PSTN Architecture Overview (1)

- **PSTN:** Public Switched Telephone Network
- History: From American Bell to AT&T
- Hierarchical and layer structures
- Planned as a national network
- Design for Ilities
  - Service availability,
  - Sound Quality,…
- Early realization of necessary basic research on ilities

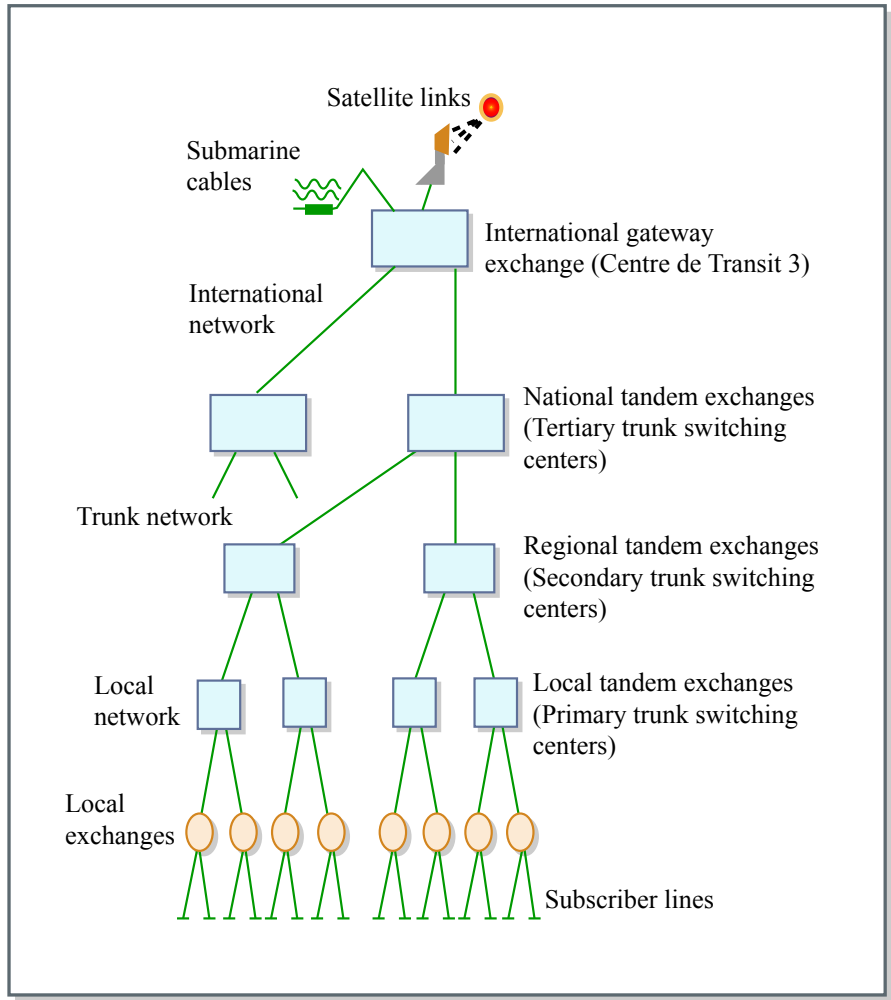


Figure by MIT OCW.

PSTN Architecture Overview (2)

- **Switching Hierarchy**
  - Regional Center
  - Sectional Center
  - Primary Center
  - Toll Center
  - End Office

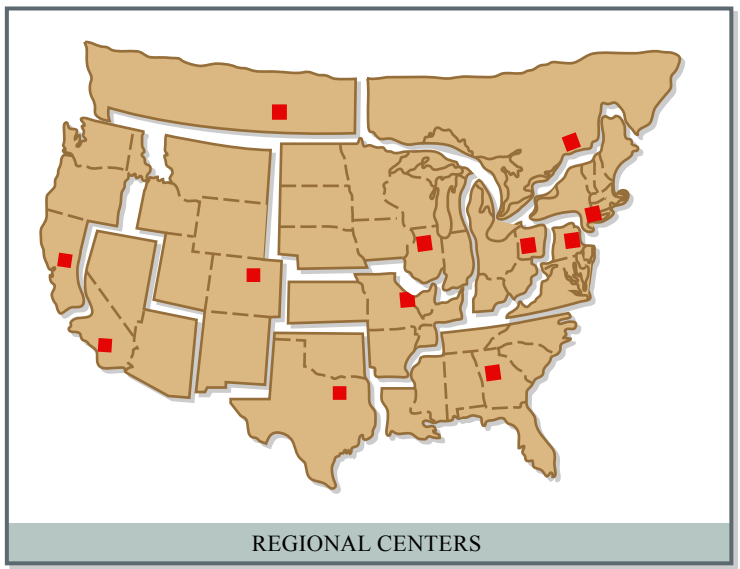


Figure by MIT OCW.

Regional Centers (1972)(12)

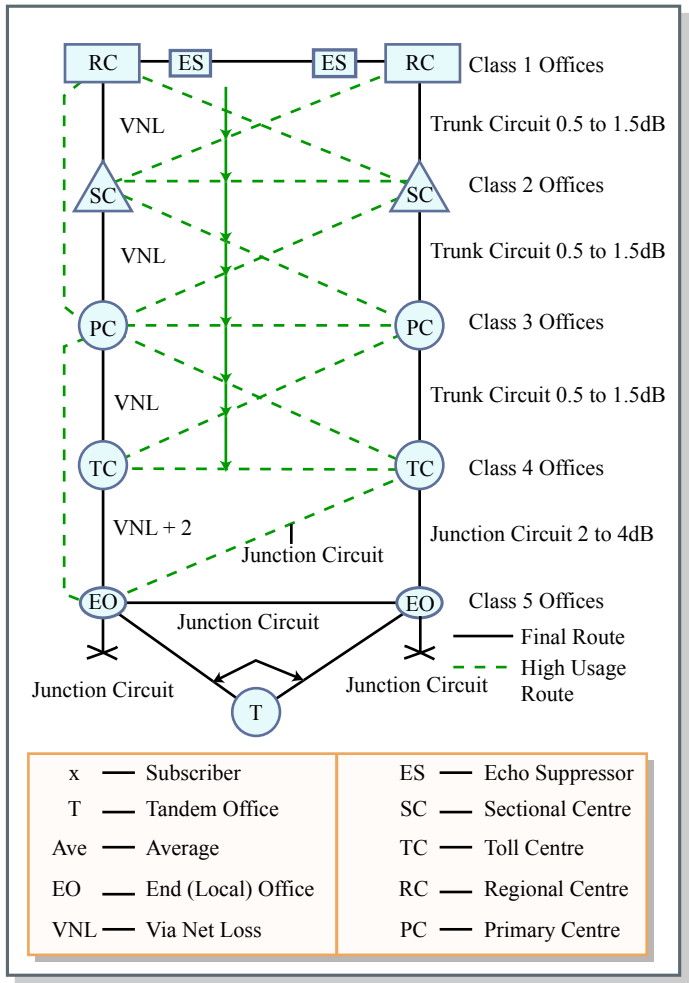


Figure by MIT OCW.

Five level switching plan in use from 1950s

PSTN History

(Collection by Prof. Whitney)

- **Classification divides the PSTN into 5 levels (post-1950):**
  - Class 1: Regional Center, top level, 8 centers in 1930, 12 centers in 1972
  - Class 2: Sectional Center (not a part of the 1930 network)
  - Class 3: Primary Center
  - Class 4: Toll Center
  - Class 5: End Office

Image removed for copyright reasons.
Map of a U.S. telephone network.

What/Where is the Data behind this Graphic?

PSTN Definitions and Metrics

- **Our network definitions**
  - **Node:** Switching center
  - **Link:** Cable connecting switching centers
- **Our metric focus**
  - Geodesic length between two points: with mechanical switches, the goal was to have this be 3 or less
  - Bandwidth: where are the choke points?
    - Betweenness
  - Centrality
  - Scale-free
  - Preferential Attachment (911? Critical infrastructure lines)
  - Motifs

Historical Connection Plans

Connection plan to help decrease the geodesic length in 1930 $_V$ (notice the motifs) and 1950 -->

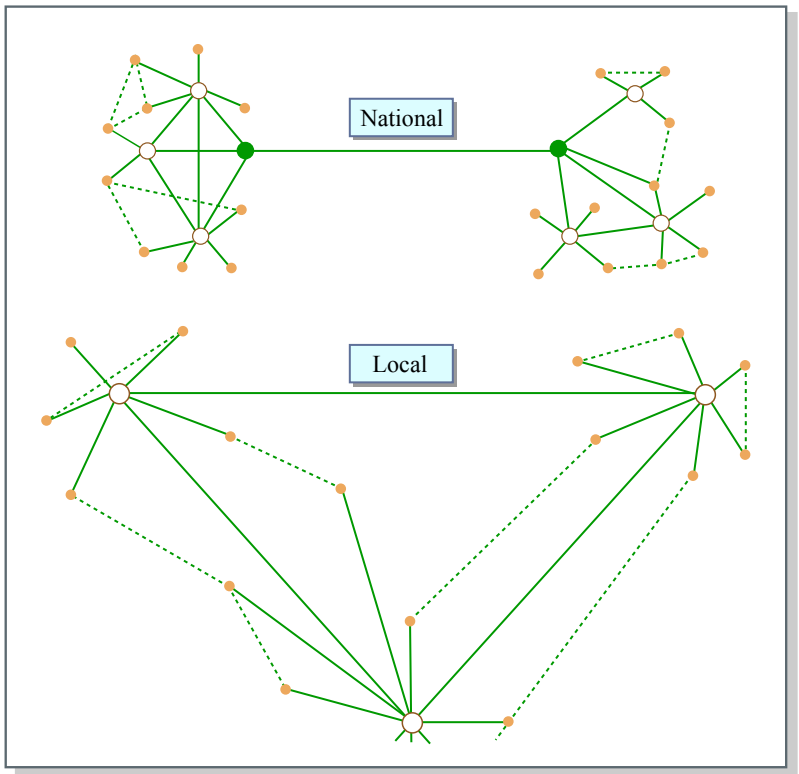
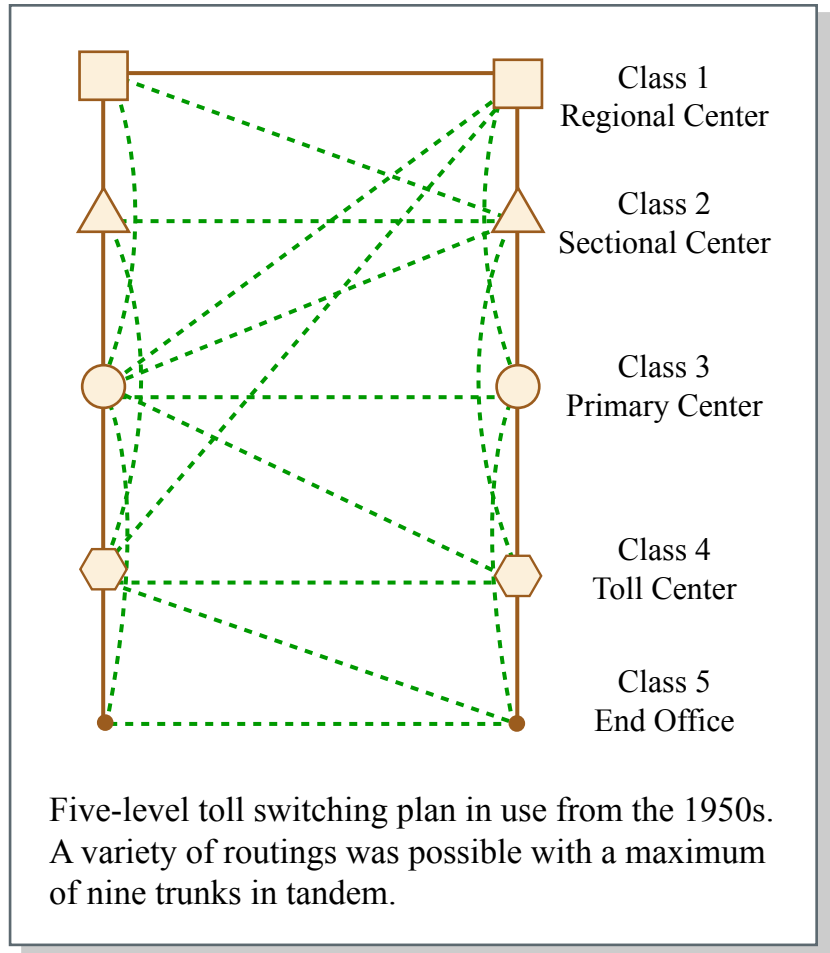


Figure by MIT OCW.



Five-level toll switching plan in use from the 1950s. A variety of routings was possible with a maximum of nine trunks in tandem.

Figure by MIT OCW. After Andrews & Hatch, 1971.

Improved quality via level skipping

Questions and Supporting Data

Predicting/Explaining Structure

Which algorithms does the analysis of the actual structure substantiate?

Data available: Switching Centers, Links in between, bandwidths

Predicting/Explaining Properties

What are the properties of the structure as a result of adding availability?

Data available: 911-Tandem Links, Diverse Routing, Location Routing Numbers

Observing systems

What motifs do we see?

Data available: Hierarchical view constructed from the data

Sources

Telcordia LERG Database, Quest Current Access Line Counts Database, Bellcore's BOC Notes on intraLATA Network