### 3.3.1 Telephone Network Issues and Definitions

Some understanding of telephone networks is needed before delving into the details of DSL. The following definitions will be helpful for readers unfamiliar with telephony terms.

**Bridged tap:** Bridged taps are branches of copper wire used to extend a local loop to multiple destinations. Historically, carriers have often tapped local loops with new branches when lines get reassigned to new service locations, creating treelike wire topologies. Bridged taps cause signal reflections, and on some circuits the removal of bridged tap segments is required to achieve maximum DSL speeds. Adding additional phone jacks within a residence is another form of bridged tap.

**Central office (CO):** The central office is the switching equipment center where the copper wire telephone lines (local loops) for a community (a service area) are terminated and connected into the telephone network. The central office contains the telephone switches, electrical power/batteries, and equipment racks needed to provide service.

**Digital loop carrier (DLC):** LECs may use T1/E1 or fiber lines to create digital loop carrier trunk lines between the CO and a remote terminal location. This strategy reduces the wire pairs needed at the CO and extends the CO service area to more customers. Carriers can also use DLC fiber links and remote terminals to create short local loops for high-speed DSL services (VDSL).

**Filters or "splitters" (splitterless designs):** DSL access line products provide both data and analog voice service over one copper wire pair by using FDM. Analog voice traffic travels on a 4 kHz passband while the data channel is implemented on higher frequencies. Often, a lowpass filter is needed to divide the signals cleanly. Some low-speed DSL designs can operate without the filters installed, reducing deployment costs by allowing existing telephones and residential station wire to be used without modification (a "splitterless" DSL system).

**Load coil/loading:** Longer POTS lines include inductive load coils to limit bandwidth to a 4 kHz voice telephony passband, allowing carriers to extend the maximum distance of local loops (beyond 18,000 ft). Load coils must be removed when converting POTS lines to ISDN or DSL because these digital services use frequencies above the POTS 4 kHz voice band.

**Local exchange carrier (LEC):** This is the company(s) or public entity (PTT) which provides the local telephone service to a community. The LEC maintains and operates the lines and equipment used for the local telephone network. In competitive markets there may be multiple DSL LECs reselling the local loop service originally provided by an incumbent LEC. DSL is for copper wire lines only; it is not a technology for long-distance carriers or others using fiber-optic networks.

**Local loop:** Network access DSL services are designed to run over the local loop circuit, the single pair of copper wires connecting a home or small business to the local CO. Historically, these wires have supported analog telephone circuits, one pair of wire for each telephone line.

**POTS:** This acronym stands for Plain Old Telephone Service, the typical analog telephone service used on most copper wire local loops. ISDN and network access DSL services replace the analog POTS service with a digital circuit to support both voice and high-speed data communications.

**Remote terminal:** In larger urban telephone networks, remote terminals are remote termination points for copper local loops outside the CO (usually an underground vault). The remote terminal is where copper local loops are terminated and multiplexed onto a high-capacity digital trunk line (a digital loop carrier).

**Trunk:** Trunk lines are high-capacity digital links where telephone circuits are multiplexed together. T3/E3 and T1/E1 lines are commonly used to provide trunks among regional COs or as a link between carrier networks. Some DSL products replace T1/E1 copper wire trunks.