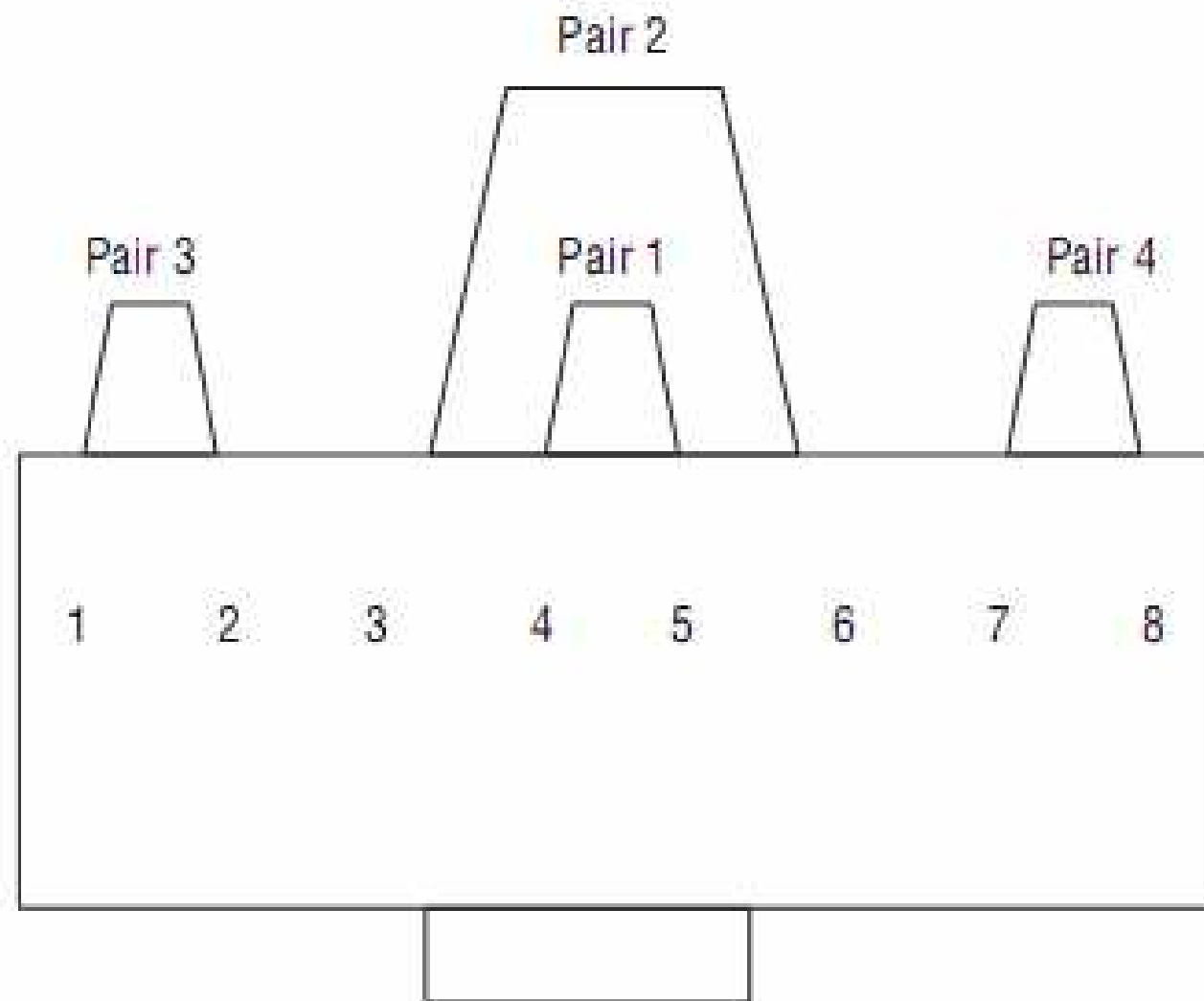


Power over Ethernet (PoE)

- Power over Ethernet (PoE) sends direct current (DC) voltage and computer data over the same Ethernet cable, enabling a device to receive DC power and computer data simultaneously. PoE is an IEEE standard, described in 802.3-2005 Clause 33, also known as IEEE 802.3af, and allows devices used in wired or wireless networking to receive DC power from the Ethernet connection without the need for an external DC power source.

- An Ethernet cable has four copper wire pairs or eight copper wires. Depending on the technology in use, either two or all four wired pairs may be used to carry data traffic. Figure 1 shows an example of a standard Ethernet cable pin assignment.

FIGURE 1 Standard Ethernet pin assignment



- The PoE standard allows electrical power to be supplied in one of two ways, either over the same wired pairs that carry computer data or over the pairs that do not carry data. 10BASE-T and 100BASE-T (Fast Ethernet) implementations use only two wired pairs (four wires) to carry data. 1000BASE-T (Gigabit Ethernet) uses all four pairs (eight wires) to carry computer data.

- The voltage for PoE is 48 VDC, but the standard allows for a range of 36 to 57 VDC.
- The PoE standard addresses two types of devices:

Power Sourcing Equipment (PSE) and
Powered Device (PD).

- The current IEEE 802.3-2005 Clause 33 standard was released in 2003 and allows for 15.4W per port maximum. The soon to be released IEEE 802.3at standard, also known as PoE Plus, will allow for approximately 30W per port maximum.

Power Sourcing Equipment (PSE)

- *Power sourcing equipment* is the device that supplies the DC voltage to the end devices. The DC voltage (power) can be delivered to the device in one of two ways:
- An endpoint device (usually a wireless LAN controller or an Ethernet switch) delivers DC power directly.
- A *midspan* device (usually a single port or multiple port injector) injects DC power into the Ethernet cable over the unused wire pairs.

Powered Device (PD)

- The *powered device* is defined as the device receiving DC power, such as an access point, wireless bridge, IP camera, IP phone, and so on. Equipment manufacturers have the option of defining a classification signature. This classification signature determines the maximum amount of power a device requires, thereby allowing the PSE to better manage the amount of power delivered to a specific port.

- The PoE standard makes five classes of powered device available (class 0 through class 4). Table 2.1 shows the available classes, and the amount power in watts for each class.

TABLE 2.1 Classes of Powered Device Described in the PoE amendment to the Ethernet standard, 802.3-2005 clause 33.

Class	Use	PSE Power Output in Watts	PD Max Levels in Watts
0	Default	15.4W	0.44 W to 12.95 W
1	Optional	4.0W	0.44 W to 3.84 W
2	Optional	7.0W	3.84 W to 6.49 W
3	Optional	15.4W	6.49 W to 12.95 W
4	Reserved for future use	n/a	n/a

Figure 2 shows an example of a power sourcing equipment (PSE) and powered device (PD).

FIGURE 2 Motorola PSE single-port injector and PD Motorola access port

Single port injector



Powered device—
thin access point



Benefits of PoE

There are many benefits to using devices that support PoE, including cost savings and convenience. The IEEE 802.3 standard (Ethernet) specifies a maximum distance of 100 meters or 328 feet for unshielded twisted pair (UTP) category 5 (CAT5) Ethernet cable. Power over Ethernet provides the ability for a PoE device to receive DC power and computer data at this distance without the need for electrical power at the point where the device is installed or located. This can amount to a large cost savings if a voltage source is not available where the device is located, because there is no need to install electrical power at that point.

Midspan Devices

- *Midspan* devices inject the required DC voltage (48V) into the Ethernet cable allowing the AP, bridge, etc., to receive electrical power and computer data.

- There are two types of midspan *device*—*single port injectors* and *multiport injectors*.
- A *single port injector* will supply power to a single device. This is useful in an implementation that may have only a few PoE devices. A single port injector is an in-line device that adds DC power to the Ethernet cable.
- A *multiport injector* will supply DC power to many devices. Two ports on this device are required to supply both DC power and computer data to a single powered device access point, such as a bridge or IP camera.

Endpoint Devices

- Endpoint devices will supply DC power and computer data directly at the Ethernet port rather than relying on an intermediate device to supply the power. Wireless LAN controllers/switches and Ethernet switches are examples of endpoint devices. A benefit of endpoint PoE is that no intermediate adapter to inject power is necessary. Figure 3 shows an example of an endpoint device.

FIGURE 3
capability

Aruba 2400 Mobility Controller with Power over Ethernet endpoint



- The 802.3-2005 Clause 33 standard specifies VDC as the
- nominal voltage.
- A. 32
- B. 57
- C. 48
- D. 12

- Which of the following devices is an in-line device that will inject DC voltage into the Ethernet cable?
- A. Midspan
- B. Midpoint
- C. Endspan
- D. Endpoint

- Power sourcing equipment delivers which of the following?
- A. RF power to the access point
- B. DC power to the end device
- C. RF power to an antenna
- D. DC power to an antenna

- Which of the following are midspan PoE devices? (Choose 2.)
- A. Single port injectors
- B. Multiport injectors
- C. Endpoint injectors
- D. Endspan injectors