

TSN: Lecture 25

The Telephone System

Topics Covered

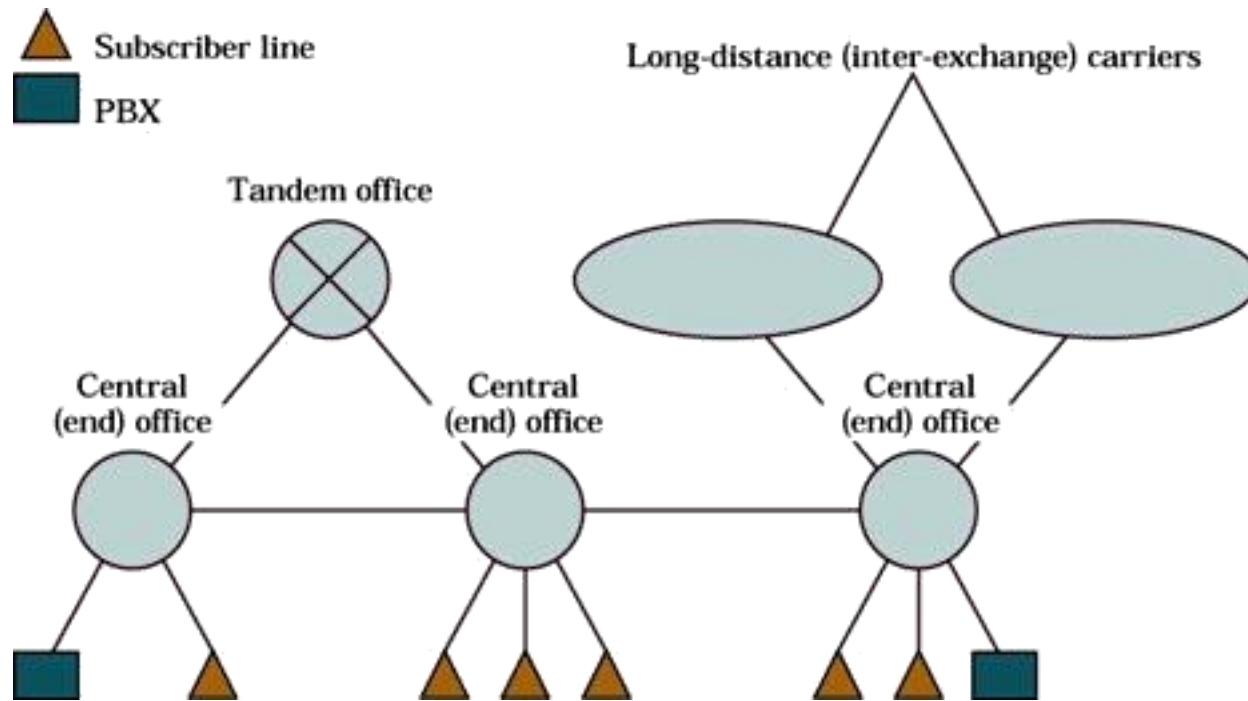
- Introduction
- Public Switched Telephone Network
- LATA Topology
- Hierarchical Switched Network

Introduction

- The *public switched* telephone system is the largest and most important communication system in the world
- Public refers to the idea that anyone can connect to it; switched indicates that anyone can connect to anyone else
- Though originally designed for voice communications, telephone networks have been adapted to serve data communications, facsimile, and video

Public Switched Telephone Network

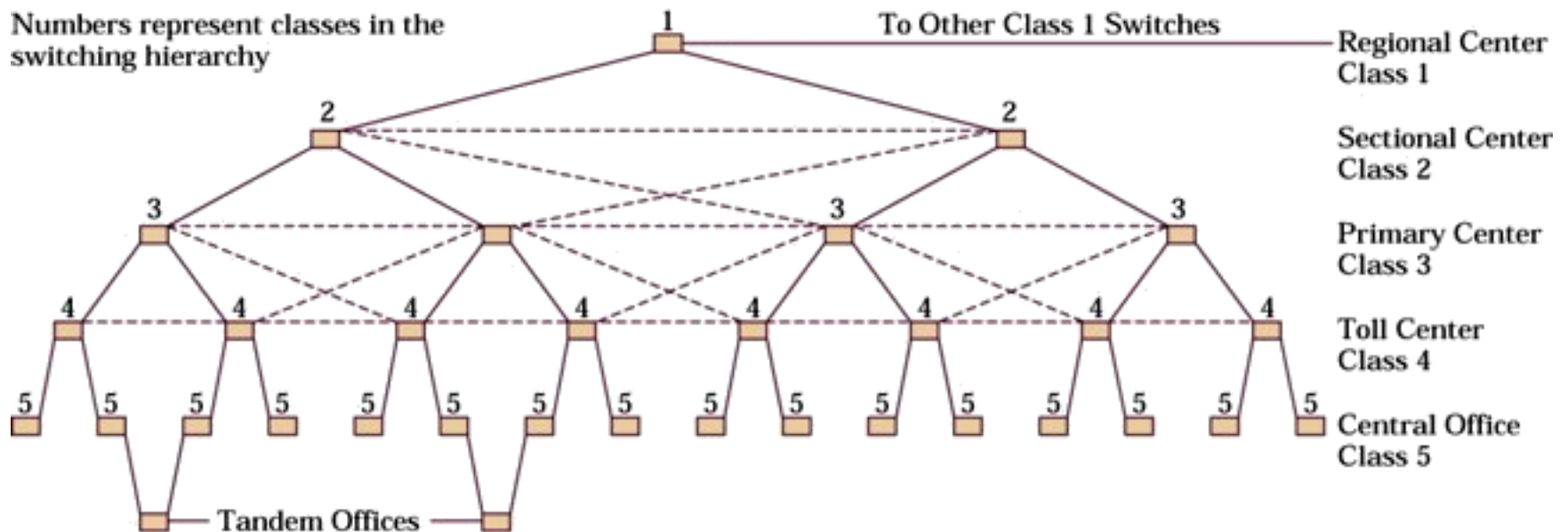
- The topology of a local calling area (*local access and transport area, or LATA*) is indicated in the figure below



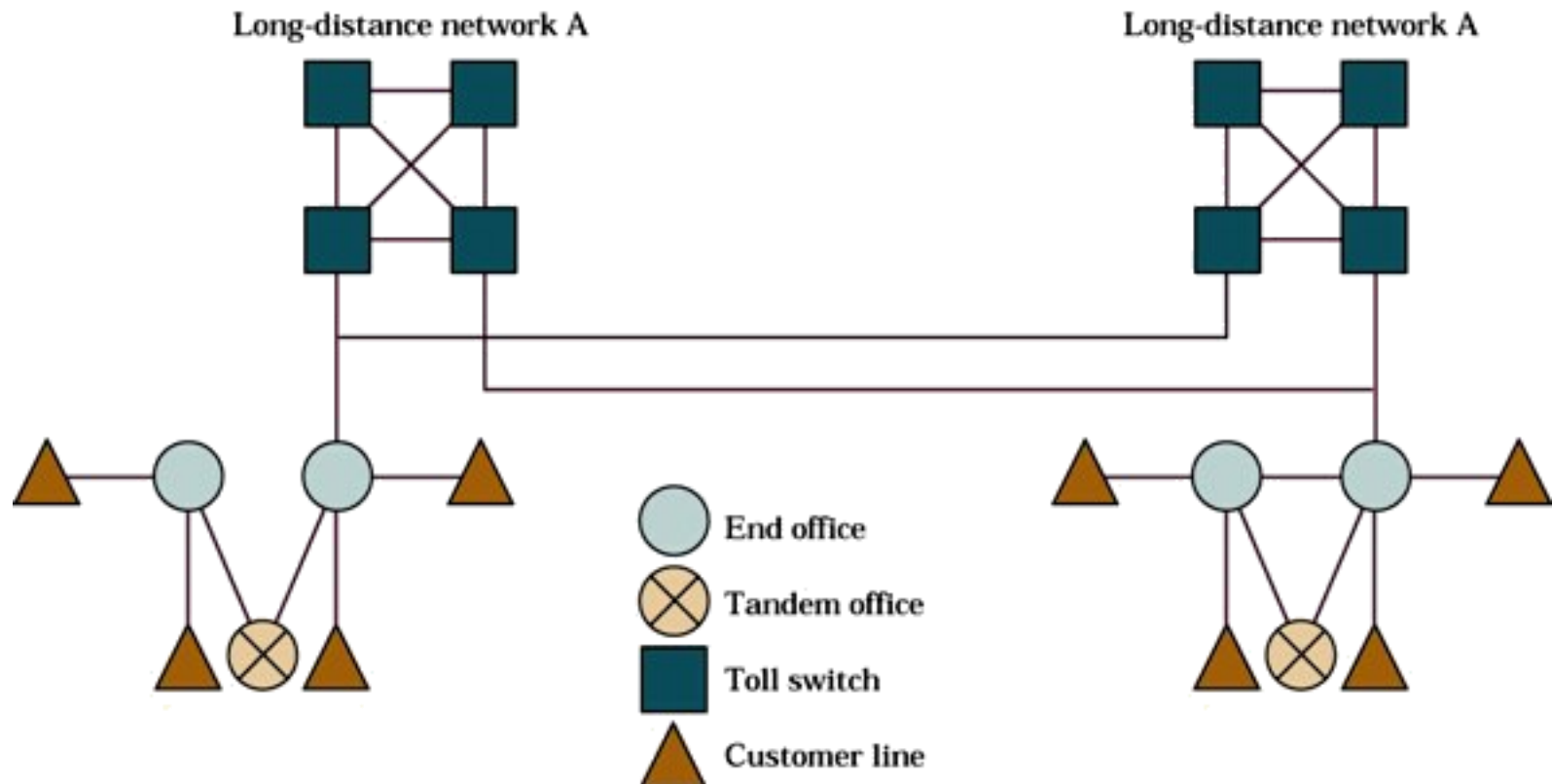
LATA Topology

- Each subscriber is connected via a **local loop**
- Each local loop is connected to a **central office**
- Central offices are connected to one another via **trunk lines**
- If too many users connect at the same time, **call blocking** will occur
- **Tandem offices** connect central offices without having direct connecting to individual telephones
- Long-distance calls used to be routed through **toll stations**
- A **flat network** usually lets the system find a direct route from one area of the country to another
- Each long-distance carrier has a **point-of-presence (POP)** to the local telephone system

Hierarchical Switched Network



Nonhierarchical Long-Distance Network



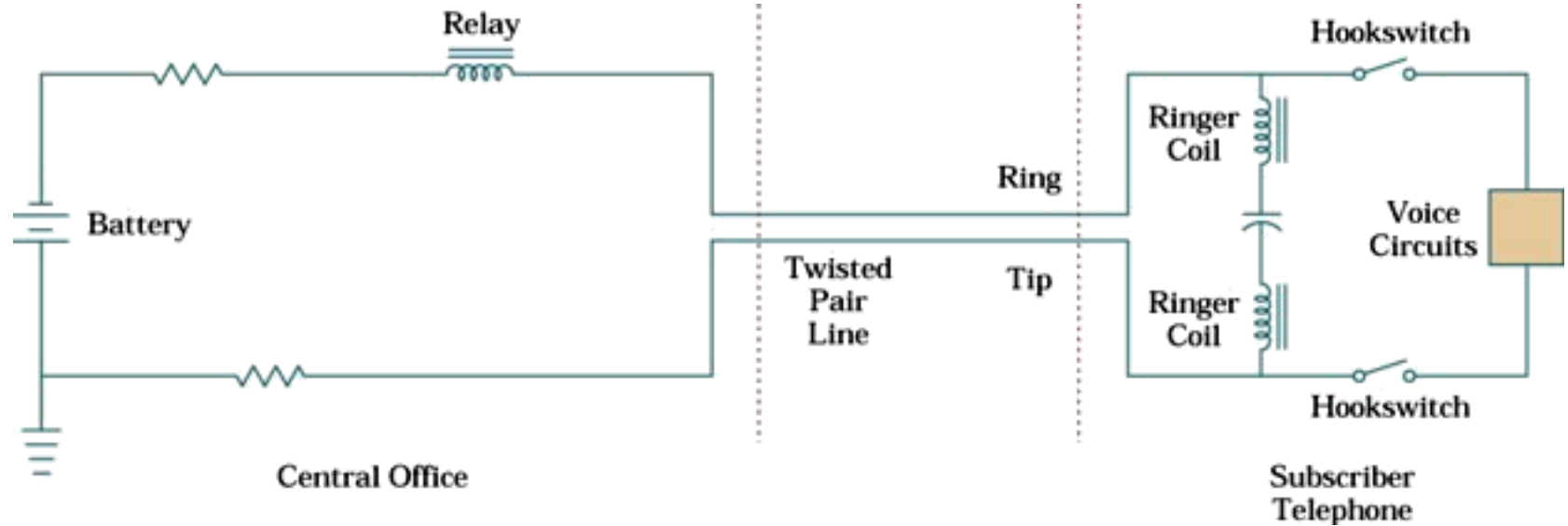
The Local Loop

- Ordinary telephone systems are often referred to as POTS (plain old telephone service)
- Normally, each subscriber is connected to the central office by a single twisted pair of wires
- The wires are twisted to reduce *crosstalk*
- Future developments include the inclusion of fiber-optic connections direct to the subscriber for greater bandwidth

Signals on the Local Loop

- A phone not in use is referred to as *on the hook*
- The central office maintains a voltage of about +48 volts across the line
- A telephone on the hook appears as an open to the central office
- When the telephone is in use, a current flows in the loop
- The presence of this current signals the central office to make a line available (seizing the line)
- A telephone off the hook drops a voltage between 5 and 10 volts across it

Local Loop

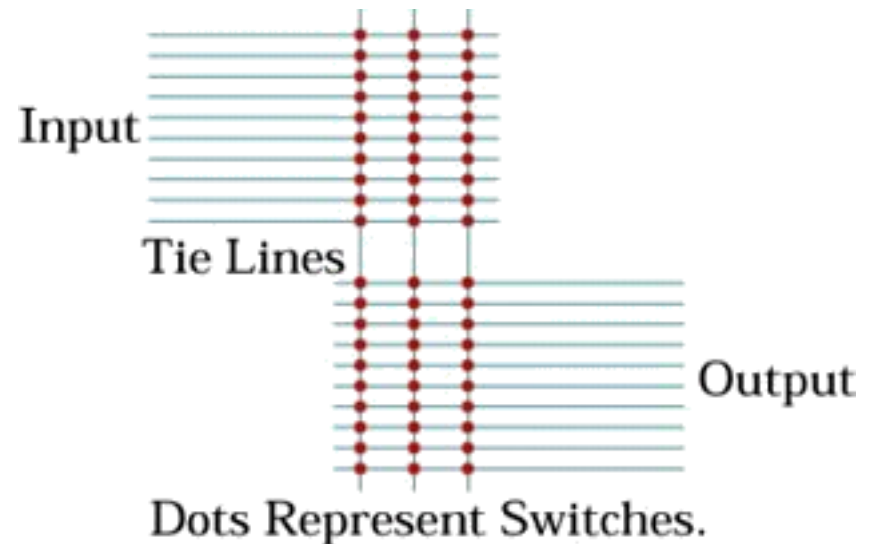


Dialing

- Dialing can be accomplished in two ways:
 - Pulse dialing uses interruptions in the current loop to dial a number
 - Dual-tone multifrequency dialing (DTMF) uses two tones for dialing. Also known as *touch dialing*

The Central Office Switch

- Early telephone switchboards were manually operated and used patch cords
- The first automatic telephone switch was the *Strowger* step-by-step switch
- The *crossbar* switch superseded the Strowger switch
- The *crosspoint* switch allows the connection of any incoming line to any outgoing line



The Subscriber Line Interface Card

- The local loop connects to the central office by means of a *subscriber line interface card (SLIC or line card)*
- The functions of the card are:
 - Battery supply
 - Overvoltage protection
 - Ringing
 - Supervision (monitoring hook status)
 - Coding
 - Hybrid
 - Testing

The Telephone Instrument

- Ordinary telephones use carbon microphones and magnetic earphones (transmitters and receivers)
- The carbon microphone needs DC bias current to operate
- Carbon microphones are reliable and simple but have poor audio quality
- Modern telephones often use electret condenser microphones to achieve better quality

