Customer Premise Equipment
Definitions

• CPE - Customer Premise Equipment
  – Correctly defined as “anything the customer connects to the network”
  – In practice we use CPE to mean “equipment other than simple terminals” (phones, PCs, etc.)

• We will discuss mainly voice, but the arguments apply to video and data also
Rationale

• Placed between End-Users and CO connections
• Provide on-premise functions
• Make cost-efficient use of CO connections
Different Types...

• PBX - Private Branch Exchange
  – Full Premise Based Switching
• Key System
  – Smaller System, usually non-switching
  – Difference to PBX often unclear
• CENTREX
  – PBX functionality, but implemented in the Central Office Switch
Switching Principles and Methods
Cross-Point Switching
“Space Division Switching”
Three-Stage Switch

From Stallings, Voice and Data Communications.

Sunday, September 19, 2010
Time Division Switching

- Each Line Card “Samples” the inbound signal (8000 times per second, each sample is taken over 0.125 msec)
- While the cards collect the next sample (during the next 0.125 msec), the Time Slot Interchanger collects all samples and delivers them to the correct line card outputs
- The TSI must process 8000*2*(number of conversation) samples
Time Division Switching
PBX “Block Diagram”

- Analog Phones
- Electronic Sets
- Special Workstations
- LINES
- PBX Switching System
- Administration
- Maintenance
- SMDR
- CTI
- TRUNKS
- Local Switched Access
- IXC Special Access
- Private Lines
Packet Switching

- Analog Phones
- VoIP Phone
- VoIP Phone

PBX Switching System

LINES

TRUNKS
VoIP Switching and Signaling Logic

Analog Phones

VoIP Phone

VoIP Phone

Switching and Signaling Logic

IT 625, ©2009, H.Kruse

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Handling Outbound Calls

- Call destination restrictions
- Least cost route selection
- Automatic redial
Handling Inbound Calls
Handling Inbound Calls

• Routing Calls
  – Attendant
  – Direct Inward Dialing
Handling Inbound Calls

• Routing Calls
  – Attendant
  – Direct Inward Dialing

• Handling Unanswered Calls
  – Call Forwarding -- General
  – Call Forwarding -- Busy/No-Answer
  – Hunt Groups
  – Queuing and Message Services
Signaling Call Information

• Calling number
  – ANI - Automatic Number Identification
    • Used in “800” services
  – Caller ID
    • Retail-level “CLASS” service

• Called Number
  – DNIS - Dialed Number Identification Service
    • Used in “800” service
  – DID - Direct Inward Dialing
    • CO to PBX Trunk Signaling
Handling Unanswered Calls
Handling Unanswered Calls

- Hunt Groups
Handling Unanswered Calls

- Hunt Groups
- Queuing
Handling Unanswered Calls

- Hunt Groups
- Queuing
- UCD
  - Universal Call Distributor
Handling Unanswered Calls

• Hunt Groups
• Queuing
• UCD
  – Universal Call Distributor
• ACDs
  – Specialized PBX software for inbound call handling
Call Centers

- Provide a business function
  - Maximize revenue or customer service, while
  - Minimizing cost to provide the service
- Components:
  - Automated Attendant
  - Audiotex(t)
  - IVR - Interactive Voice Response
  - ACD - Automated Call Distributor
  - Predictive Dialers
ACDs

- Inherently, an ACD is a PBX, but:
  - It is optimized for handling in-bound calls
  - It has extensive queueing functions
    - almost always more trunks than lines!
  - Sophisticated internal routing function
    - What is agent is best matched to the customer/caller?
  - Extensive reporting options
    - Real-time - what is going on right now
    - Planning and Performance reports
PBX Capacity

- Traffic (usually measured in call minutes per hour)
  - How Many Simultaneous Calls
- Processor
  - Total Calling Volume
  - Busy Hour Call Attempts
- Physical Interfaces
  - Stations and Trunks
“Programming a PBX”

- Moves, Adds, and Changes (MAC)
  - Establish New Service
  - Disconnect Service
  - Change Features On Existing Service