenarios to analyze and discuss.
   1. Groups should identify the types of premises cabling components and configurations needed for the application.
3. Allow time for groups to present their findings and solutions to the rest of the participants. Encourage questions and discussions after each presentation to clarify concepts.
4. After the presentations, wrap up the lesson by asking the participants to discuss the questions presented in the activity. Sample answers are provided in the Instructor Wrap-up Discussion Resource.

**Resources:**

* Laptops, tablets, or phones for research
* Premises Cabling Network Applications in Action handout
* Instructor Wrap-up Discussion Resource

# Reflection Section

## Reflect on the key concepts and skills gained or reinforced during this activity. How did the scenarios, discussions, and quiz questions contribute to your understanding of structured cabling networks and their applications in various systems?

Identify any challenges you encountered during the activity and reflect on the strategies you used to overcome them. How did these challenges contribute to your learning process?

*This lesson is supplemental to the Fiber Optics lesson within FOA's Fiber U curriculum and not part of the FOA required curriculum to obtain the Certified Premises Cabling Technician certification. If interested in becoming an approved school and/or obtaining a certification, please contact FOA at*[*thefoa.org/contact-foa.html*](https://www.thefoa.org/contact-foa.html)*.*

*Note: AI, specifically ChatGPT 3.5, was used to generate timeline for this contextualized lesson plan.*

**Premises Cabling Network Applications in Action**

**Scenario 1: Upgrading CCTV System**

You are an IT technician tasked with upgrading the CCTV system in a large office building. The current system uses analog cameras connected via coaxial cables. The management wants to upgrade to IP cameras for better resolution and remote monitoring capabilities. Your task is to design and implement the structured cabling infrastructure needed for this upgrade. Consider the types of cables, connectors, switches, and other components required for the new IP camera system.

**Scenario 2: POTS System Upgrade**

A retail store chain is planning to upgrade its Point of Sale (POS) terminals and phone systems. They currently use traditional POTS lines for phone communication and want to transition to Voice over IP (VoIP) for cost savings and flexibility. Your task is to design a structured cabling plan that supports both the new VoIP phones and the upgraded POS terminals. Consider the types of cables, patch panels, routers, and quality of service (QoS) settings needed for a reliable and efficient system.

**Questions for Wrap-Up Discussion:**

1. What are the key differences between coaxial, unshielded twisted-pair, and fiber optic cables in premises cabling networks? When would you use each type?
2. What are the advantages of using Power over Ethernet (PoE) for devices like IP cameras and VoIP phones? How does it simplify cabling and installation?
3. Describe the process of cable testing and certification in premises cabling installations. Why is it important, and what tools are commonly used for this purpose?
4. How does premises cabling contribute to scalability and future-proofing of network infrastructure? Provide examples of how businesses can expand their networks without major re-cabling efforts.

**Instructor Wrap-up Discussion Resource**

**Question 1**: What are the key differences between coaxial, twisted-pair, and fiber optic cables in structured cabling networks? When would you use each type?

Coaxial cables: These cables consist of a central conductor surrounded by insulation, a metallic shield, and an outer insulating layer. They are commonly used for television signals, CCTV systems, and some Ethernet connections due to their ability to carry high-frequency signals over longer distances without much interference.

Twisted-pair cables: Twisted-pair cables have pairs of insulated copper wires twisted together to reduce electromagnetic interference. They are widely used in Ethernet networks, telephone lines (POTS), and some CCTV installations. There are two main types: Unshielded Twisted Pair (UTP) and Shielded Twisted Pair (STP), with STP offering additional protection against interference.

Fiber optic cables: Fiber optic cables use glass or plastic fibers to transmit data using light signals. They offer high bandwidth, immunity to electromagnetic interference, and longer distance capabilities compared to copper cables. Fiber optics are commonly used in high-speed internet connections, long-distance communication links, and backbone networks in data centers.

Participants should discuss the advantages and limitations of each cable type based on factors such as bandwidth, distance, susceptibility to interference, and cost. They should also provide examples of when each type would be most suitable based on the specific requirements of different applications.

**Question 2**: What are the advantages of using Power over Ethernet (PoE) for devices like IP cameras and VoIP phones? How does it simplify cabling and installation?

Power over Ethernet (PoE) allows devices to receive power and data over the same Ethernet cable, eliminating the need for separate power supplies or outlets for devices like IP cameras and VoIP phones.

Advantages of PoE include simplified cabling, reduced installation costs, flexibility in device placement (no need to be near power outlets), centralized power management, and the ability to power devices remotely.

Participants should also mention that PoE standards (such as IEEE 802.3af and IEEE 802.3at) provide different power levels to support various devices, and PoE injectors or switches are used to deliver power to PoE-enabled devices.

**Question 3**: Describe the process of cable testing and certification in structured cabling installations. Why is it important, and what tools are commonly used for this purpose?

Cable testing and certification involve verifying the performance and quality of structured cabling installations to ensure they meet industry standards (e.g., TIA/EIA standards for Ethernet cables).

Testing typically includes checks for continuity, cable length, attenuation, crosstalk, and signal integrity using specialized testing equipment such as cable certifiers, cable analyzers, and OTDRs (Optical Time Domain Reflectometers) for fiber optic cables.

Certification involves documenting test results and providing assurance that the cabling infrastructure meets specified performance criteria, which is important for warranty compliance, troubleshooting, and future scalability of the network.

**Question 4**: How does structured cabling contribute to scalability and future-proofing of network infrastructure? Provide examples of how businesses can expand their networks without major re-cabling efforts.

Structured cabling provides a standardized and organized approach to network infrastructure, including labeling, documentation, and modular components like patch panels, connectors, and cable trays.

Businesses can easily expand their networks by adding or relocating devices, upgrading to higher-speed technologies (e.g., from Cat5e to Cat6), and implementing new services (e.g., VoIP, video conferencing) without extensive re-cabling.

Examples of scalability include using patch panels and switches with available ports, implementing cable management strategies for neat and accessible installations, and following best practices for future-proofing (e.g., leaving spare cable runs for future expansion).