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Federal Communications Commission
Office of the Secretary

VoIP Telephony Discussion

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Version 4

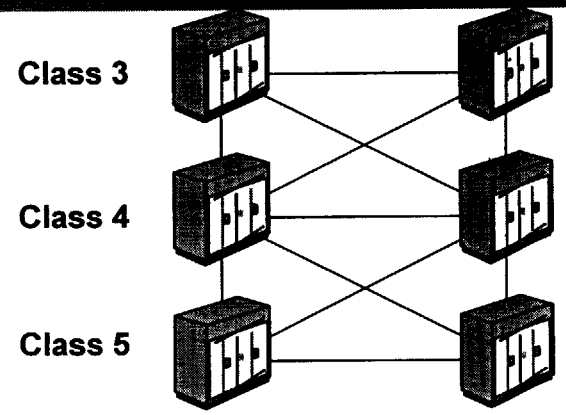
Agenda

- PSTN Hierarchy and Call Flow Examples
- How PSTN Calls Works
- Circuit Switch vs. Packet Networks
- Voice and Data Network Convergence
- How VoIP Call Works
- Why VoIP is Attractive to Business and Consumers
    - Call Flow Examples
- Core Network Roadmap

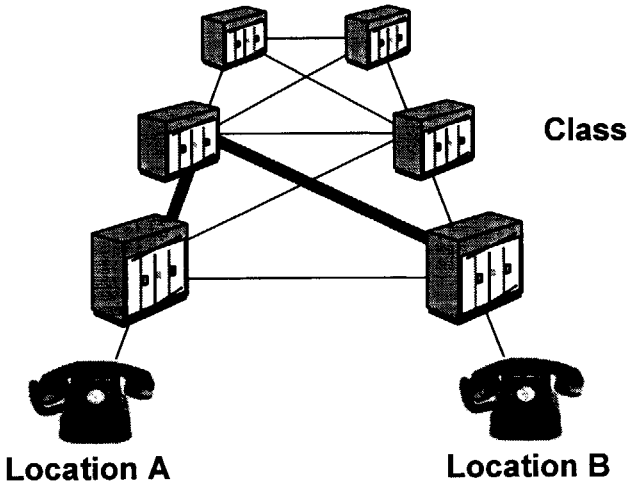
PSTN Hierarchy and Call Flow Examples

Class N Switch Hierarchy

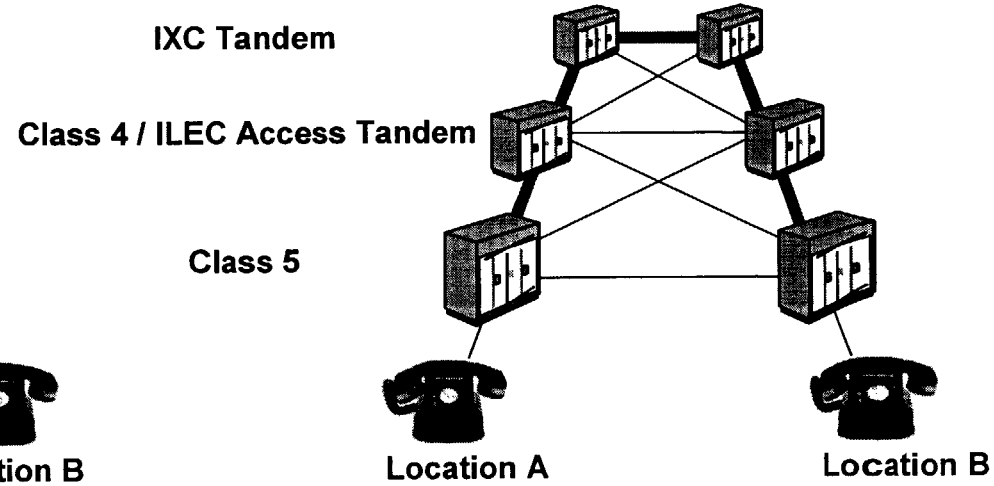
- **Class 5** – End office. Delivers dial tone to the customer.
- **Class 4** – Tandem Office / Toll Center. Calls between two end offices not directly connected route through the toll center. Also provides connections to the long-distance network.
- **Class 3** – Primary Center – Completed intra-state calls between Toll Centers.



Intra-LATA Call



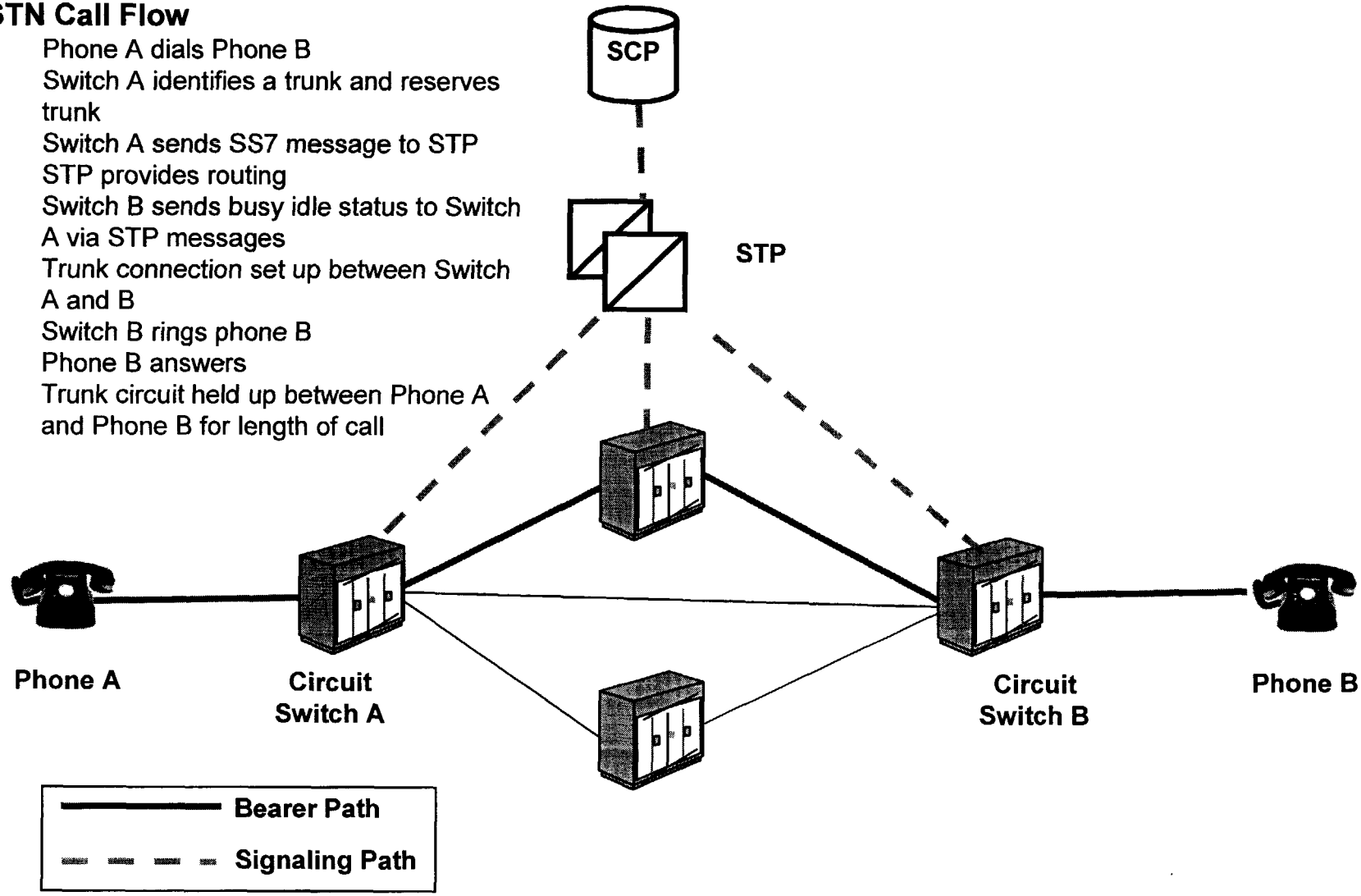
Inter-LATA Call



How PSTN Calls Work

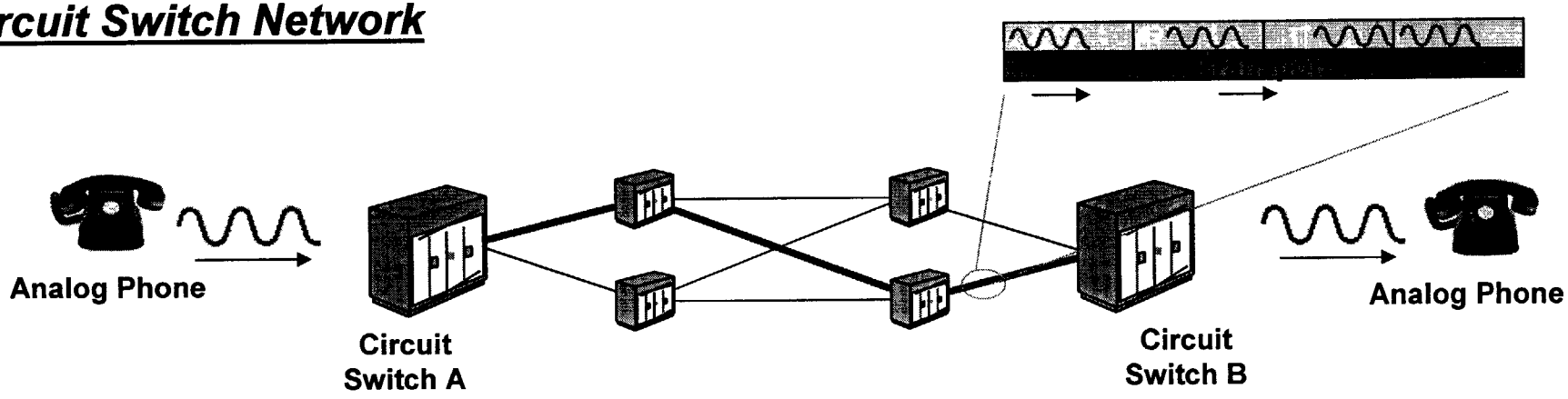
PSTN Call Flow

1) Phone A dials Phone B
2) Switch A identifies a trunk and reserves trunk
3) Switch A sends SS7 message to STP
4) STP provides routing
5) Switch B sends busy idle status to Switch A via STP messages
6) Trunk connection set up between Switch A and B
7) Switch B rings phone B
8) Phone B answers
9) Trunk circuit held up between Phone A and Phone B for length of call

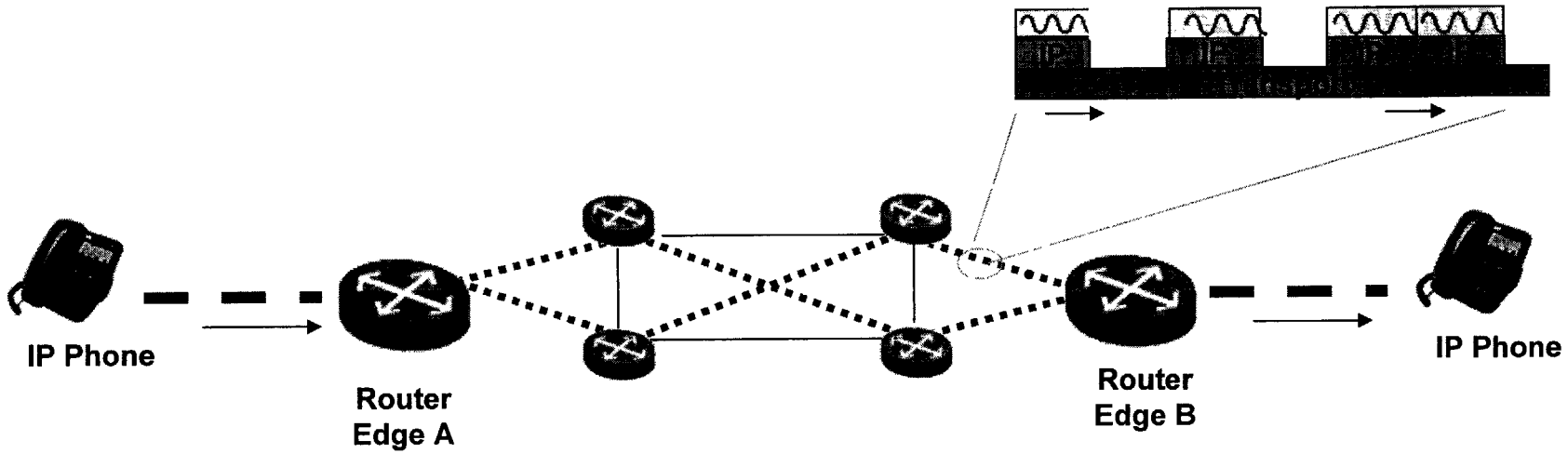


Circuit Switch vs. Packet Networks

Circuit Switch Network

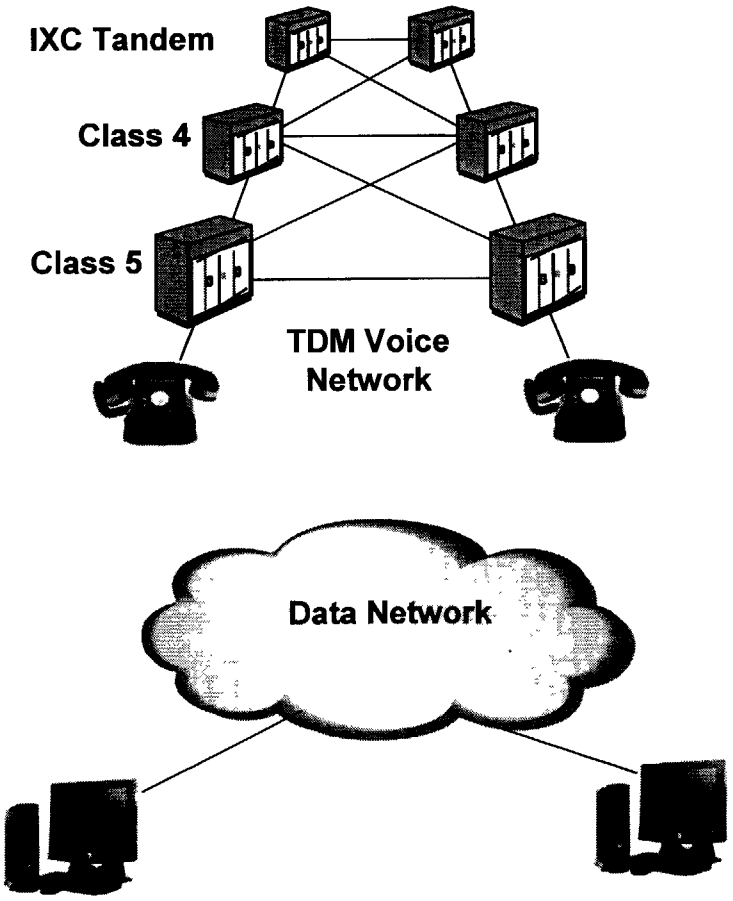


Packet Network

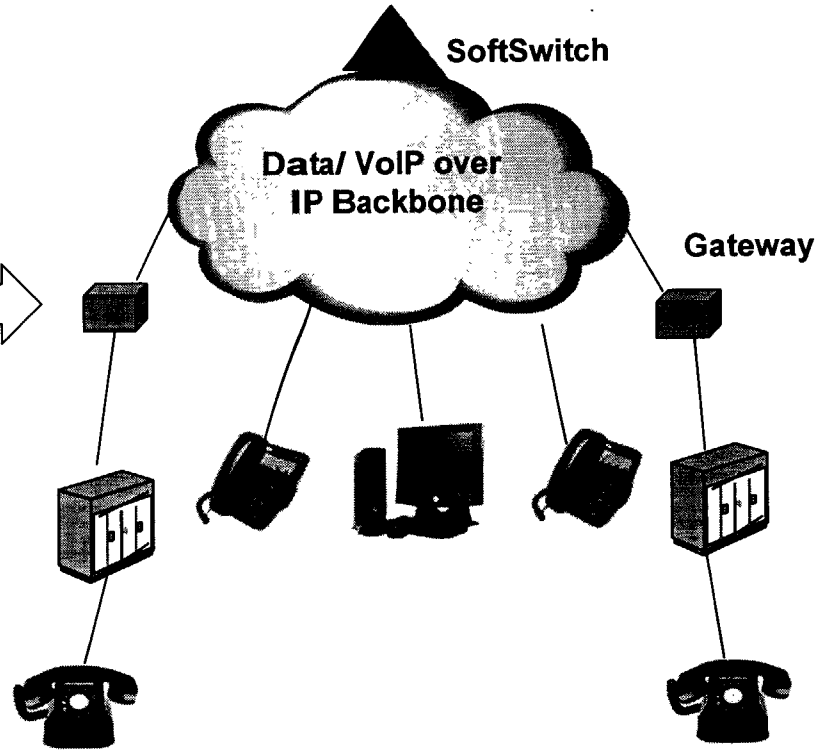


Voice and Data Network Converge

Today's Separate Networks



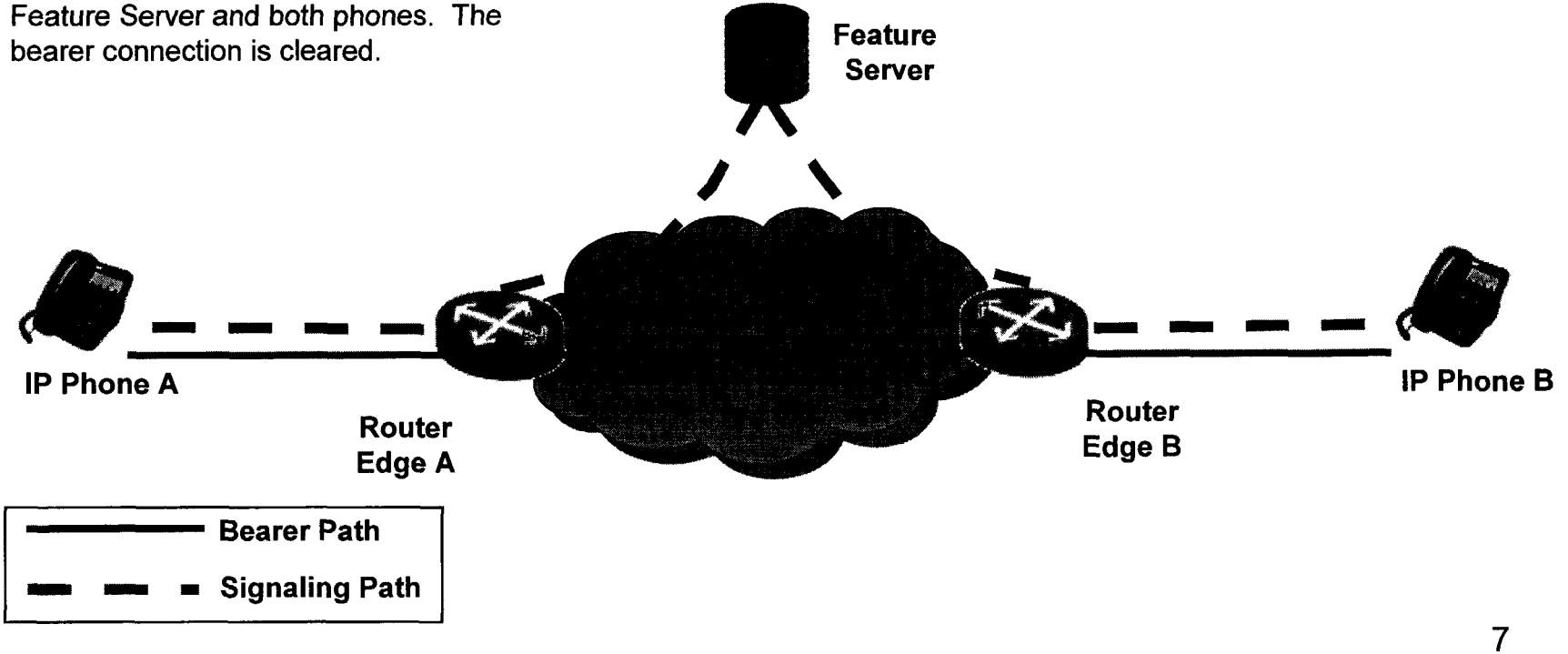
Tomorrow's Converged Network



How VoIP Calls Work

IP Call Flow

1. Phone A exchanges signaling messages with the Feature Server. Phone B is identified as located on the same network as the originating station and it exchanges signaling messages with the Feature Server.
2. Phone A establishes a bearer connection to Phone B over the IP Network.
3. When either party disconnects signaling messages are exchanged between the Feature Server and both phones. The bearer connection is cleared.

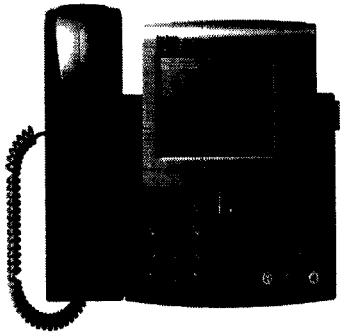


Why VoIP is Attractive to Business and Consumers

- One Network to Manage for Businesses
- Ease of Station Changes
- Features
- Usage Costs

VoIP Hard and Soft Client Examples

Cisco 7960

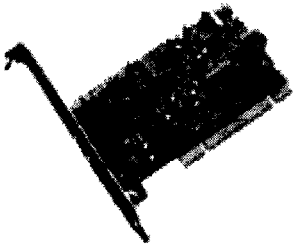


$300

Cisco 7902

$130

ActionTec VoIP/Internal



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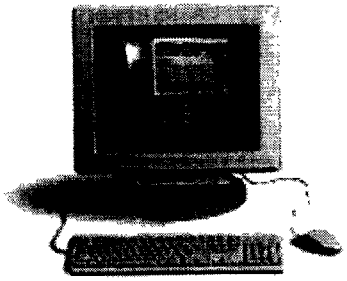
Callserve's Internet Softphone



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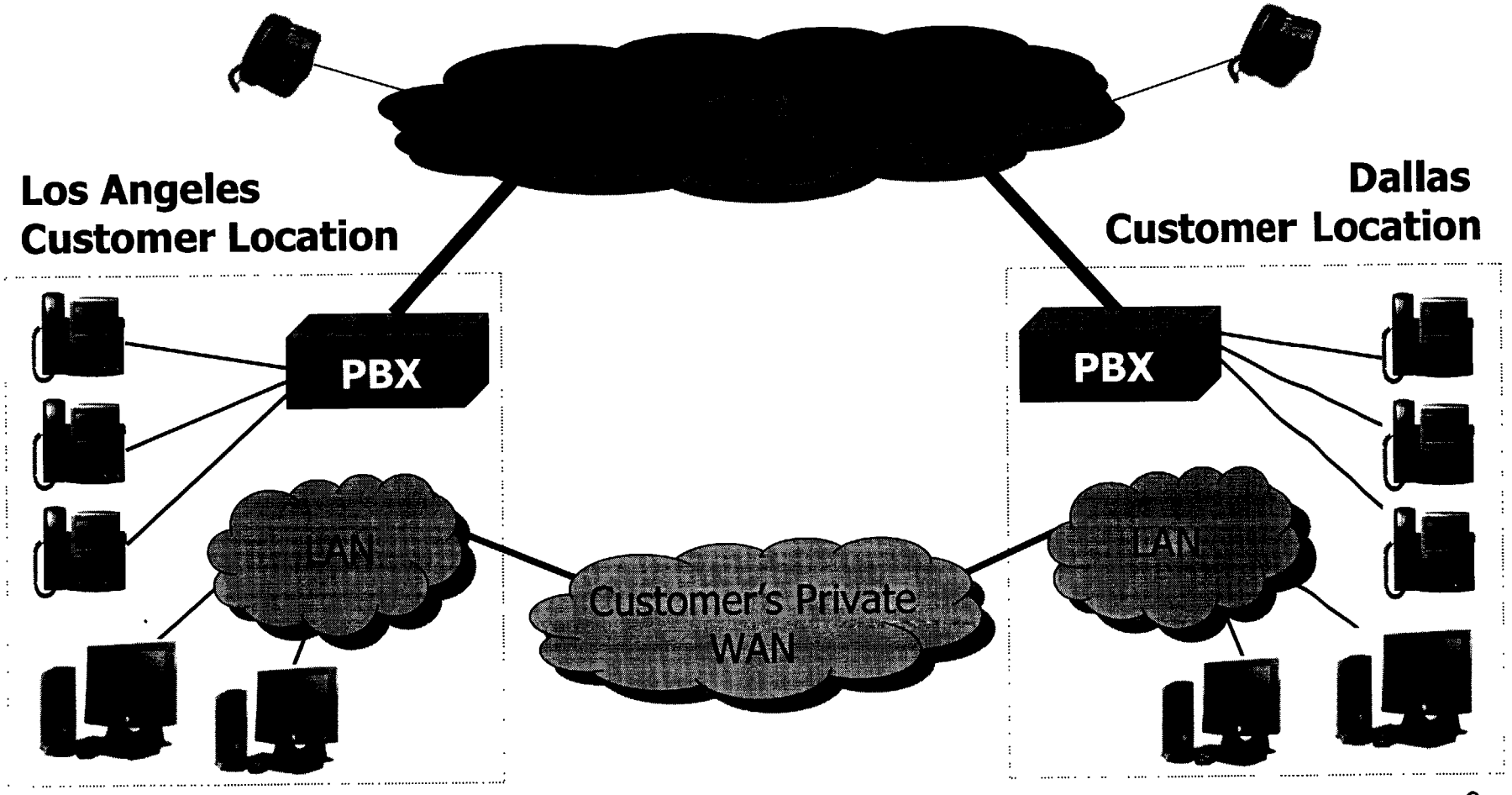
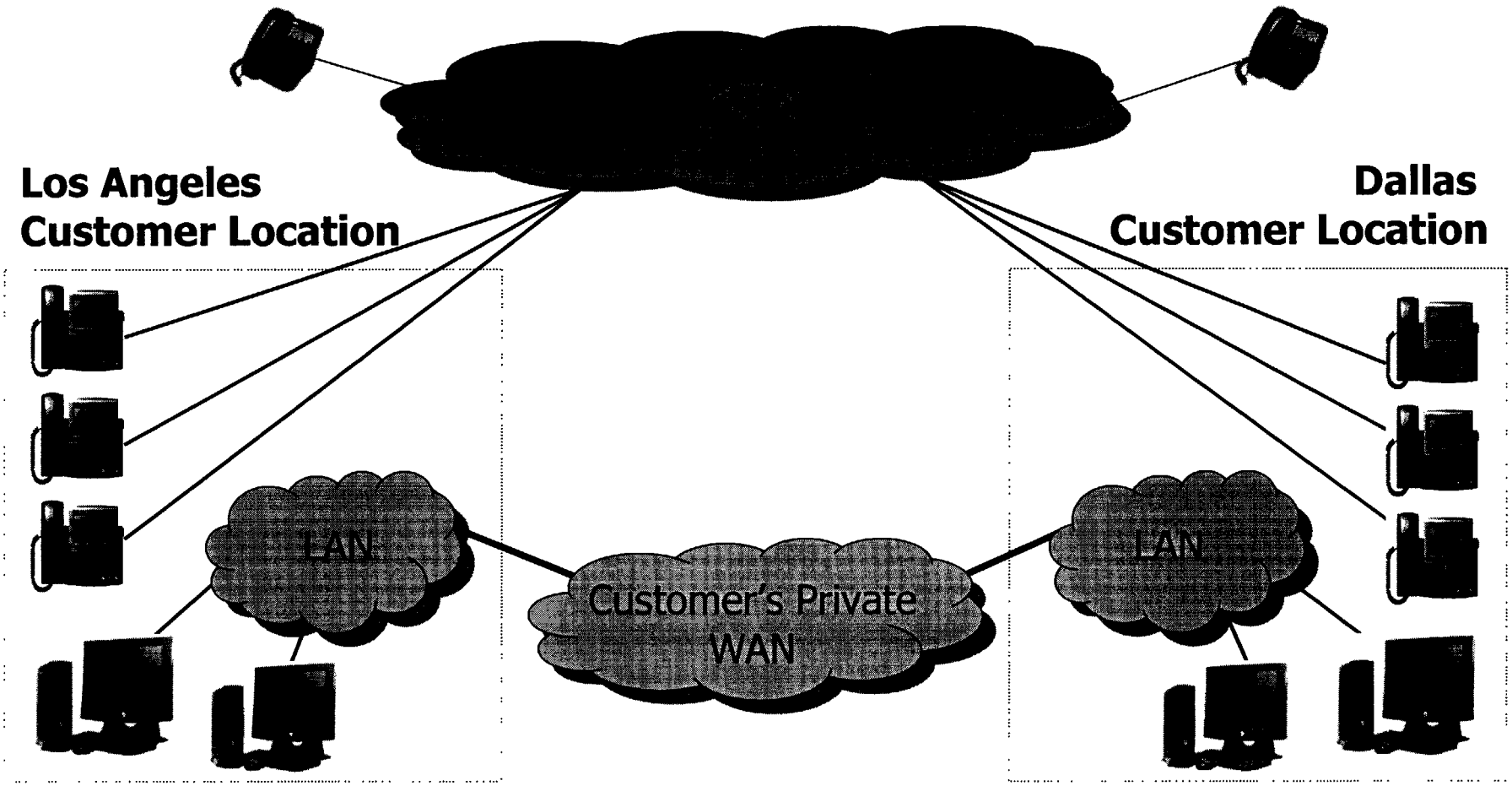
Business Today: Separate Data and Voice Networks

Example: Customer Premise based Solution (PBX)



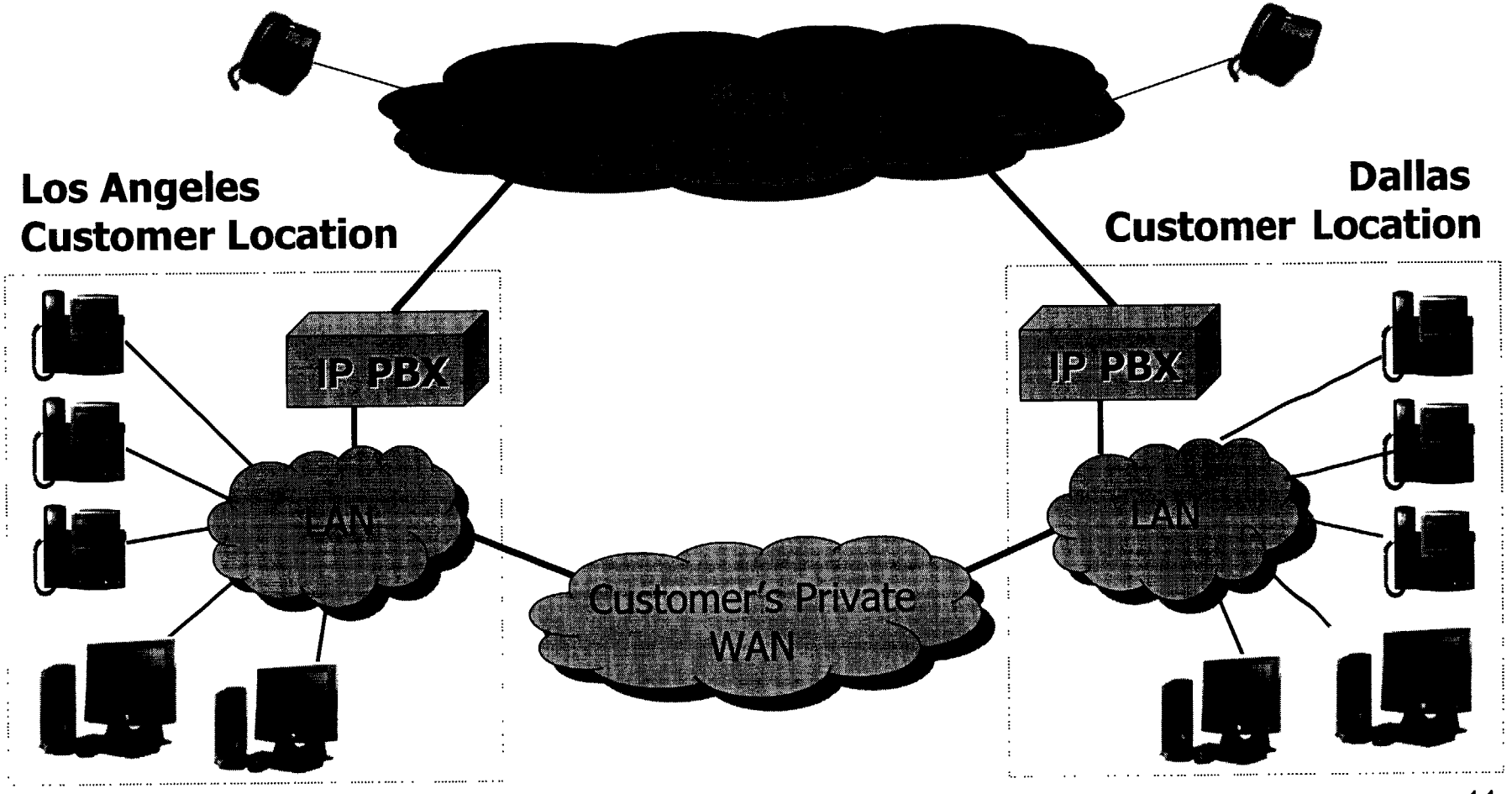
Business Today: Separate Data and Voice Networks

Example: Service Provider Hosted Solution (e.g. Centrex)



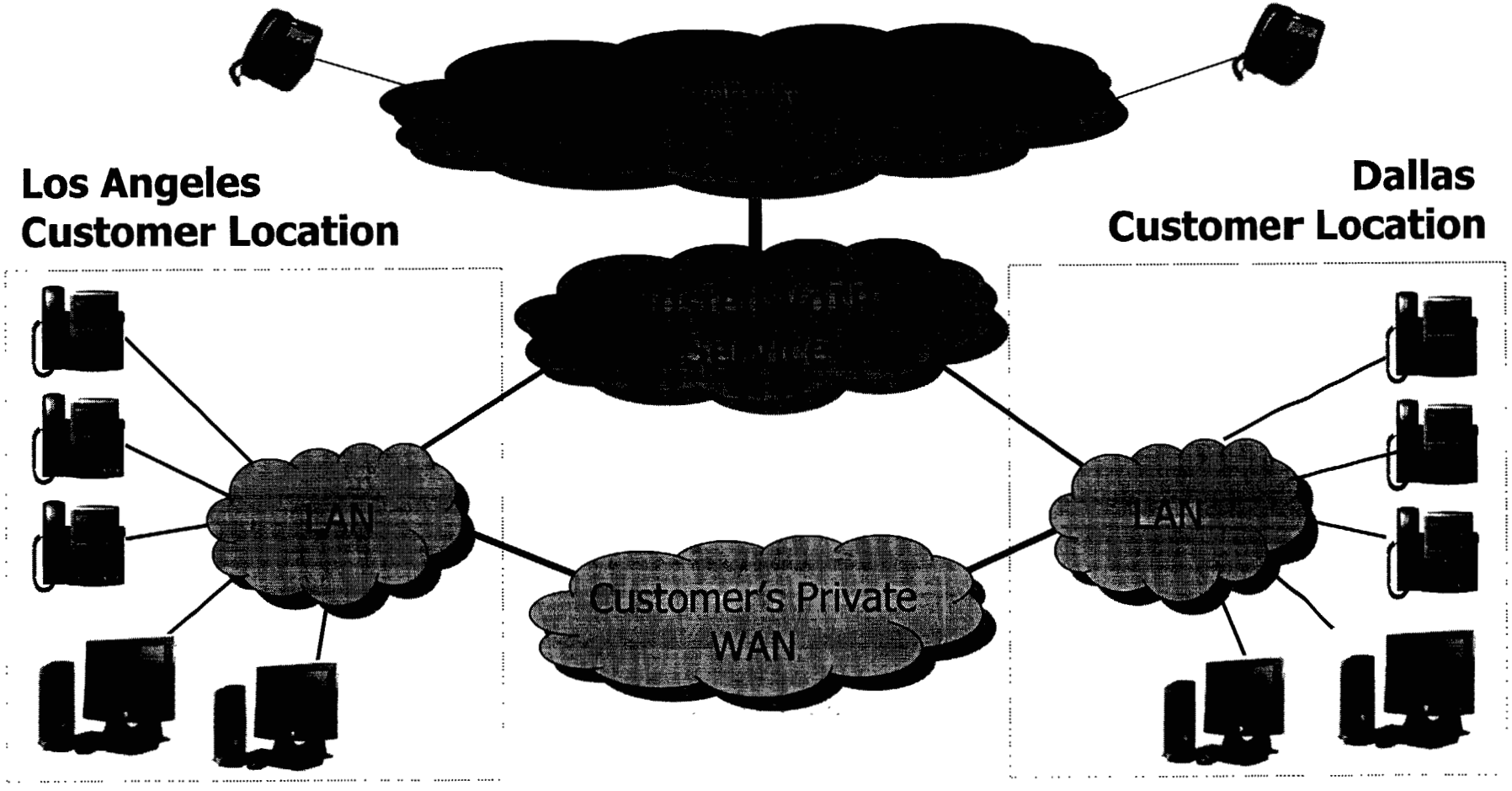
VoIP Enables Lower Operating and Usage Costs

Example: Customer Premise based Solution (e.g. IP-PBX)

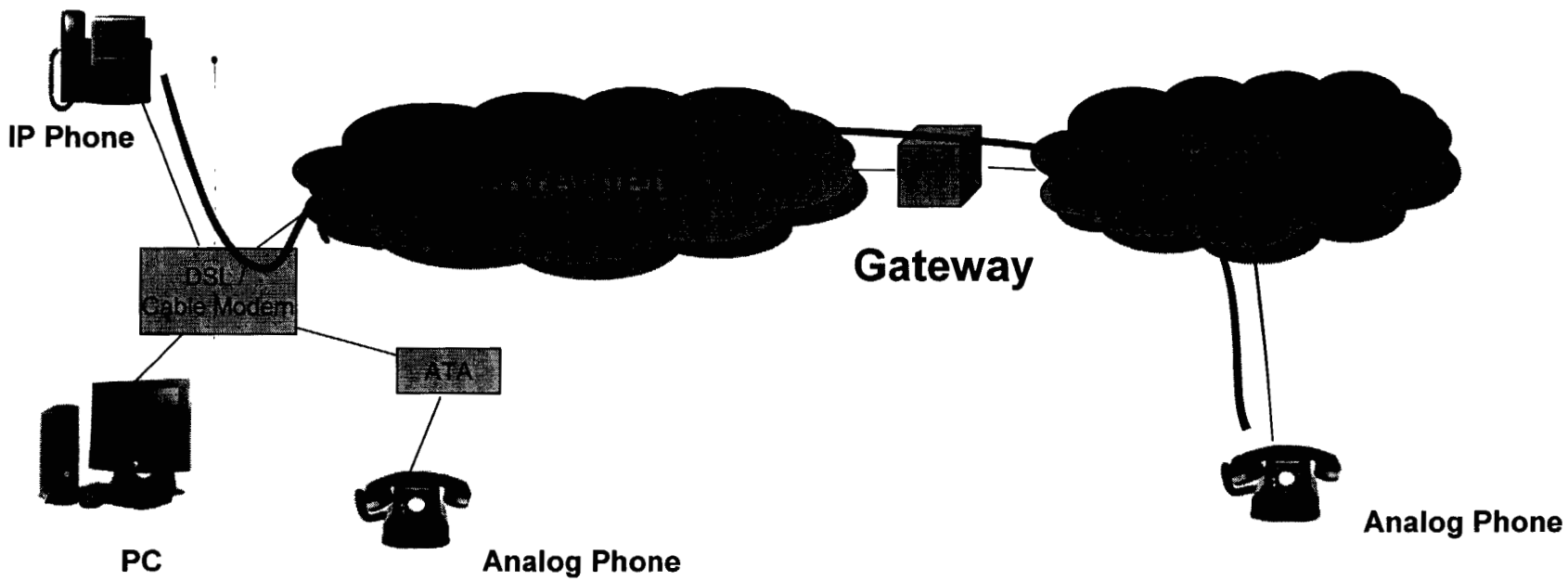


VoIP Enables Lower Operating and Usage Costs (Cont'd)

Example: Service Provider Hosted Solution (e.g. SBC's HIPCS)

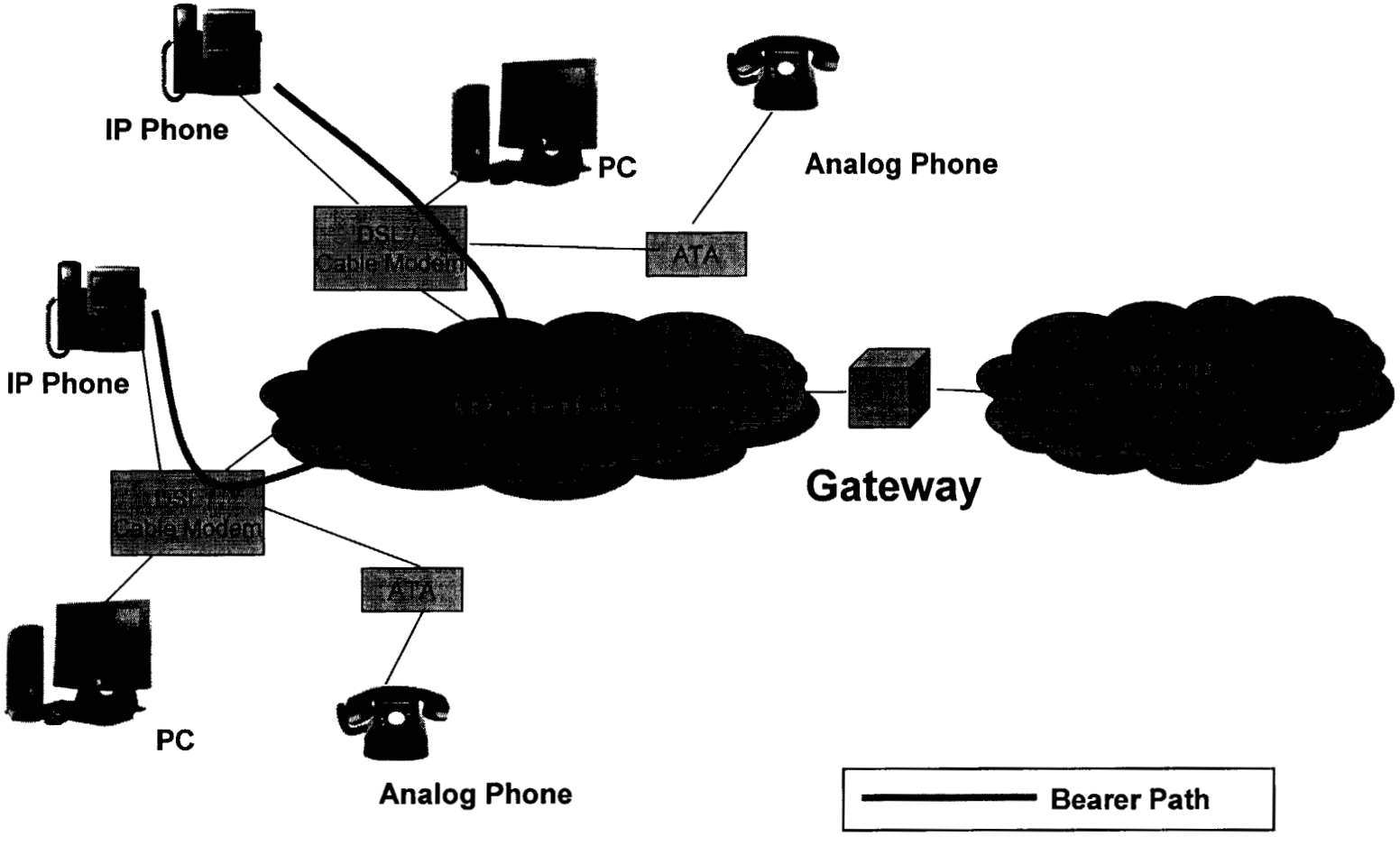


Consumer VoIP: IP Phone to PSTN Phone

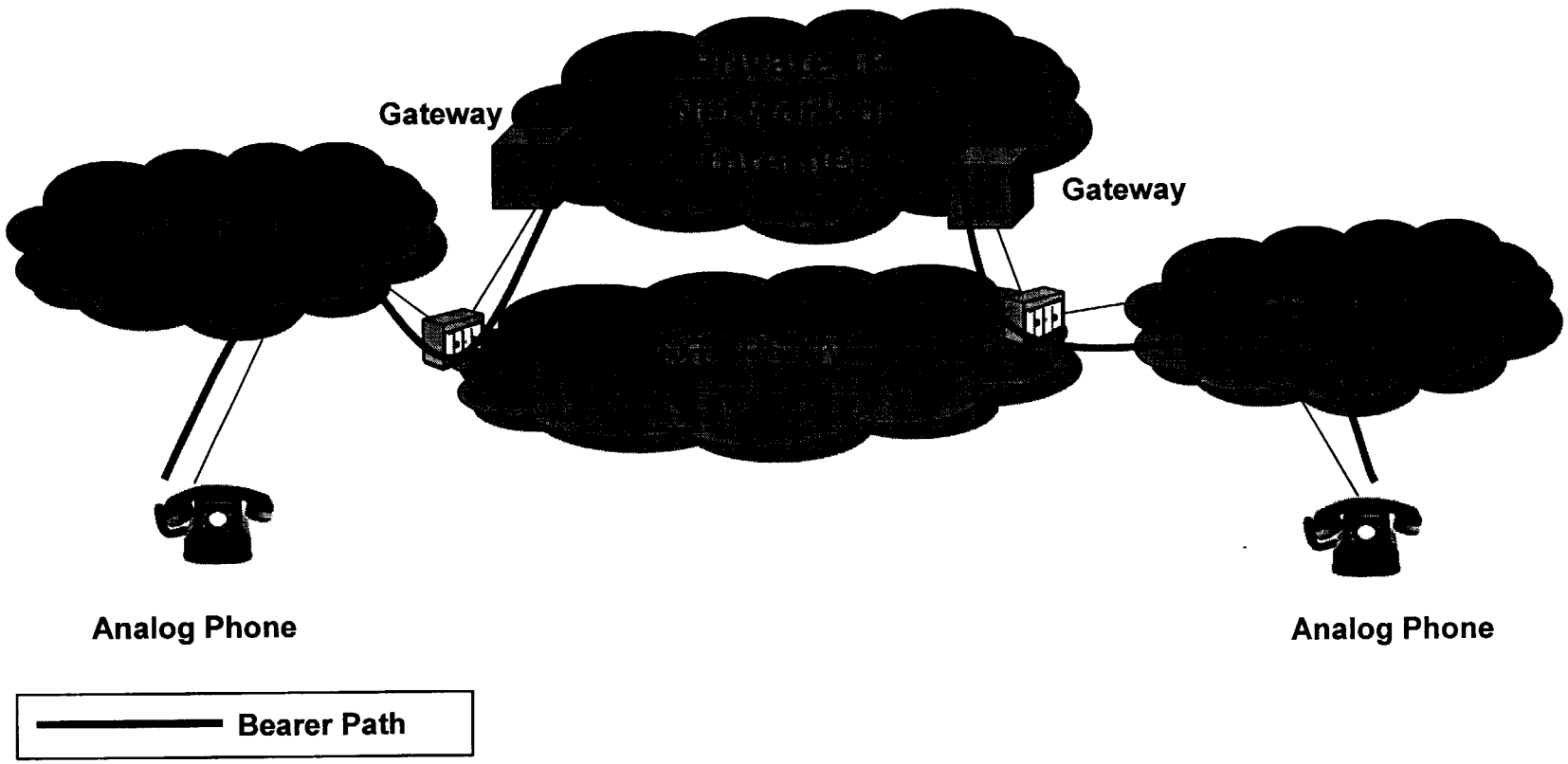


Bearer Path

Consumer VoIP: IP Phone to IP Phone



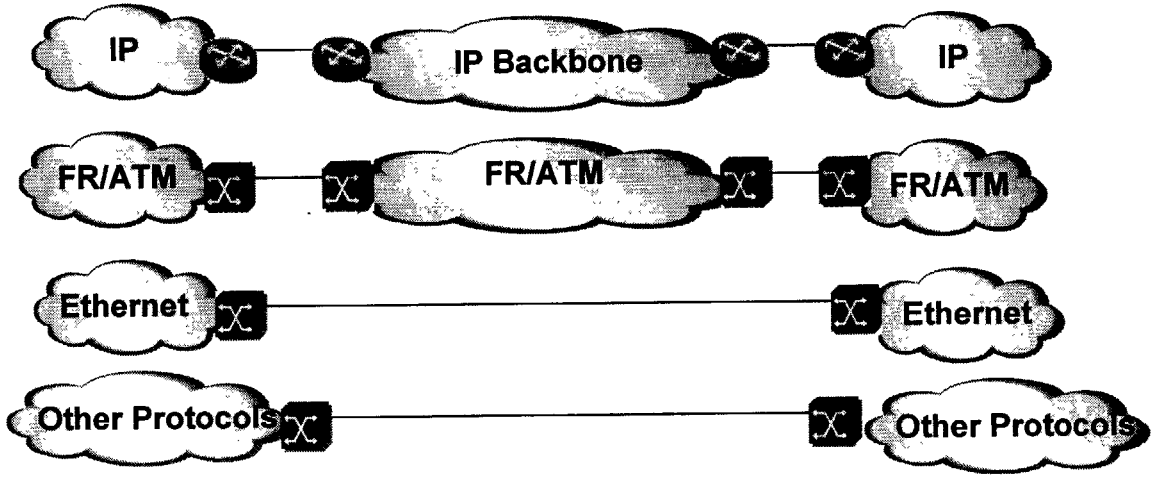
Consumer VoIP: PSTN Calls with VoIP Inter-working



Core Network Roadmap

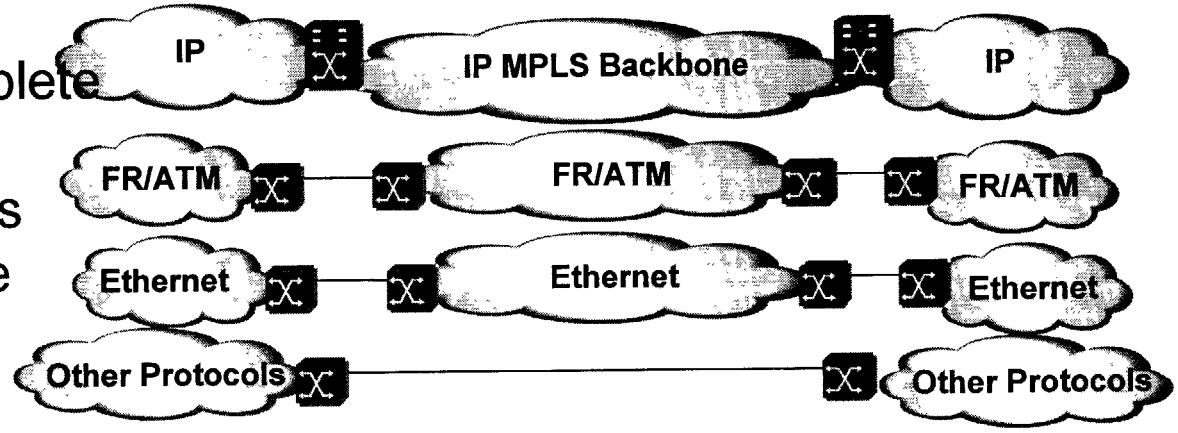
Today

- Separate Networks



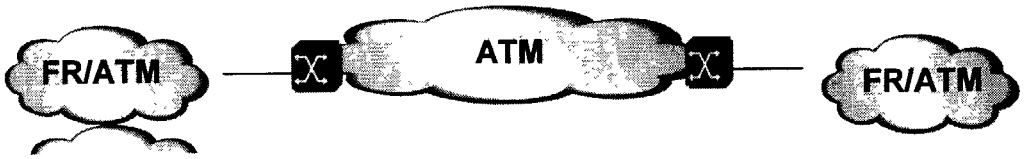
Phase 1

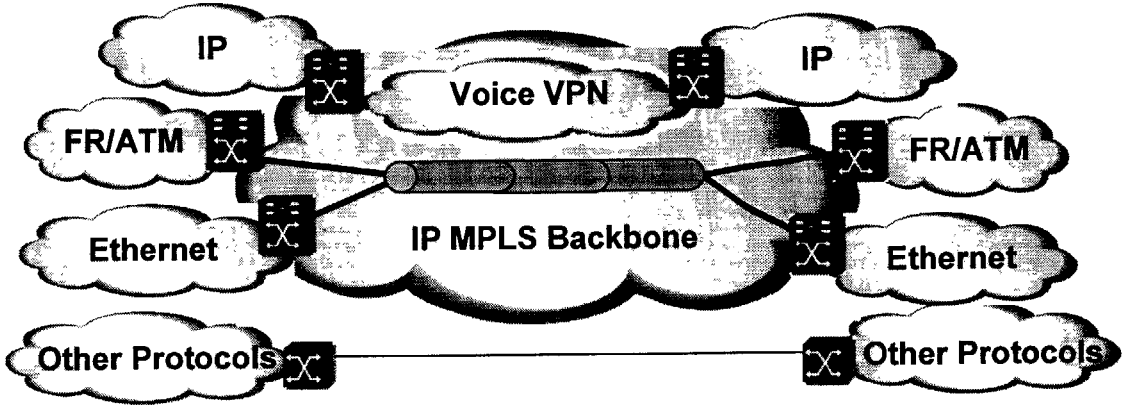
- MPLS Conversion Complete
  - IP Backbone
- Network Based IP-VPN's
- Routed Ethernet Service



Phase 2

- IP Enabled Frame on IP Backbone
- VoIP VPN Complete

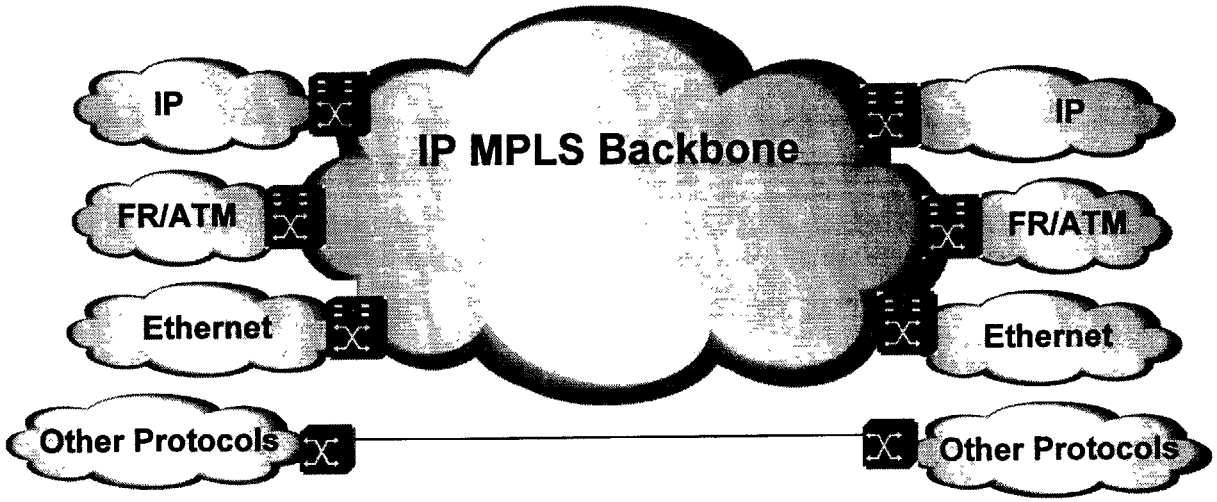


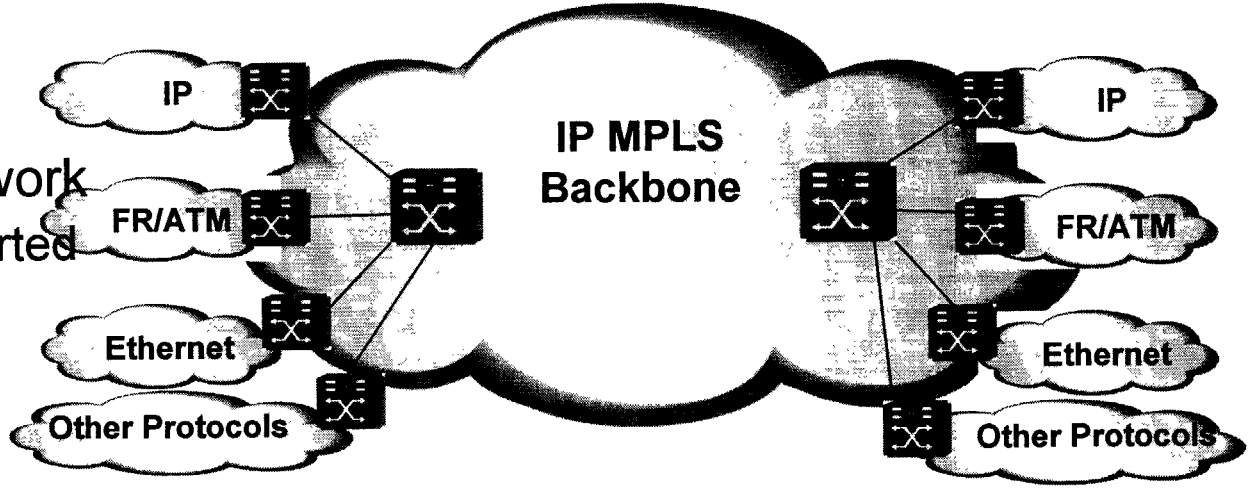


Core Network Roadmap (cont'd)

Phase 4

- Complete MPLS
  - Inter-Working
    - Frame
    - ATM
    - Ethernet



Phase 5

- MPLS Backbone Network
  - All Protocols Converted At Edge