Georgia Institute of Technology

Software Defined Networking

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In this course, you will learn about software defined networking and how it is changing the way communications networks are managed, maintained, and secured.

School of Computer Science

Module 1: History of SDN

- Discuss the timeline of SDN from the 1980s to present
- Gain awareness about the ideas and principles behind SDN
- Recognize architectural themes in computer networking where SDN originated.

The Four Chapters of SDN History

- Evolution of supporting technologies
- Control-data plane separation
- Developing control channels for specific data planes
- Convergence of control channels and data planes

Evolution of Supporting Technologies (Three Lessons)

- **Central network control:** Dates back (at least) to AT&T's network control point (1980s)
- **Programmability in networks:** Active networks (1990s)
- **Network virtualization:** Switchlets, XEN, VINI (1990s)

Early Days: Control and Data Together

- In-band signaling
  - Data and control sent over same channel
  - Certain frequencies (e.g., 2600 Hz) could reset phone trunk lines, route calls
- Resulting network was brittle, insecure, etc.

http://en.wikipedia.org/wiki/Blue_box

Network Control Point

The network control point (NCP) was introduced in 1981 and is intended to support a wide range of SPC network applications. The first of these is an improved version of 800 Service and Mechanized Calling Card Service. A wide variety of other applications are currently being considered.

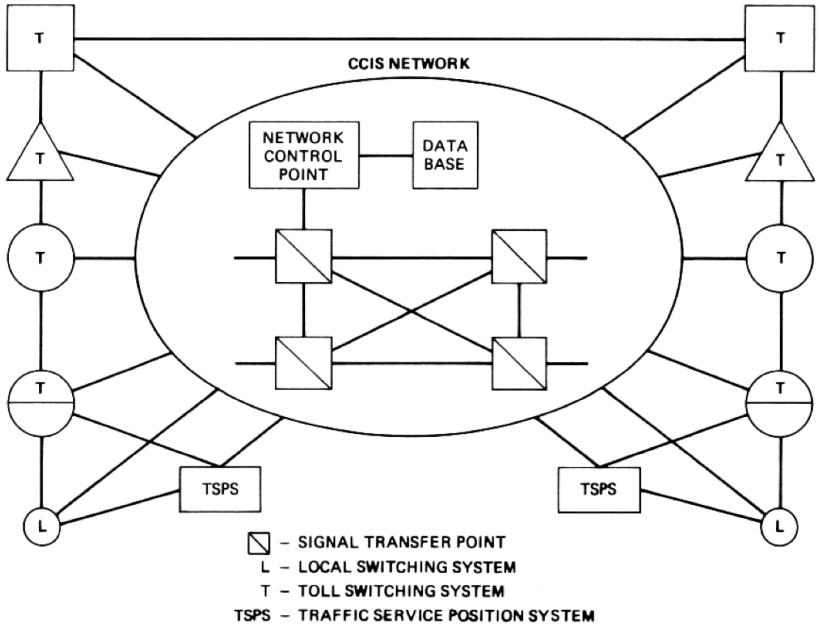


Fig. 1—Stored Program Controlled Network—switching hierarchy.

- Telephone network
- Signaling at NCP
- Benefits
  - Services on demand
  - Rapid introduction of new services

Source: Bell System Technical Journal, Vol. 61, No. 7 (1982)

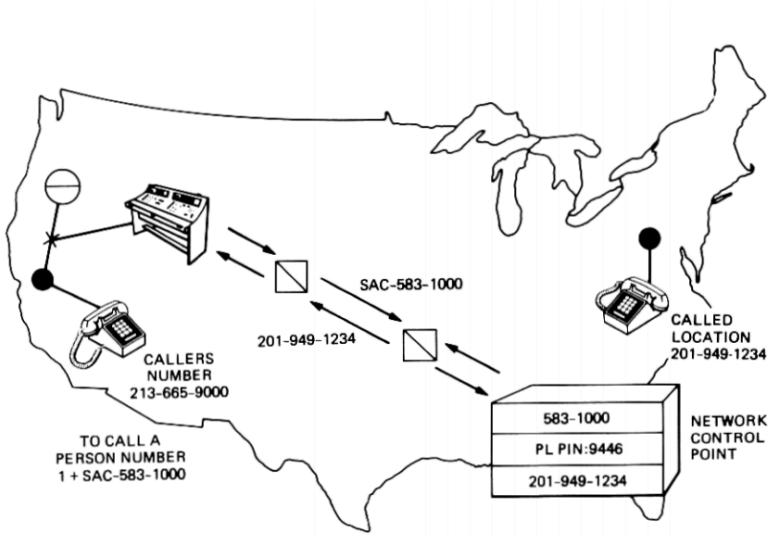
Benefits of the NCP in the AT&T Network

- Elimination of in-band signaling reduces expenditures
  - Shorter circuit holding time
  - Ability to determine busy/idle status before requesting a circuit
- Rapid introduction of new services
  - “In the area of new services that can be supported…possibilities are limited only by imagination.

Apps from Composing Basic Primitives

- Collect N digits
- Send a message to the NCP
- Make a billing record
- …

Envisioned Service: Person Locator



- User registers location with NCP database
- NCP routes call to the current location/ number
- NCPs currently used to route 800 calls

Additional Source: http://www.corp.att.com/cpetesting/ss7.html

Benefits of Central Control

- Network-wide vantage point
  - Can directly observe (rather than infer) network-wide behavior
- Independent evolution of infrastructure, data, and services
  - Services and resource allocation decisions can be made based on customer data, network load, etc.

Evolution of Supporting Technologies

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