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# Putting Interoperability Specifications to Work

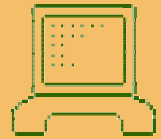
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Michael Bayer

Computer Telephony Solutions

[www.CTExpert.com](http://www.CTExpert.com)

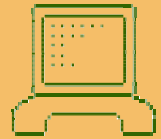
# Introductions



## ■ Michael Bayer

- President, Computer Telephony Solutions
  - Company dedicated to CTI Plug and Play
- Author, “CTI Solutions and Systems”
- mbayer@CTExpert.com
- www.CTExpert.com

# Introductions

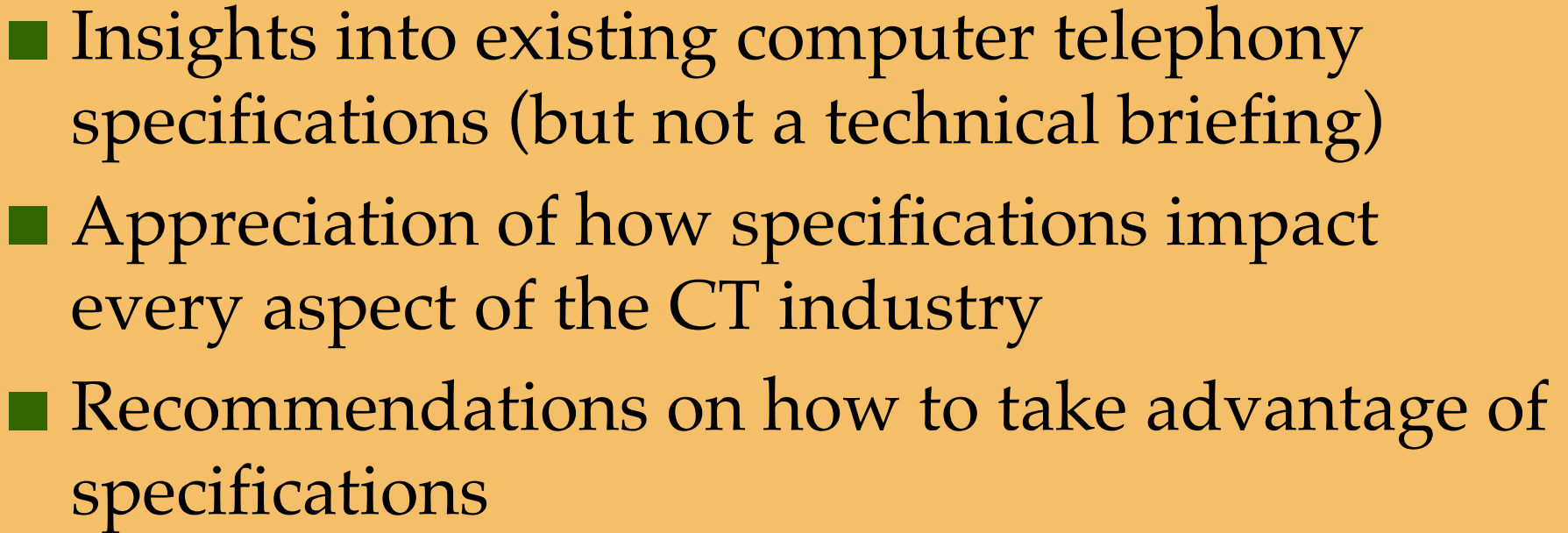


## ■ Who are you?

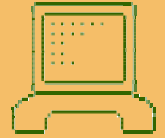
- Vendors?
- Integrators, Interconnects, and Resellers?
- System Owners?

## ■ When do you think you will be investing in Computer Telephony?

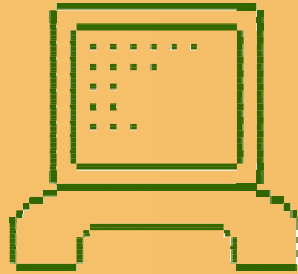
- This year?
- Next year?
- Within 5 years?
- Never?



# Agenda



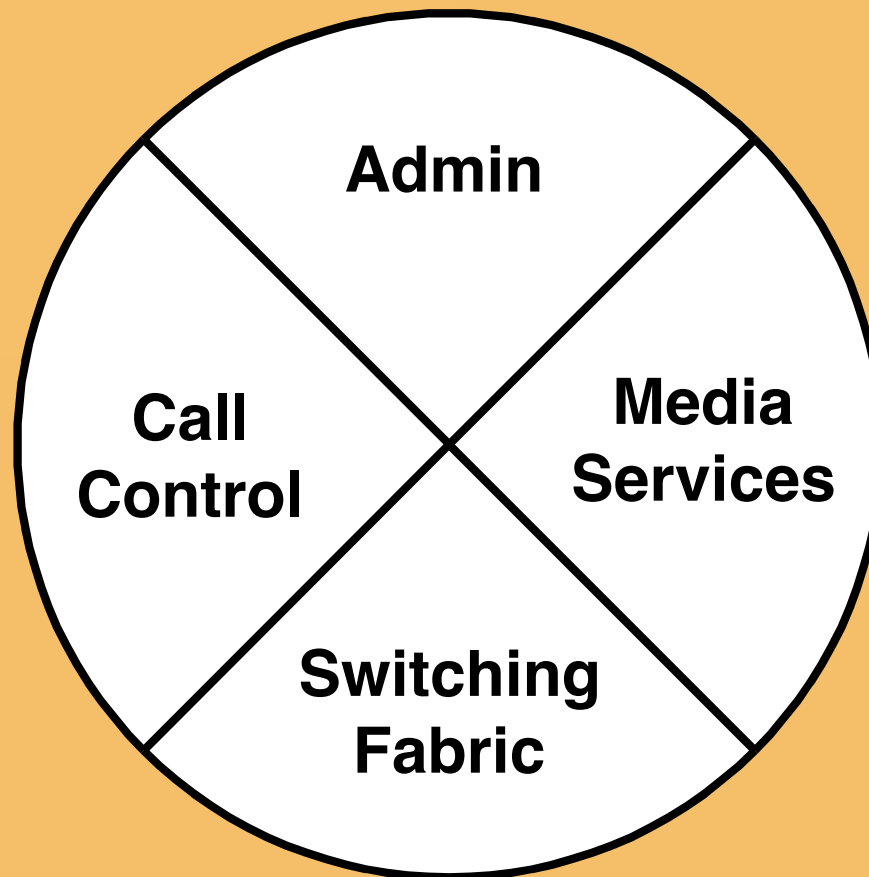
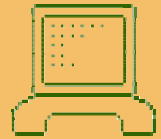
- Computer Telephony Technology
- Market Requirements and Opportunities
- Evolution of Standards and Specifications
- Taking Advantage of Specifications
- How to Shop for Products
- Q&A



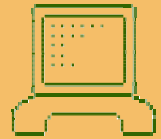
Context:

# Computer Telephony Technology

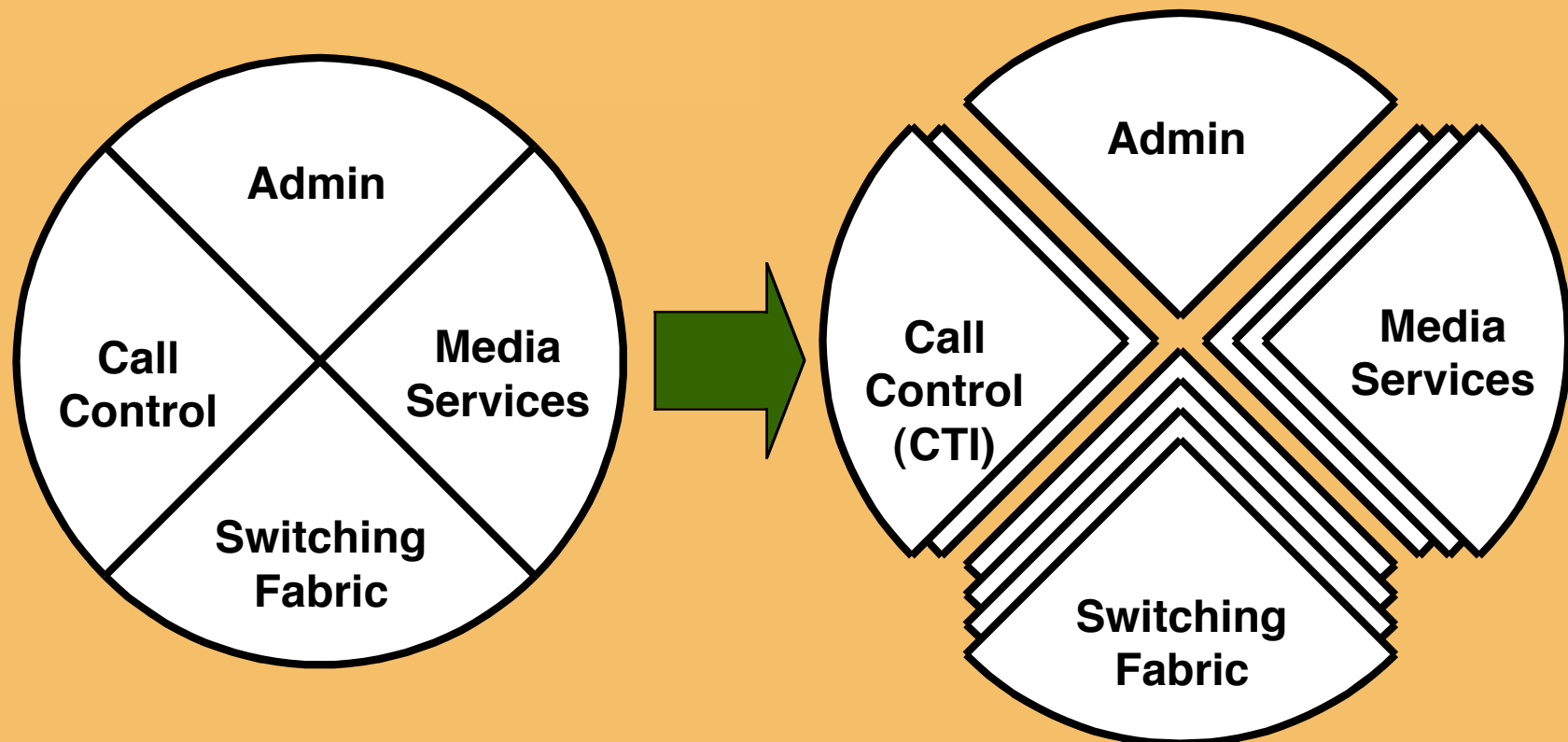
# Telephone System Technologies



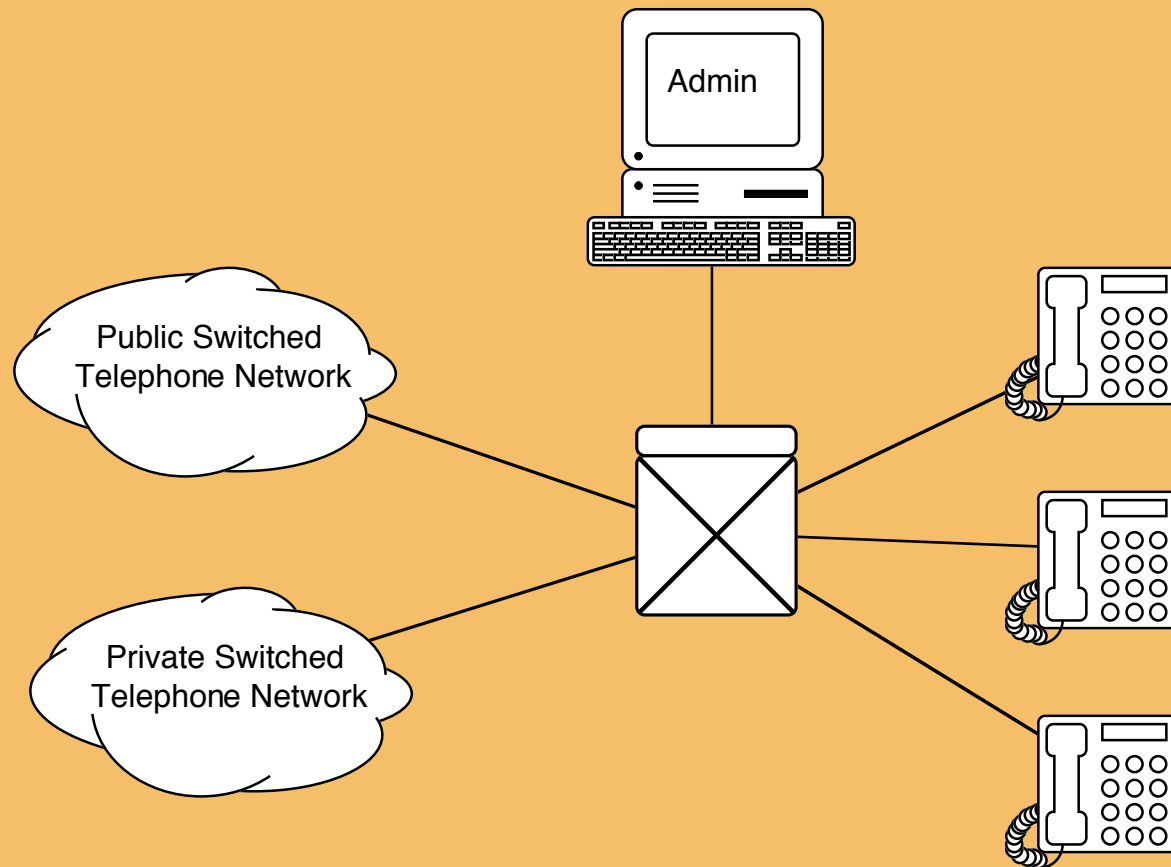
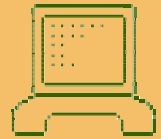
# Computer Telephony Revolution



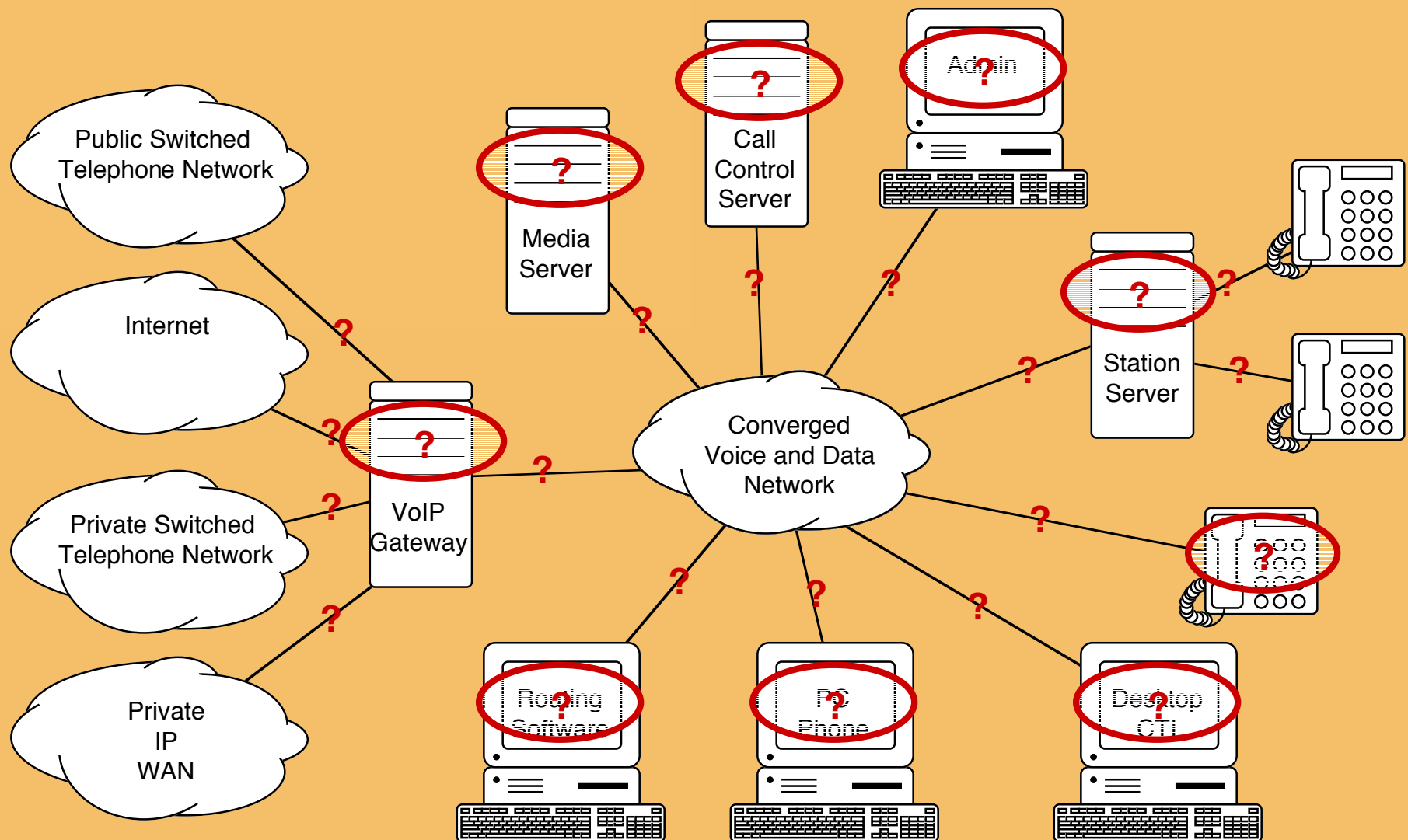
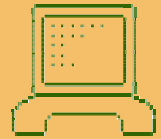
- Using off-the-shelf computer technologies to implement telephone system components
- Shift from Monolithic to Modular systems

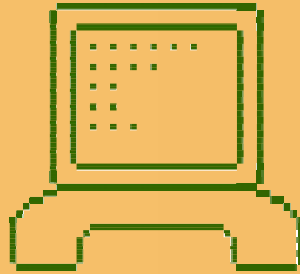


# Telephone System Implementation



# Telephone System Implementation

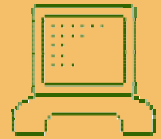




Motivation:

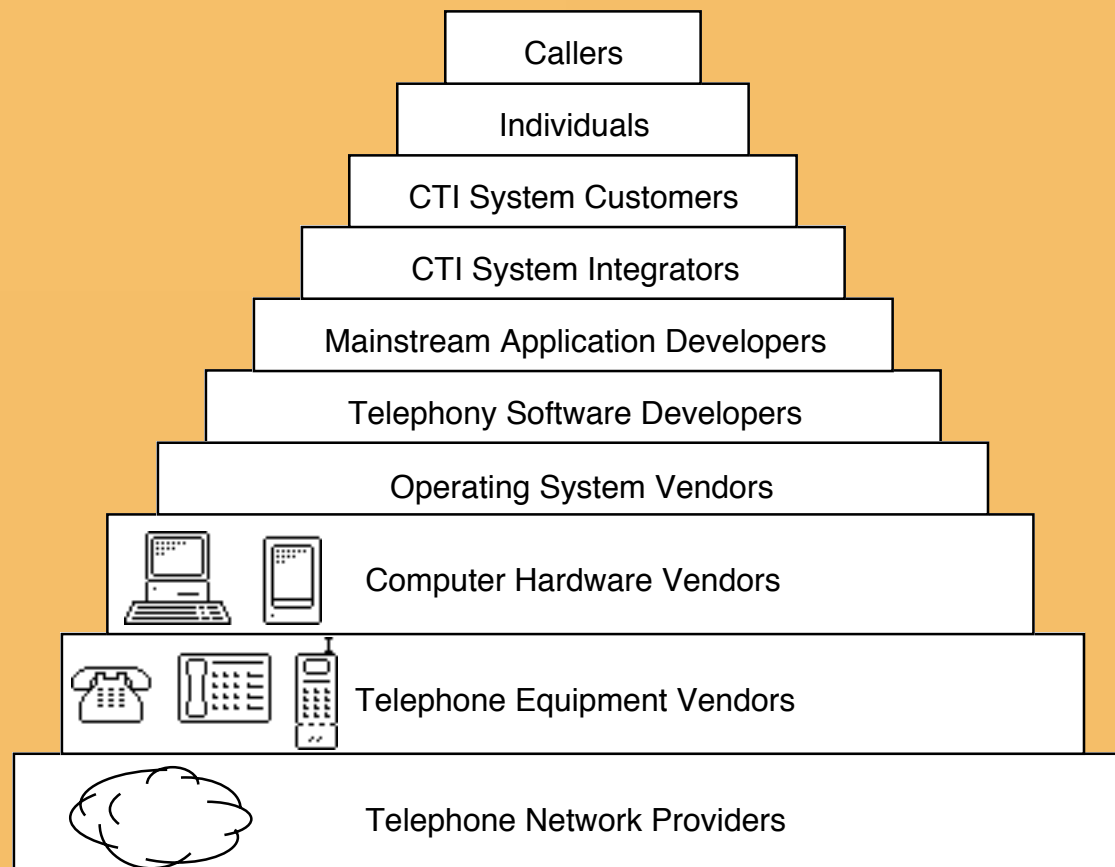
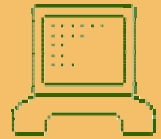
# Market Requirements and Opportunities

# The Promise of CT Technology

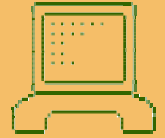


**Telephone systems**  
that are  
**tailored**  
to the  
**specific needs and preferences**  
of **users**

# Value Chain

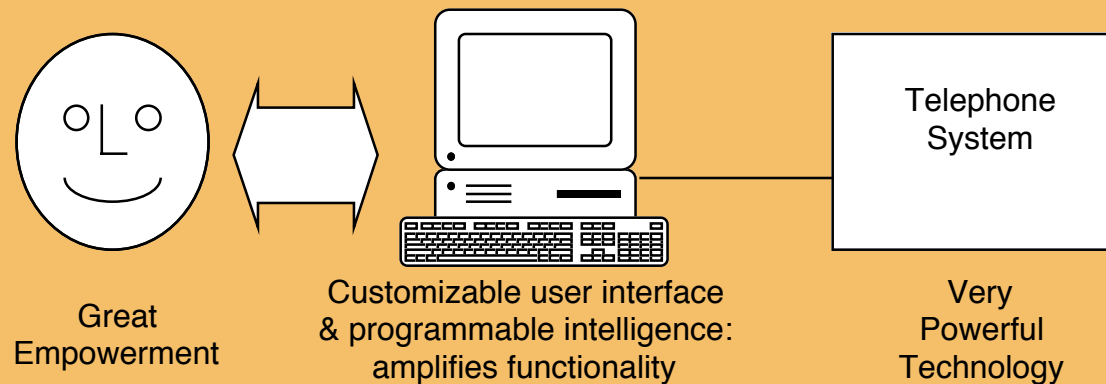
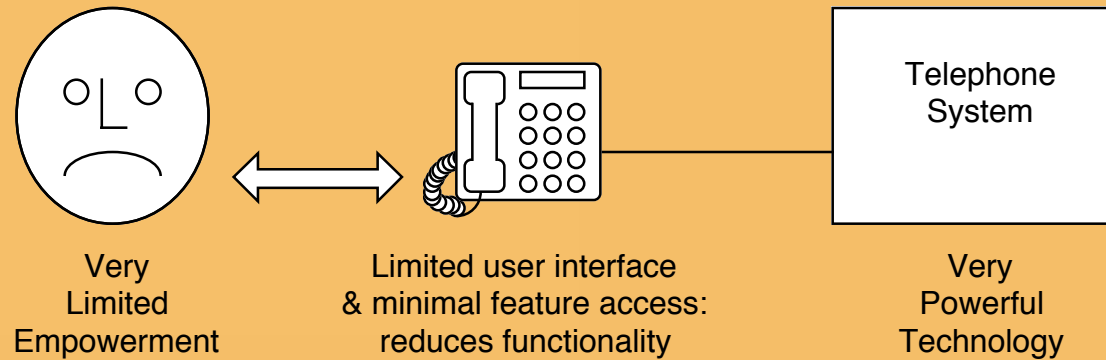
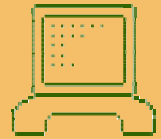


# User Requirements

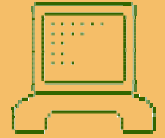


- Take full advantage of user-identified telephony features
- Integration with mainstream applications
- No functional limitations to prevent personalization
- Add-on as needed

# CT: Before & After

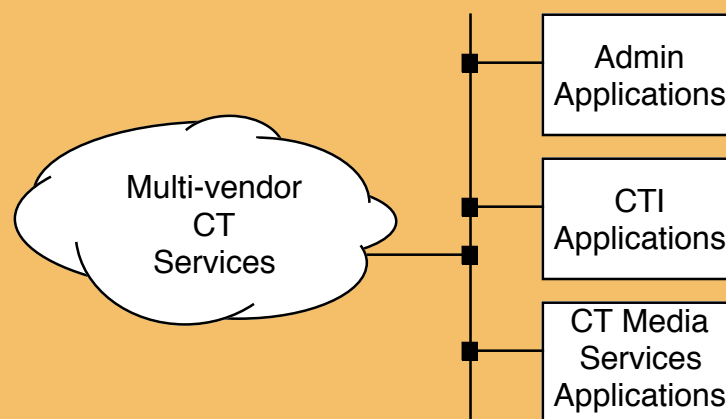
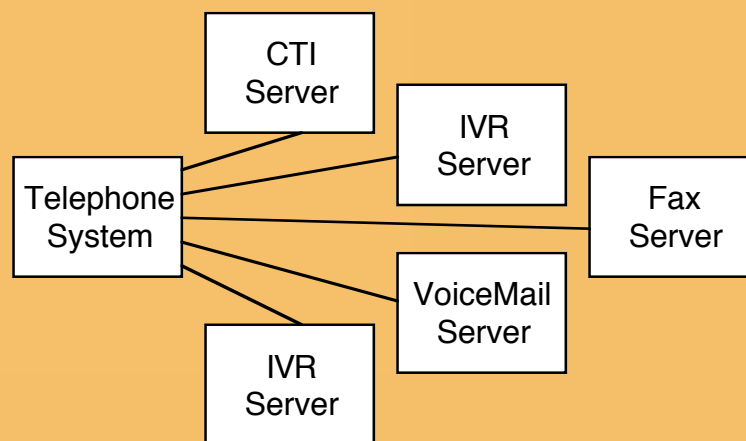
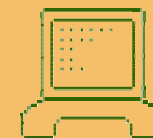


# Customer Requirements

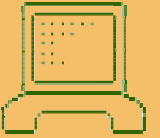


- No limits to addition of functionality
- Easy to scale
- No barriers to multi-vendor systems
- No barriers to multi-platform support
- System-centric (rather than vendor-centric) administration

# Customer Requirements

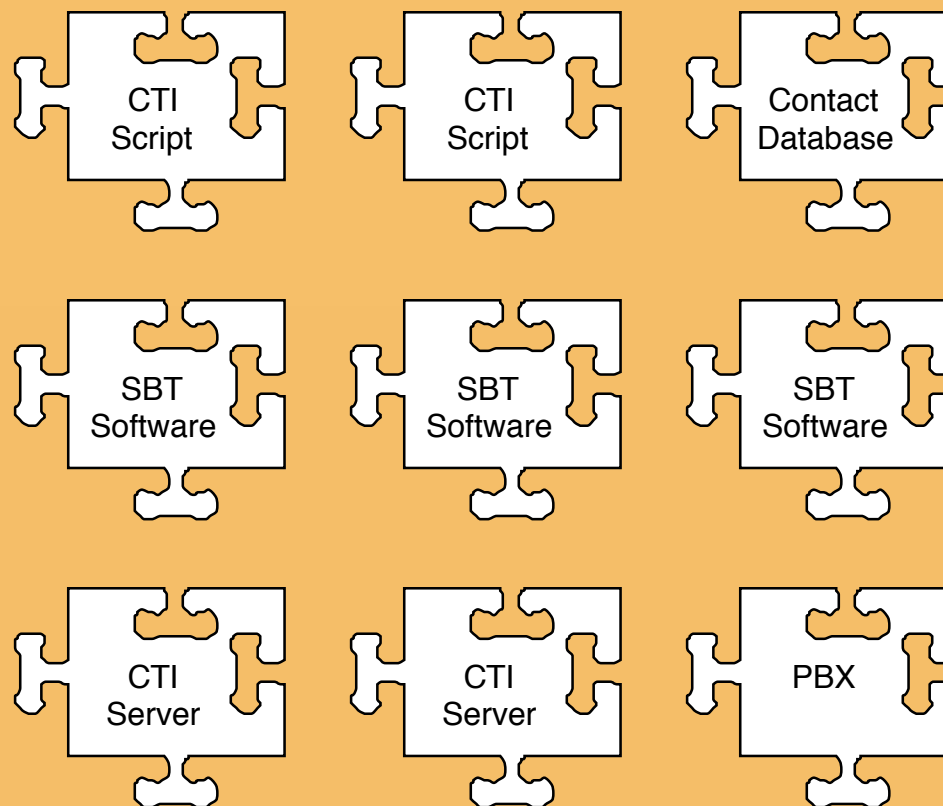
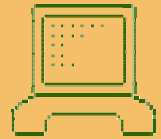


# Integrator's Point of View

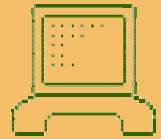


- Maximize opportunity for value-add through customized solutions
- Ability to source solution components from a diversity of vendors

# Integrator's Point of View

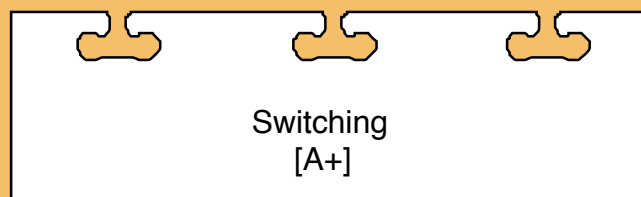
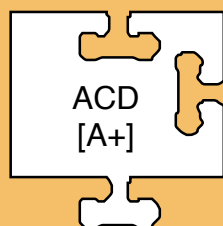
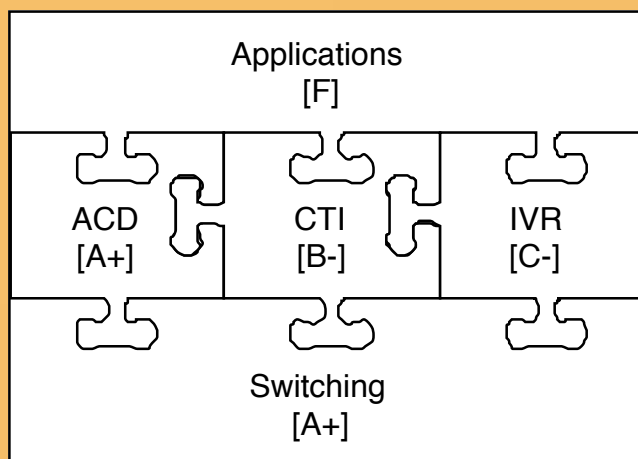
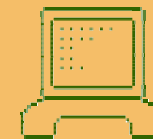


# Vendor's Point of View

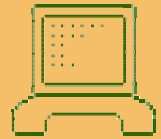


- Expose underutilized features and capabilities to differentiate products
- Maximize the opportunities to sell best-of-breed components rather than monolithic systems
- Not dependent on a particular platform or OS/tool vendor

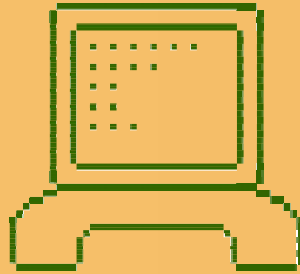
# Vendor's Point of View



# Network Service Provider



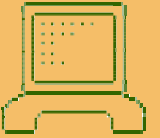
- Deliver more benefits associated with existing service offerings
- Opportunity to deliver new services
- Opportunity to differentiate offerings in a more competitive marketplace



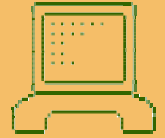
Interoperability

# Evolution of Specifications and Standards

# Any day CT will take off...

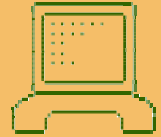


# What went wrong?



- The promise of CT / CTI is custom, modular solutions
- The lack of interoperability between products limits or prevents customization
- Standards and other interoperability specifications allow for modular systems
- Modularity is a measure of product maturity
- The competition is the status quo

# Product Maturity



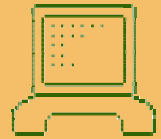
## ■ Capabilities

- New products must be functionally competitive with existing products

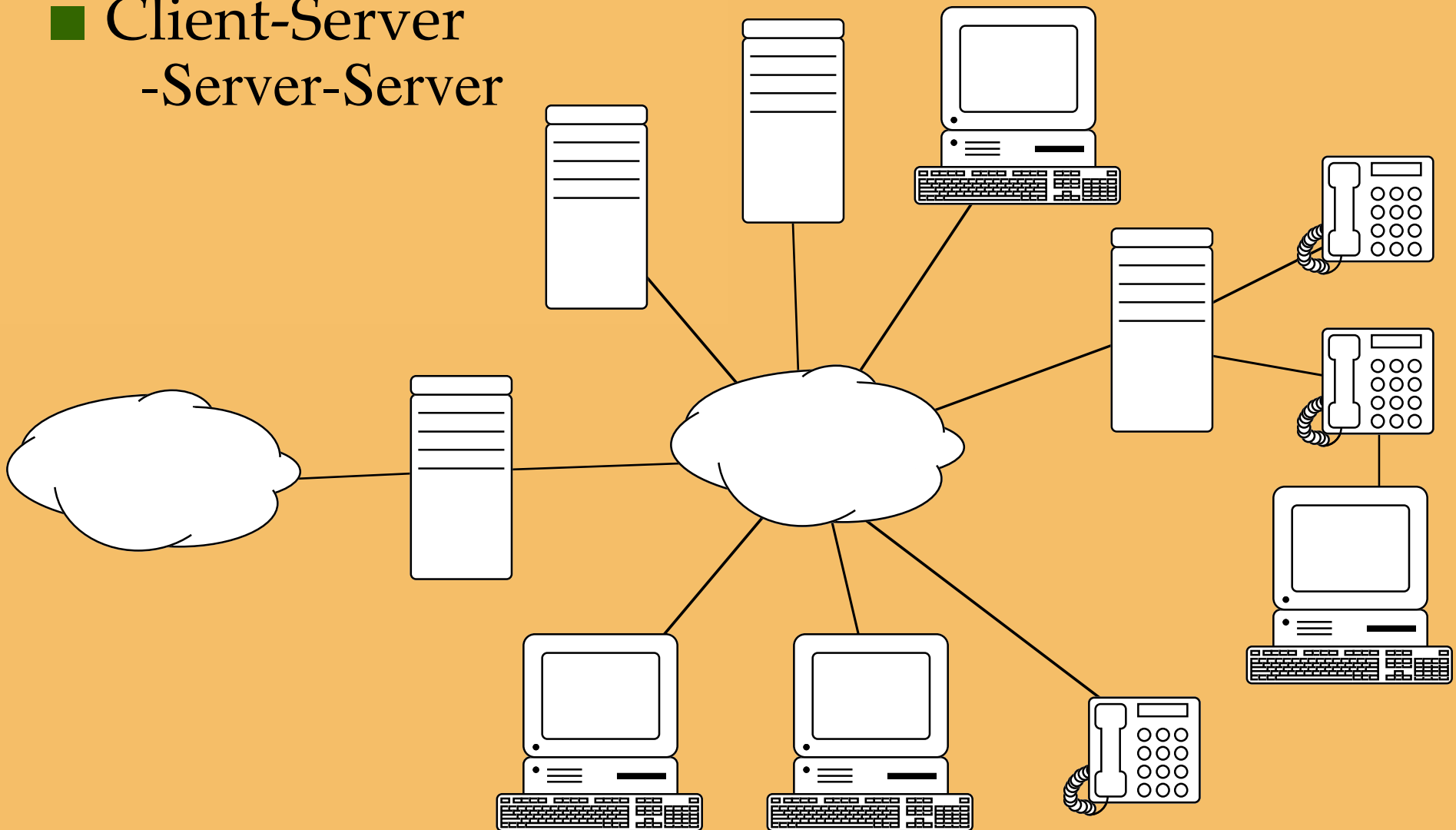
## ■ Interoperability

- Standards and other interoperability specifications allow for modular systems

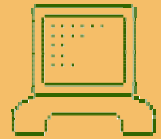
# Modular Telephony Solutions



- Client-Server
- Server-Server

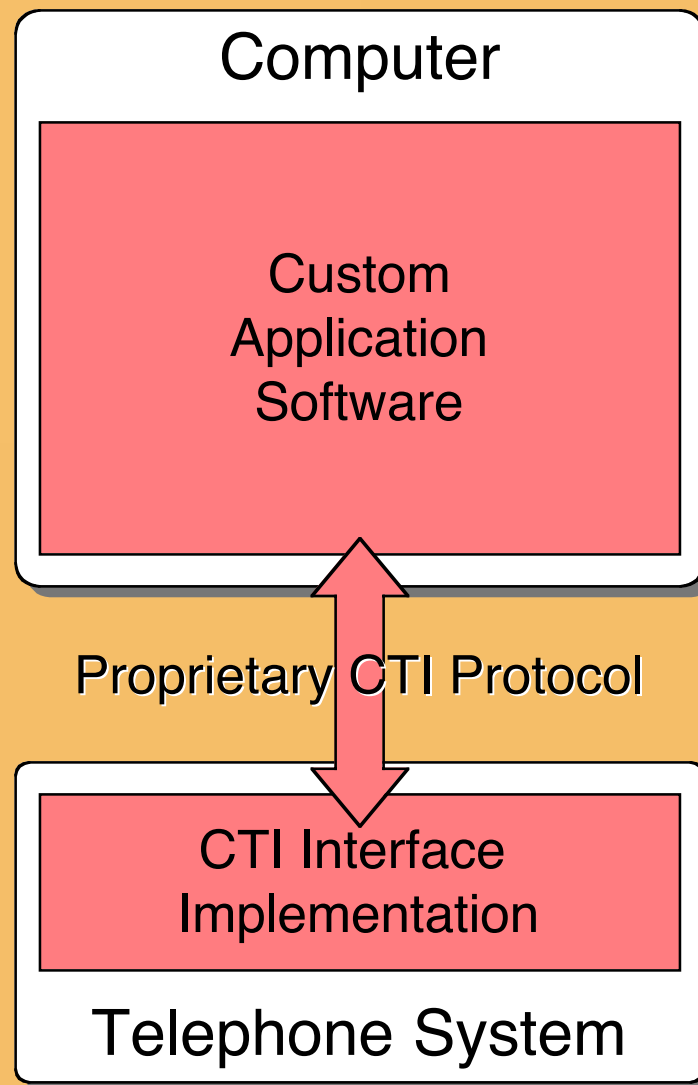
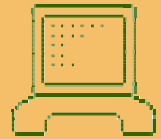


# Three Phases of CTI

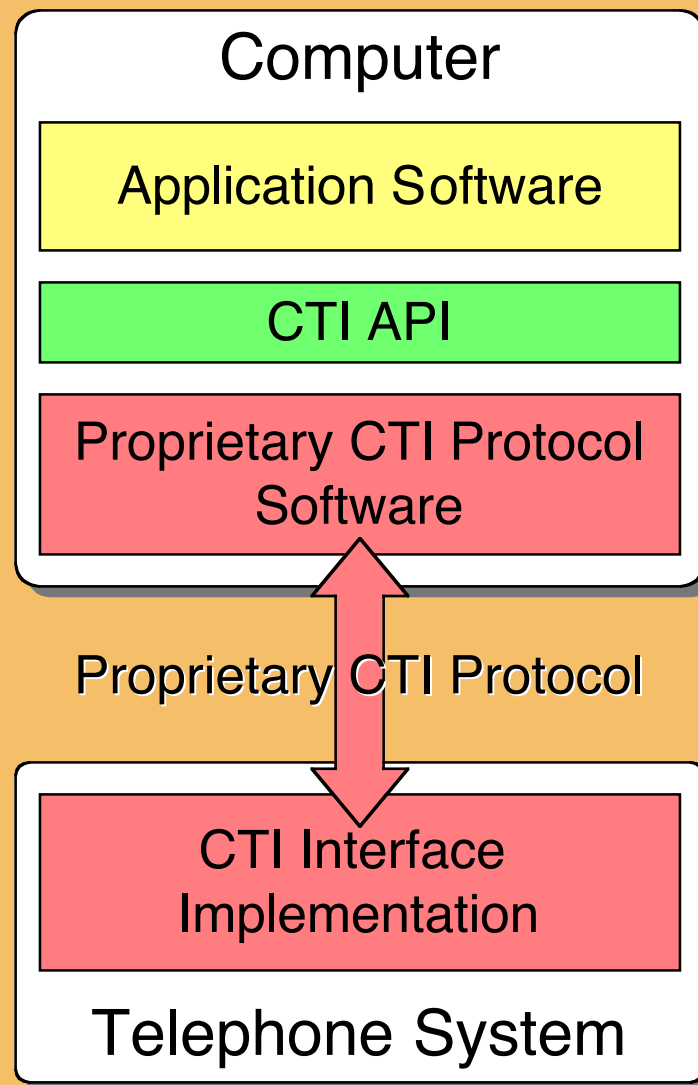
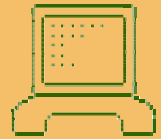


- First Phase of CTI: Custom Systems
- Second Phase of CTI: APIs
- Third Phase of CTI: CTI Protocols

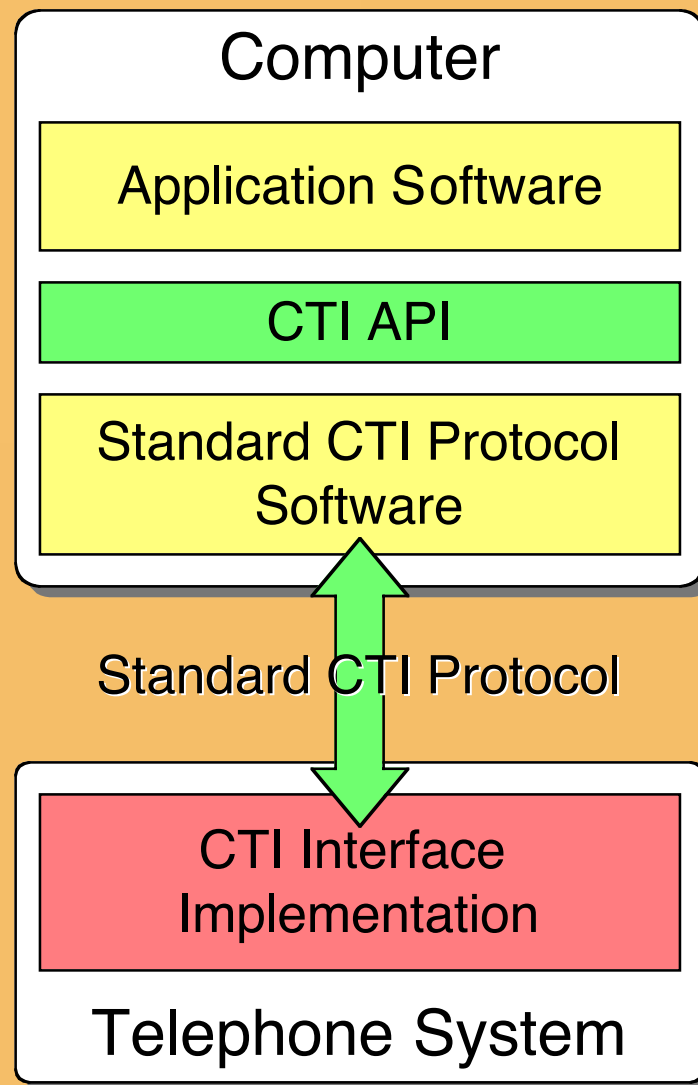
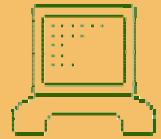
# First Phase of CTI: Custom Systems



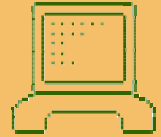
# Second Phase of CTI: APIs



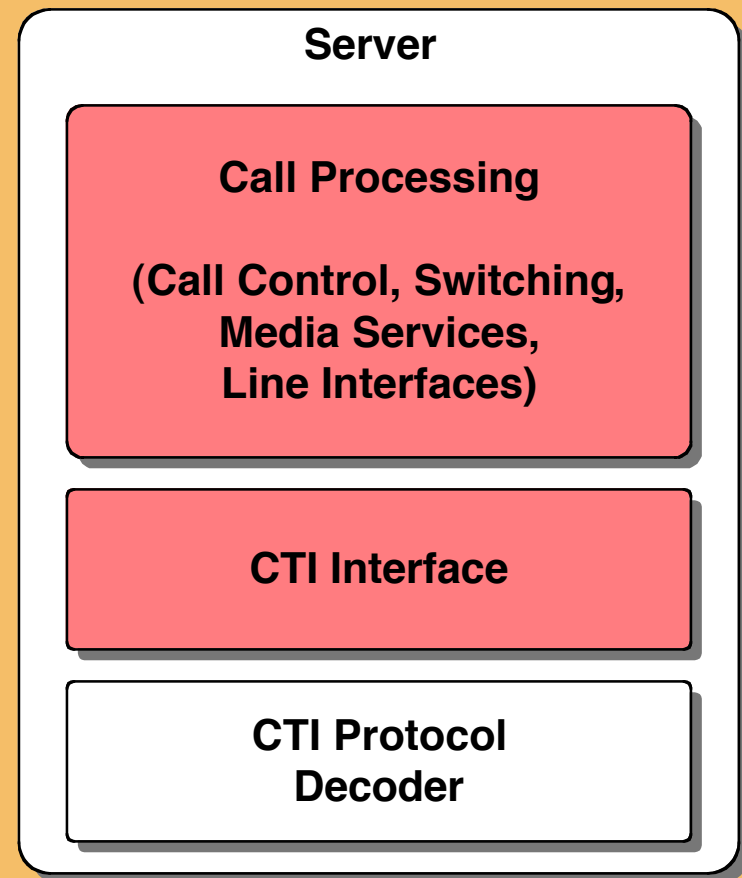
# Third Phase of CTI: CTI Protocols



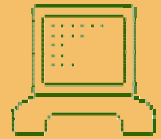
# Monolithic Server



- Modem
- CT Server
- PBX

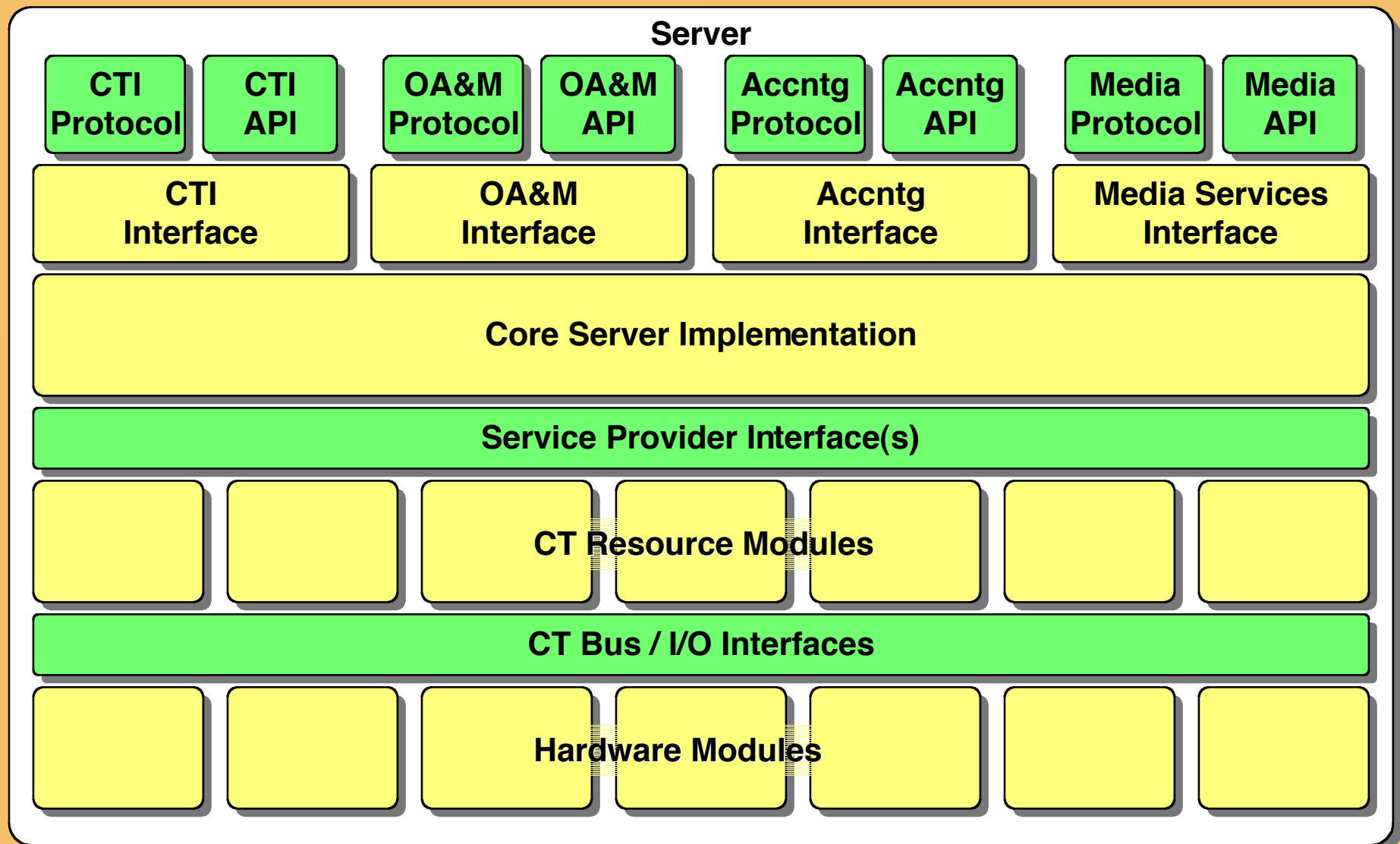
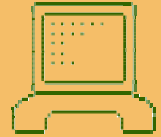


# Generic CT Server

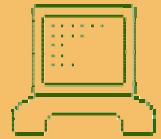


- All components are modular
- Server can be scaled and enhanced as required
- Server can interoperate with other servers and clients
- Server supports local applications

# Open Servers



# Three Types of Specifications



## ■ Models

- Agreement on terminology and concepts
- Standardized abstraction

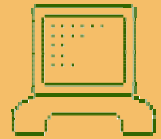
## ■ Programmatic Interfaces

- For software modules on the same platform
- May or may not be platform independent

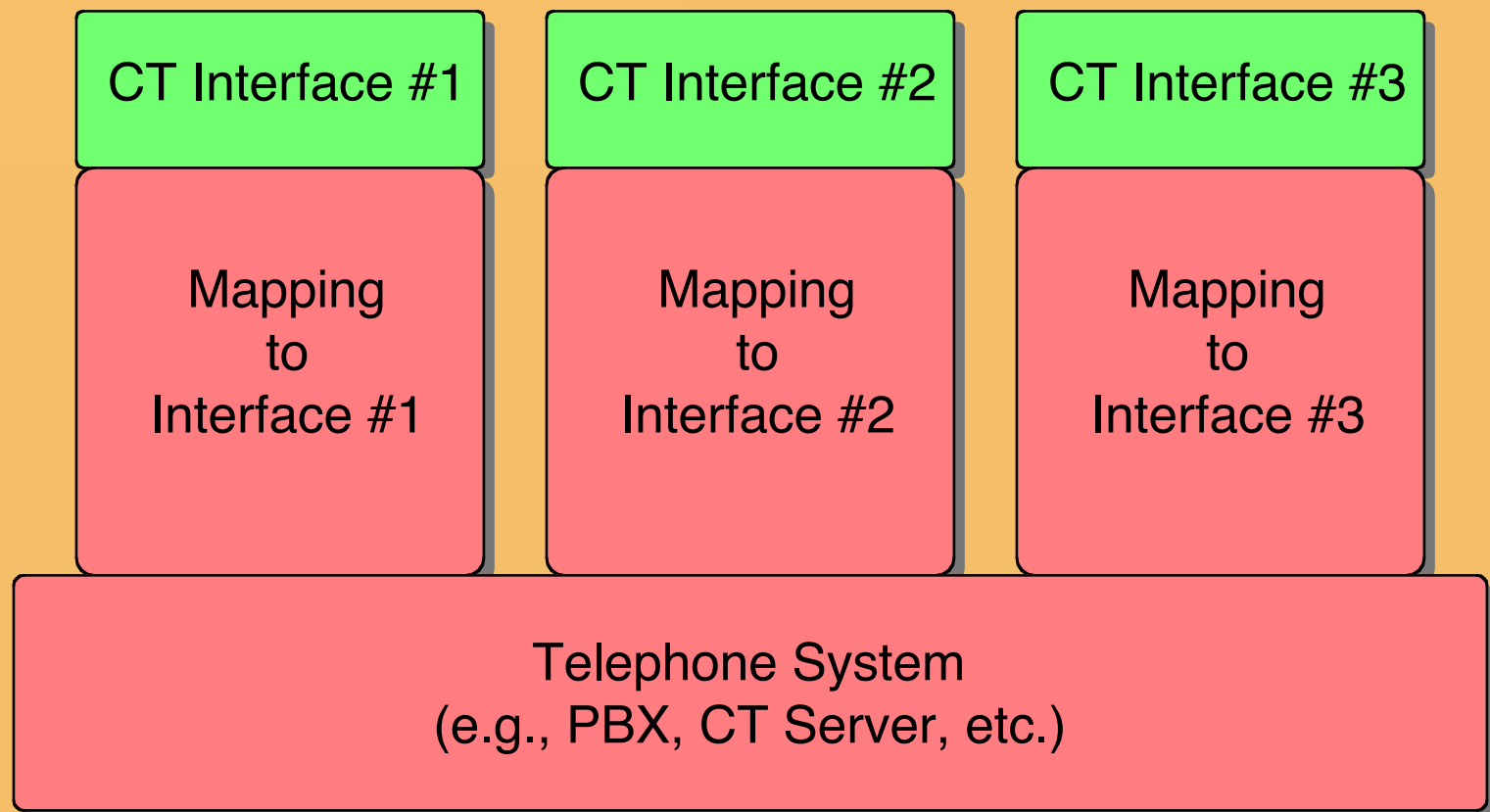
## ■ Protocols

- Platform independence
- Plug and Play interoperability

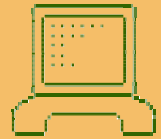
# Traditional Development Approach



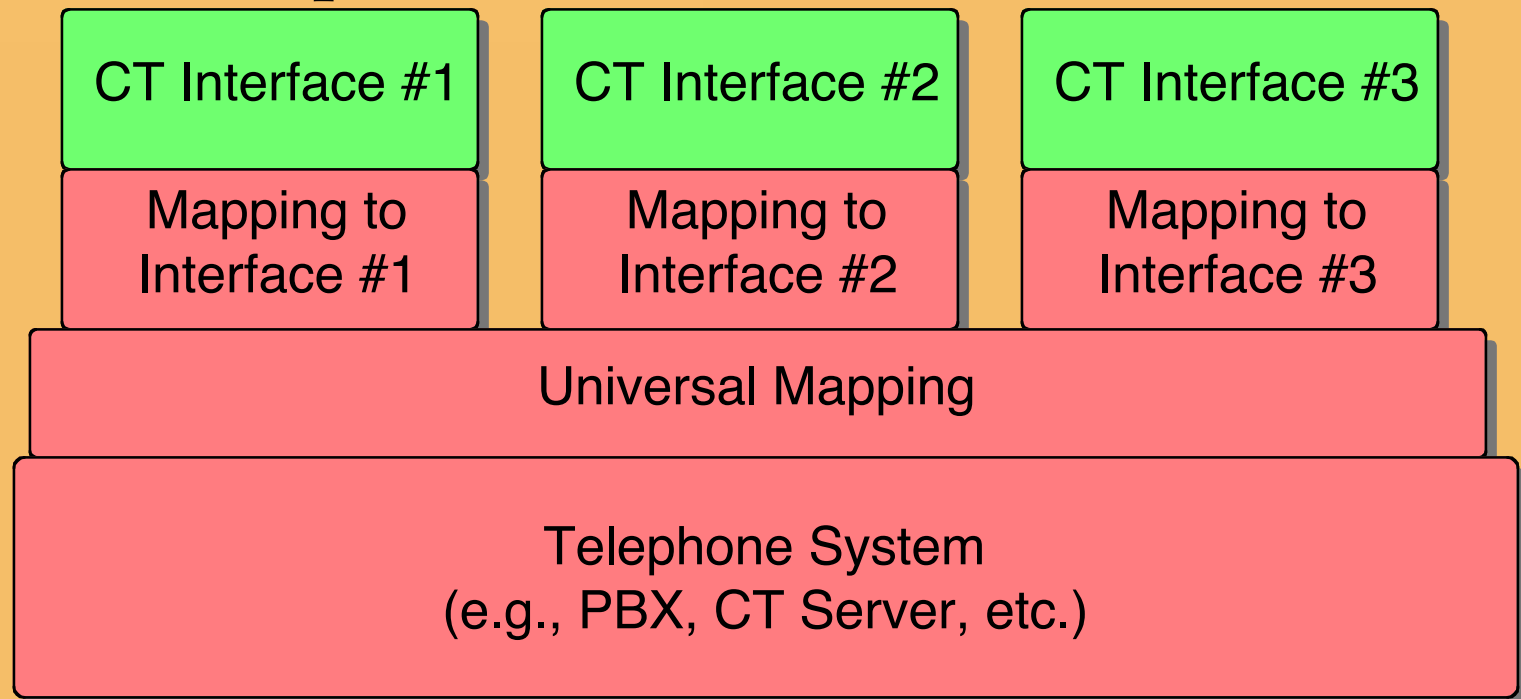
- Independent, “stove-pipe” development projects



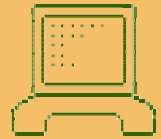
# Development with Standard Model



- Universal abstraction simplifies and improves implementation of interfaces
- Delivers behavioral consistency between interface implementations



# Specifications and Standards



## ■ Standards Bodies

- ITU
- ANSI

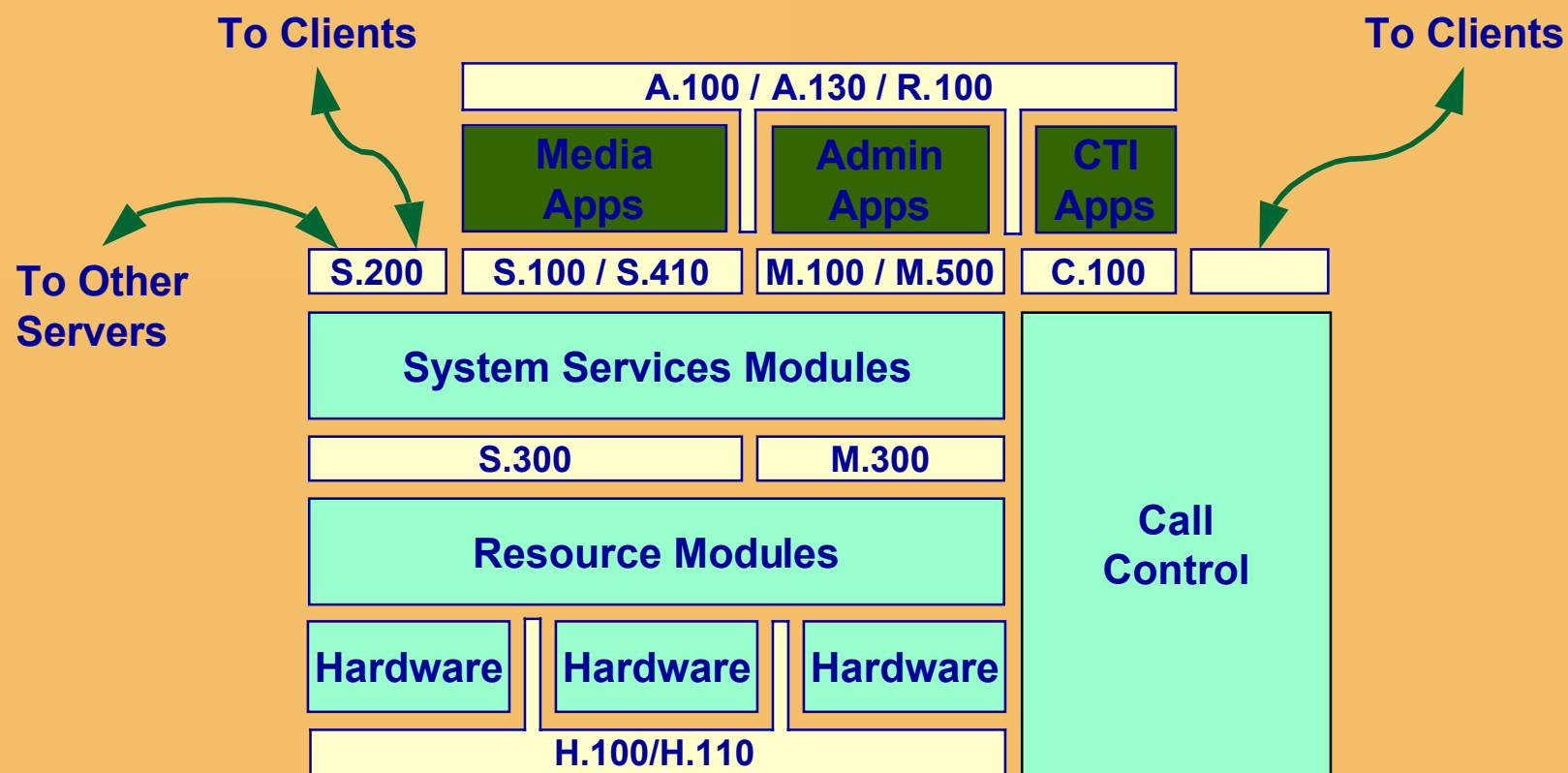
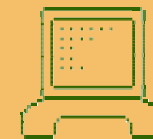
## ■ Individual Vendors

- Microsoft
- Lucent/Novell
- Sun

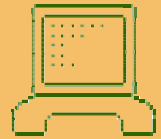
## ■ Industry Organizations

- IETF
- ECTF

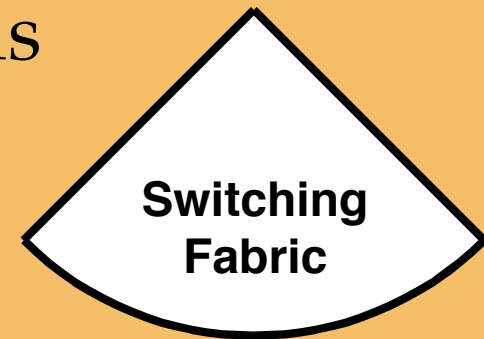
# ECTF Framework



# Switching Fabric



- Establishes media stream channels between endpoints and conveys signaling information



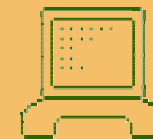
- Traditional Switching Fabric

- TDM bus backplanes connecting line cards
- Analog (POTS) and digital (T-1, ISDN, proprietary) telephony circuits

- IP Telephony Switching Fabric

- Packetized voice over conventional IP networking infrastructure
- Typically based on off-the-shelf computer technology

# TDM Bus Specifications

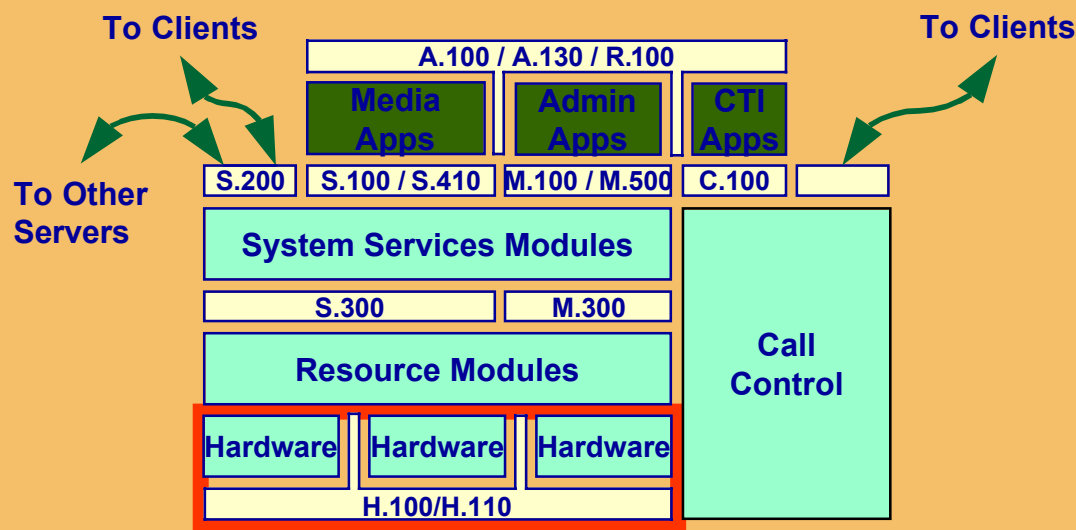


## ■ H.100

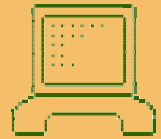
- CT Bus for PCI Specification

## ■ H.110

- CT Bus for Compact PCI Specification



# ITU H.323 Family



## ■ Media Stream Channels

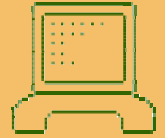
- RTP/RTCP
- G.711 / G.722 / G.723 / G.728 / G.729

## ■ Signaling & Control

- RAS
- Q.931
- H.235
- H.245
- H.GCP (under development)

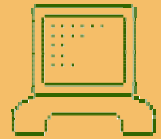
Signaling	Audio Codecs
H.235	G.711
H.245	G.722
Q.931	G.723
RAS	G.728
	G.729
	Media Stream Transport
	RTP
	RTCP

# MGCP

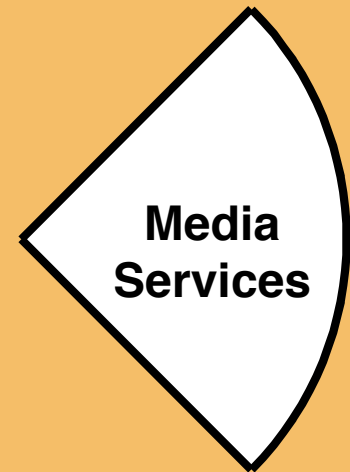


- Multi-media gateway control protocol
- Result of merging IPDC and SGCP
- Provides control of telephony gateways
- Allows “Gatekeeper” function to be independent of “Gateway” function
- Specification in track for IETF adoption

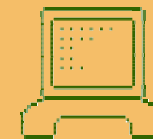
# CT Media Access / Services



- Tone Detection and Generation
- Recording and Playback
- Text-to-Speech
- Speech Recognition
- Modulated Data (Modem / Fax)
- Digital Data (Compressed Video, etc.)
- Call Binding



# Media Services Specifications



## ■ Framework

- ECTF S.100

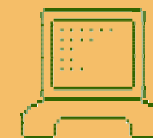
## ■ Protocols

- ECTF S.200

## ■ APIs/SPIs

- ECTF S.100
- ECTF S.300
- JTAPI Media (ECTF S.410)
- Windows Telephony

# ECTF: Media Services APIs

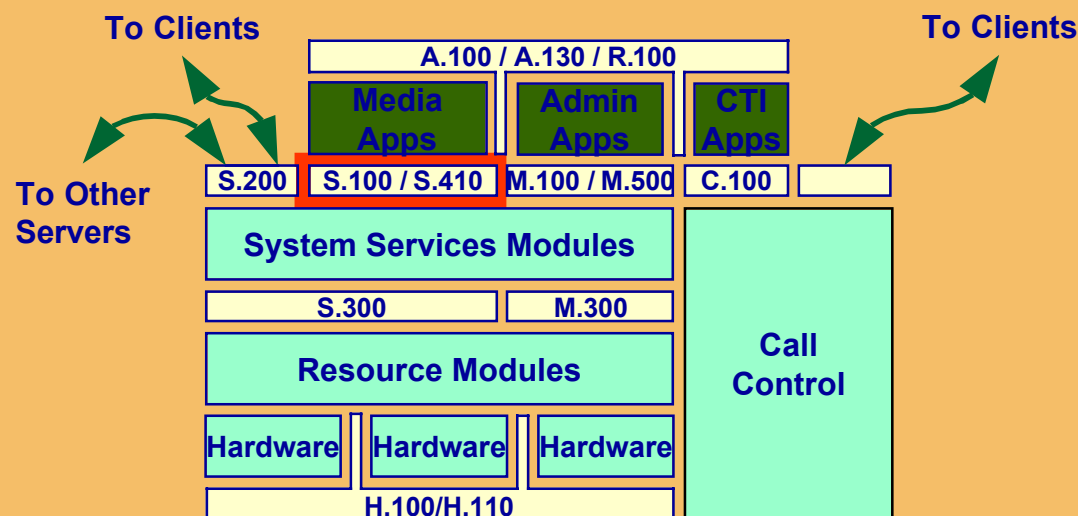


## ■ S.100 “C” Language API

- Platform independent Media Services APIs
- Access to local and server-based resources

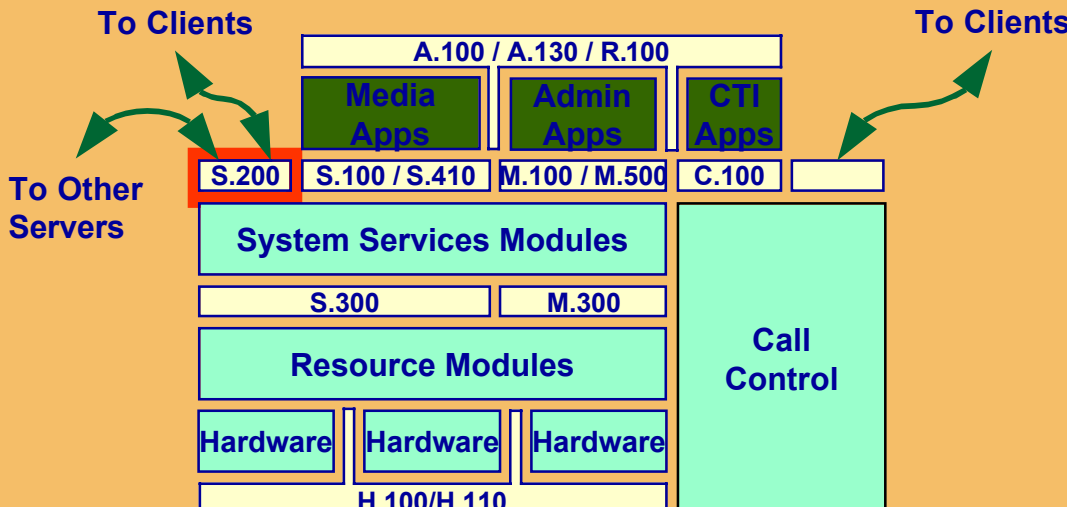
## ■ S.410 Java JTAPI Media API

- Object-oriented interface for media services



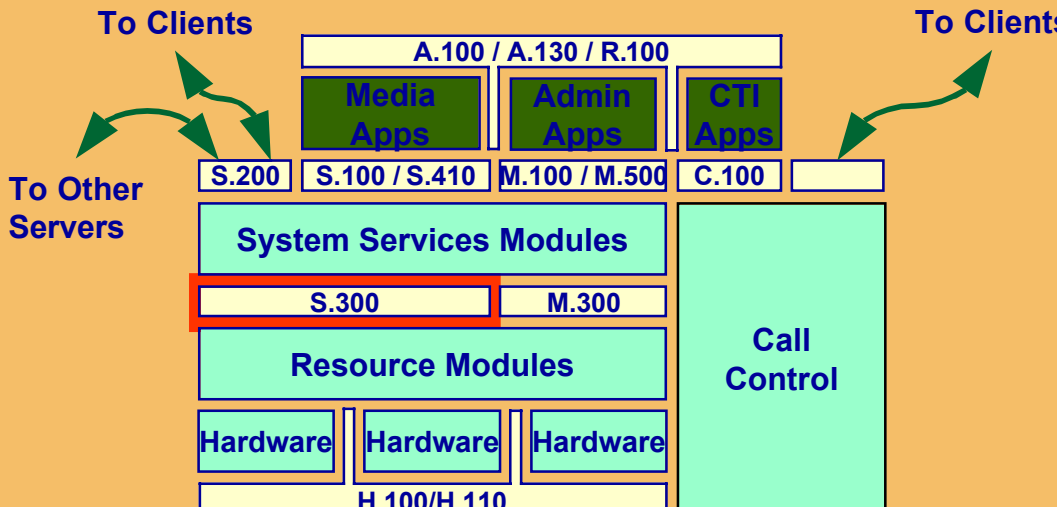


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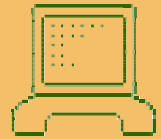




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# CTI



## ■ Call Control

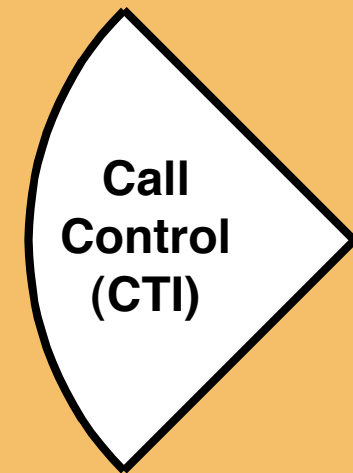
- Monitoring and directing calls in a telephone system

## ■ Telephone Control

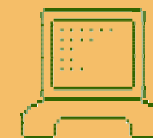
- Monitoring and controlling features of a telephone set

## ■ Media Binding

- Relating other communications / telephony functionality to calls in a telephone system



# CTI Specifications



## ■ Universal Call Control Model

- ECTF C.001 / Versit CTIE / ECMA CSTA

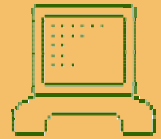
## ■ Protocols

- Versit / CSTA

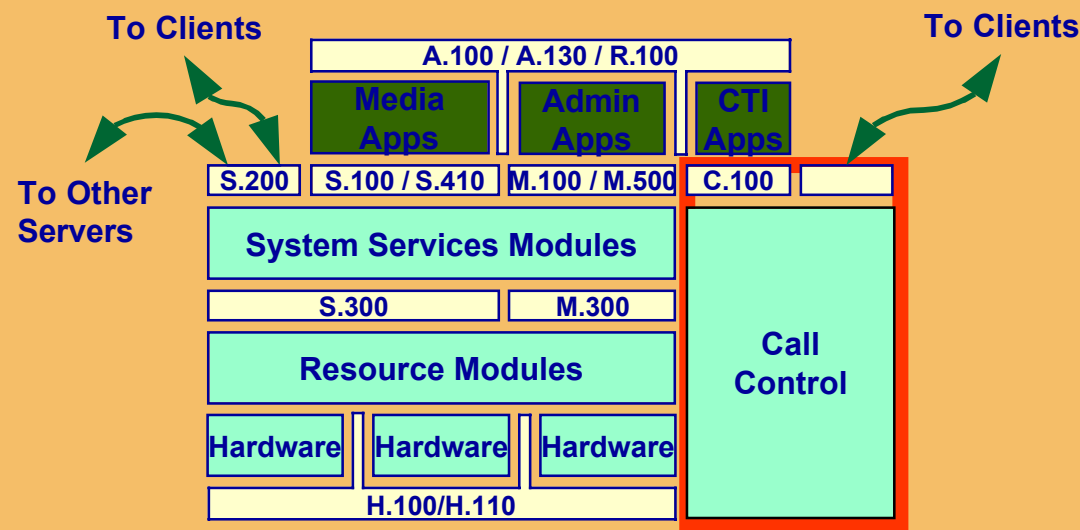
## ■ Interfaces

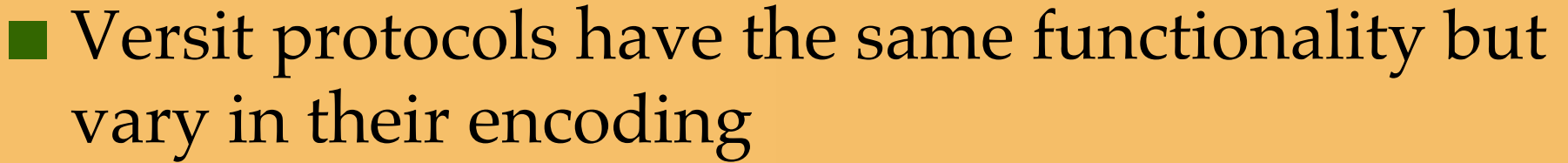
- TSAPI
- Java Telephony: JTAPI (ECTF C.100)
- Windows Telephony: TAPI

# Universal Call Control Model



- Everyone has to talk the same language before they can discuss interoperability
- A single model has emerged
  - ECTF C.001 / Versit CTIE / ECMA CSTA





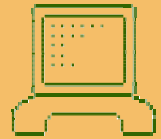
- Intended for switch-server streams

- Optimized for client-server streams

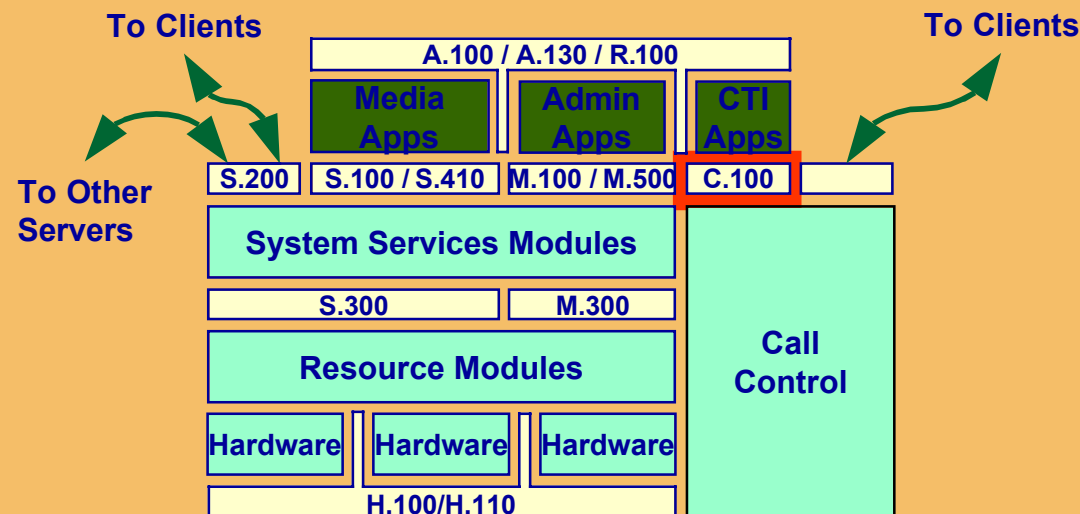
- Optimized for direct-connect streams

## ► Variant of Versit Protocol 1

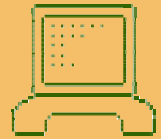
# ECTF C.100 / JTAPI 1.3 (Any Java VM)



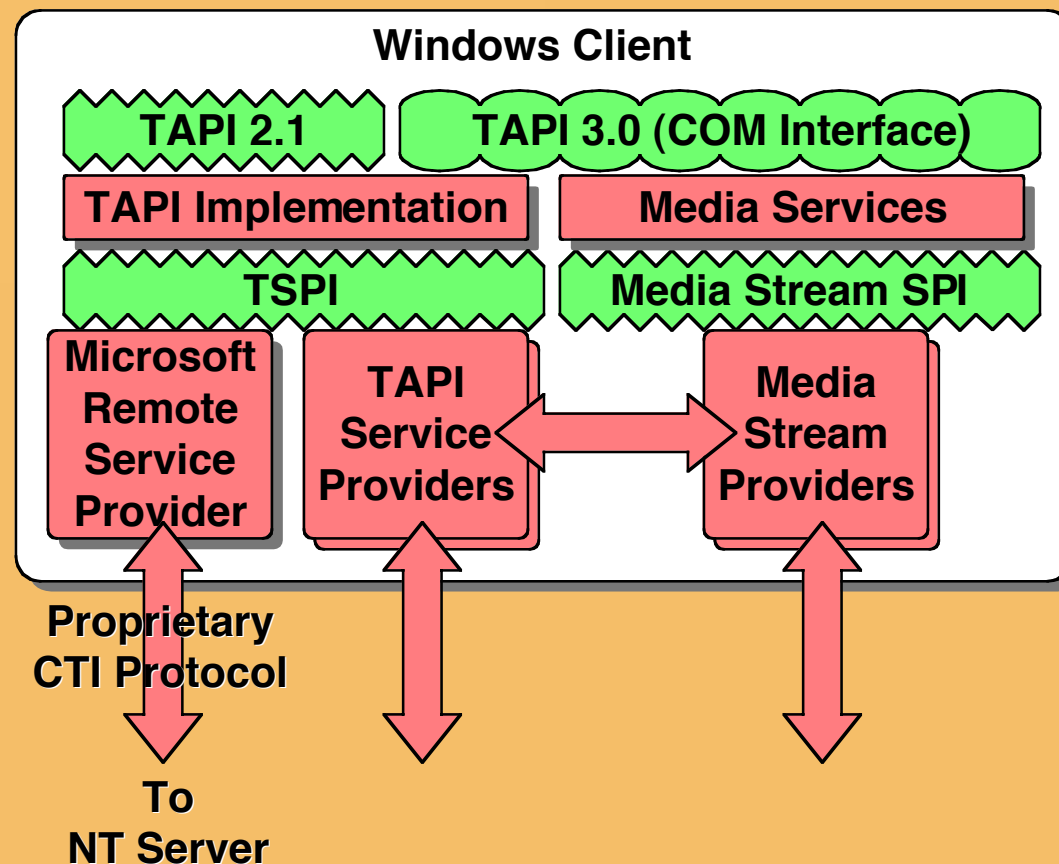
- Any Java Virtual Machine
- Allow portability of applications between platforms and call control implementations.
- Designed to be layered over CTI APIs, or Protocols, or directly over implementations



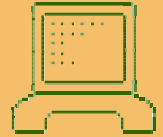
# TAPI (Windows)



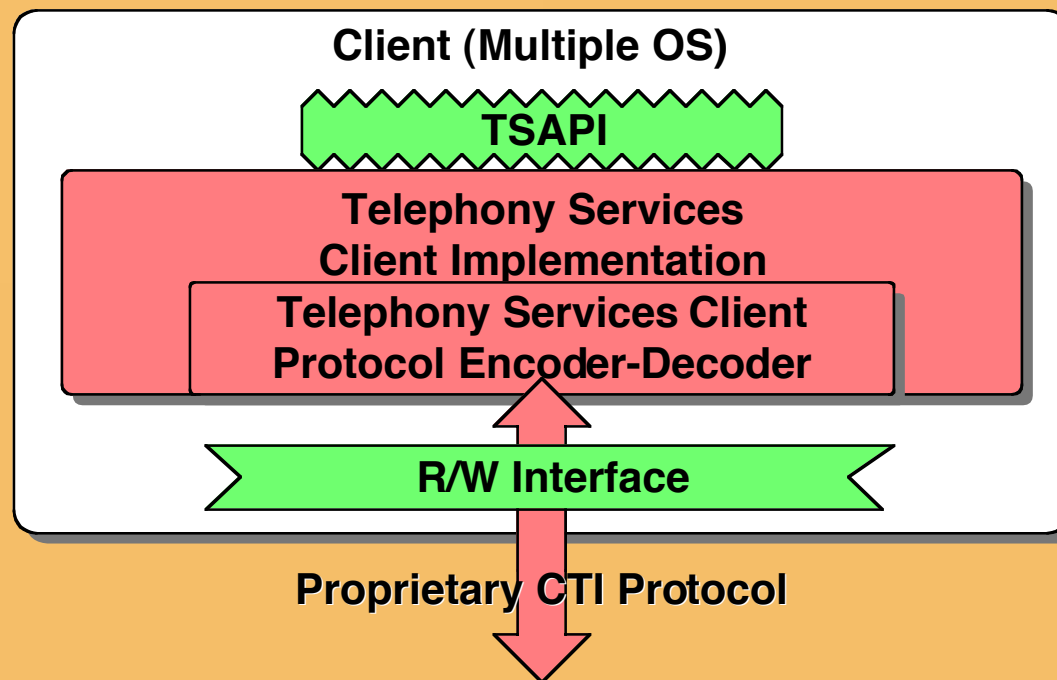
## ■ Windows Telephony Architecture



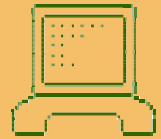
# TSAPI (MacOS, Unix, Windows, etc.)



## ■ TSAPI Implementation



# Admin



## ■ System configuration

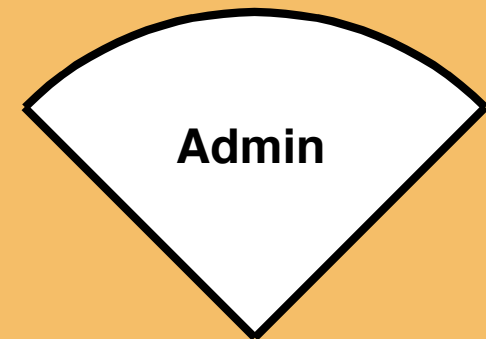
- System customization
- Moves / Adds / Changes

## ■ Fault monitoring

## ■ Accounting

## ■ Performance management

## ■ Security

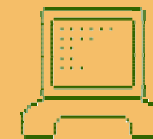




- ## ■ M.300 Management SPI

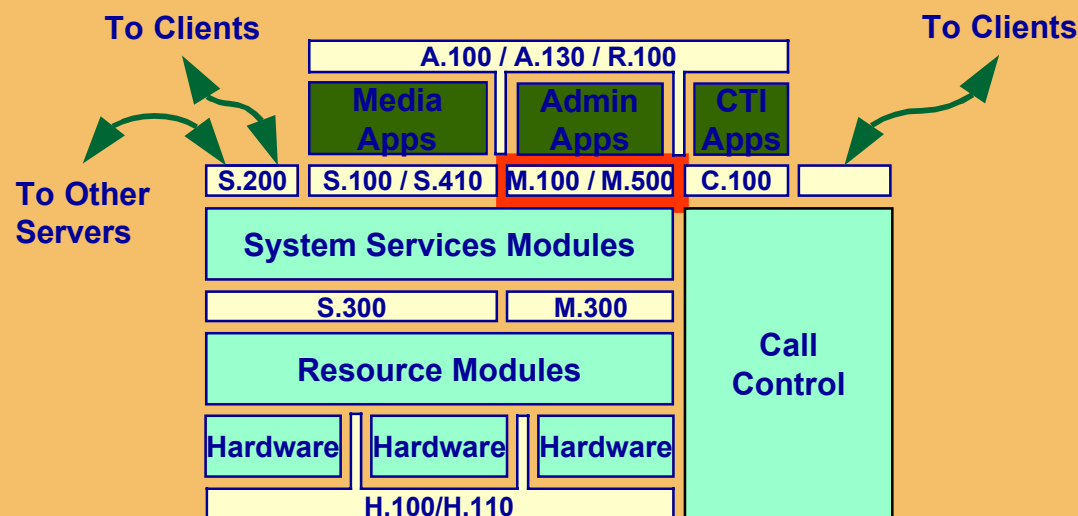
- Galaxies in the BCGs are classified into three categories: (1) *central* galaxies, (2) *inner* galaxies, and (3) *outer* galaxies. The *central* galaxies are those within the central region, the *inner* galaxies are those within the inner region, and the *outer* galaxies are those within the outer region. The *central* galaxies are those within the central region, the *inner* galaxies are those within the inner region, and the *outer* galaxies are those within the outer region.

# ECTF M.500: SNMP MIB

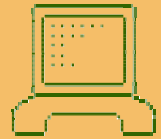


## ■ Management Information Base for:

- CT Servers and Services
- CT Clients
- CT Resources



# ECTF: Application Interoperability

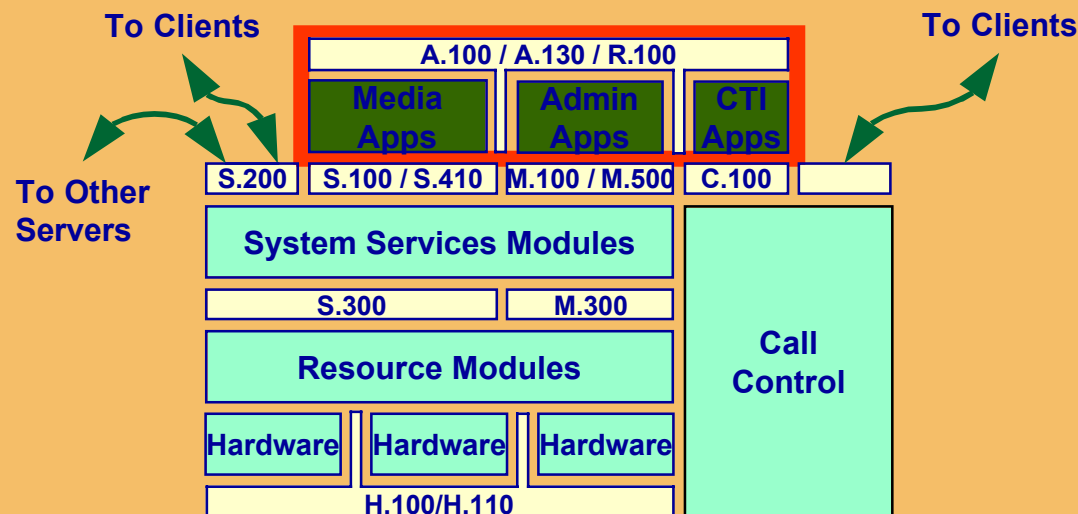


## ■ A.100 Application Interoperability

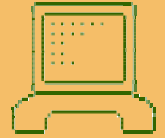
- Requirements for call handling, hand-off, and accepting calls in S.100 environments

## ■ A.130 Shared Data Specification

- Data types for application interoperability



# Open Areas

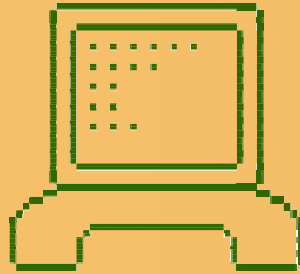


## ■ IP Telephone Stations

- H.323 is insufficient
- TIA TR-41.3.4 is developing MGCP-based specification

## ■ Administration

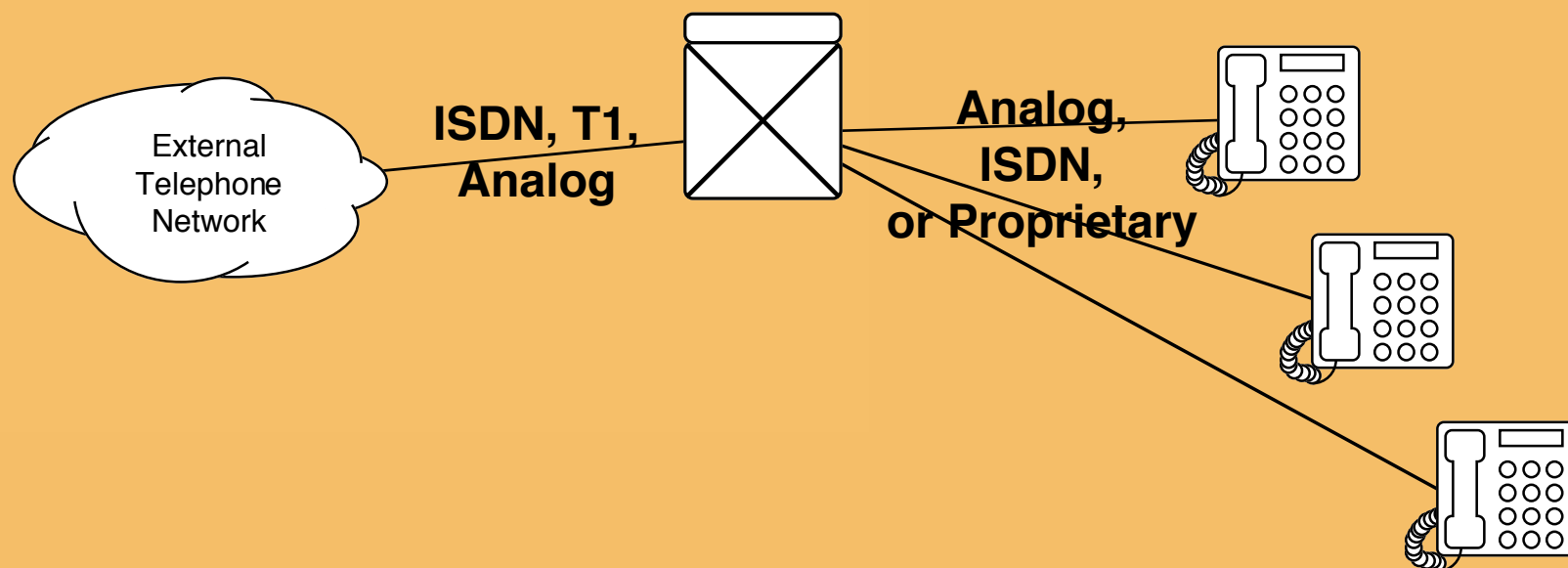
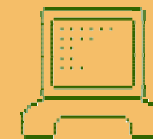
- CDR
- Configuration



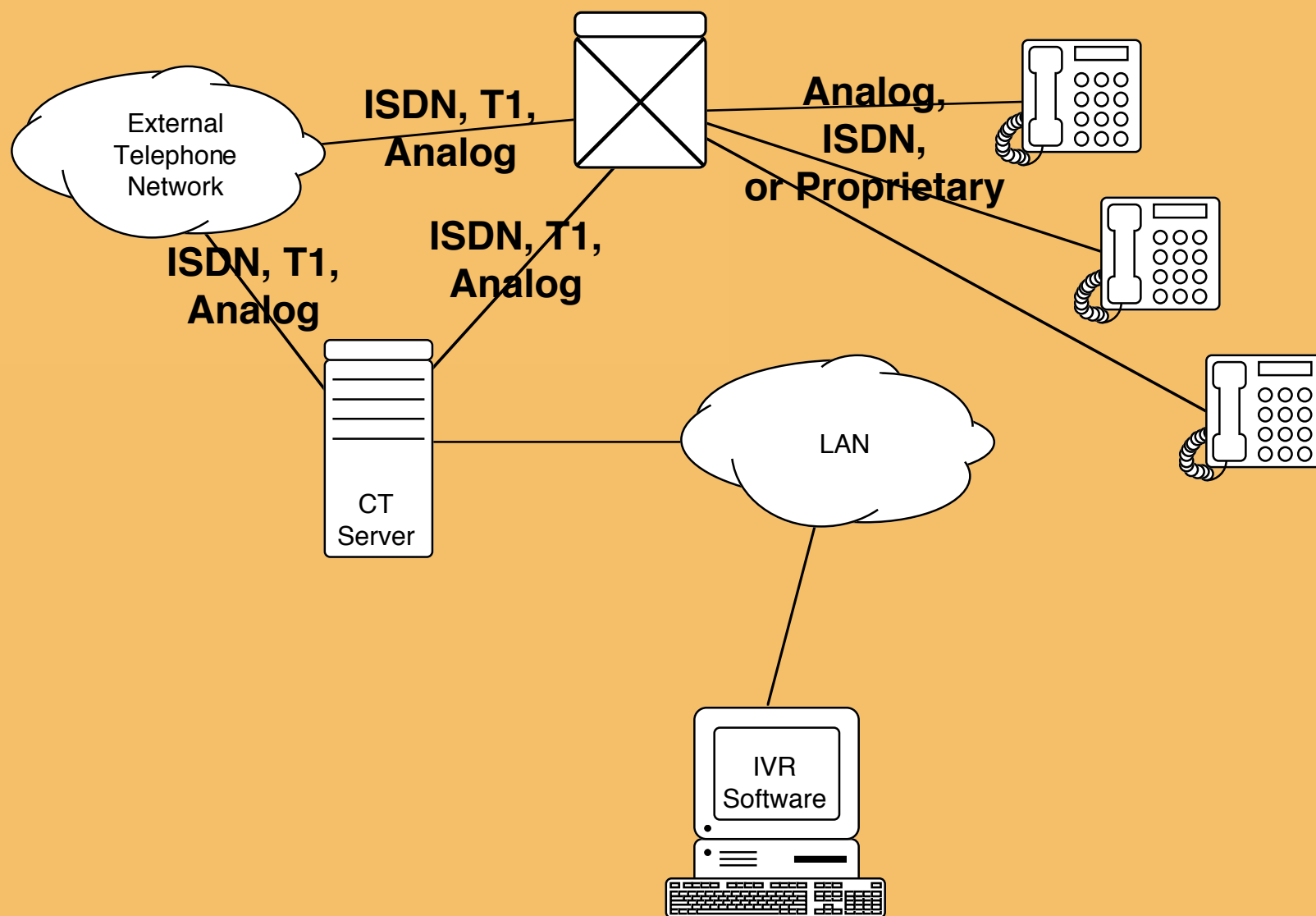
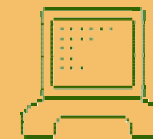
Building Modular Solutions:

# Taking Advantage of Specifications

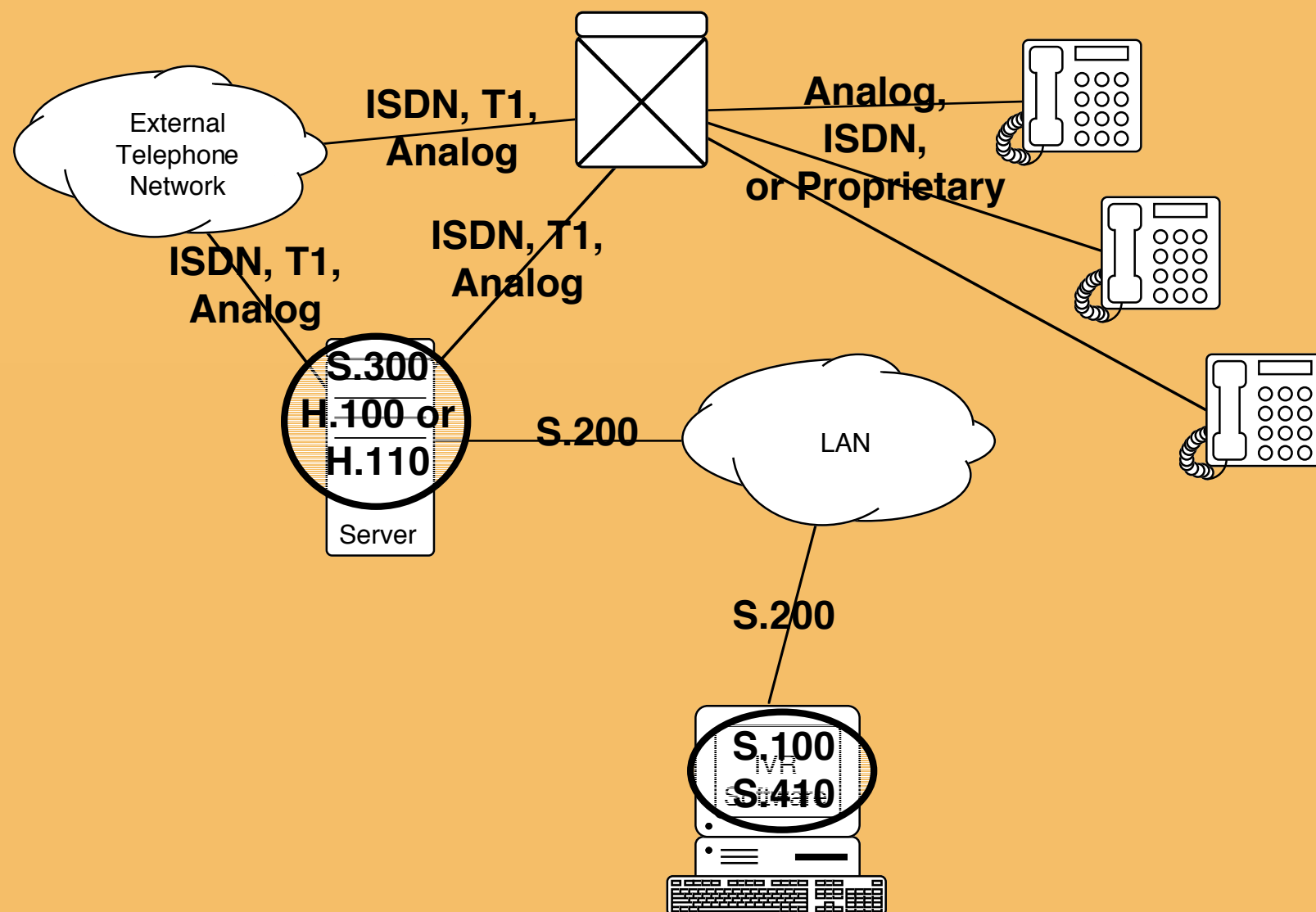
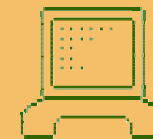
# CT Servers in Legacy Configurations



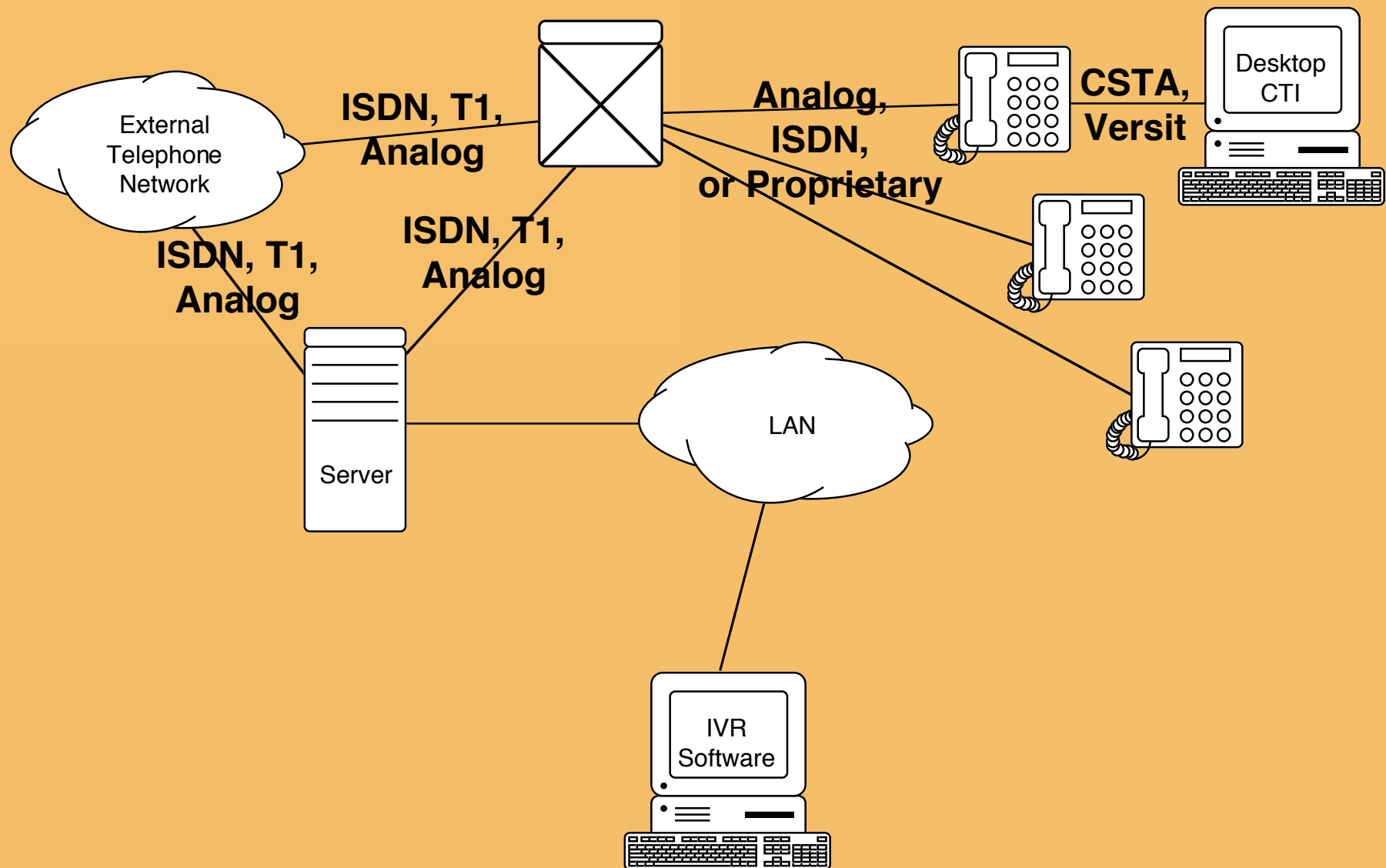
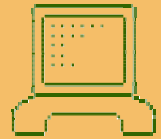
# CT Servers in Legacy Configurations



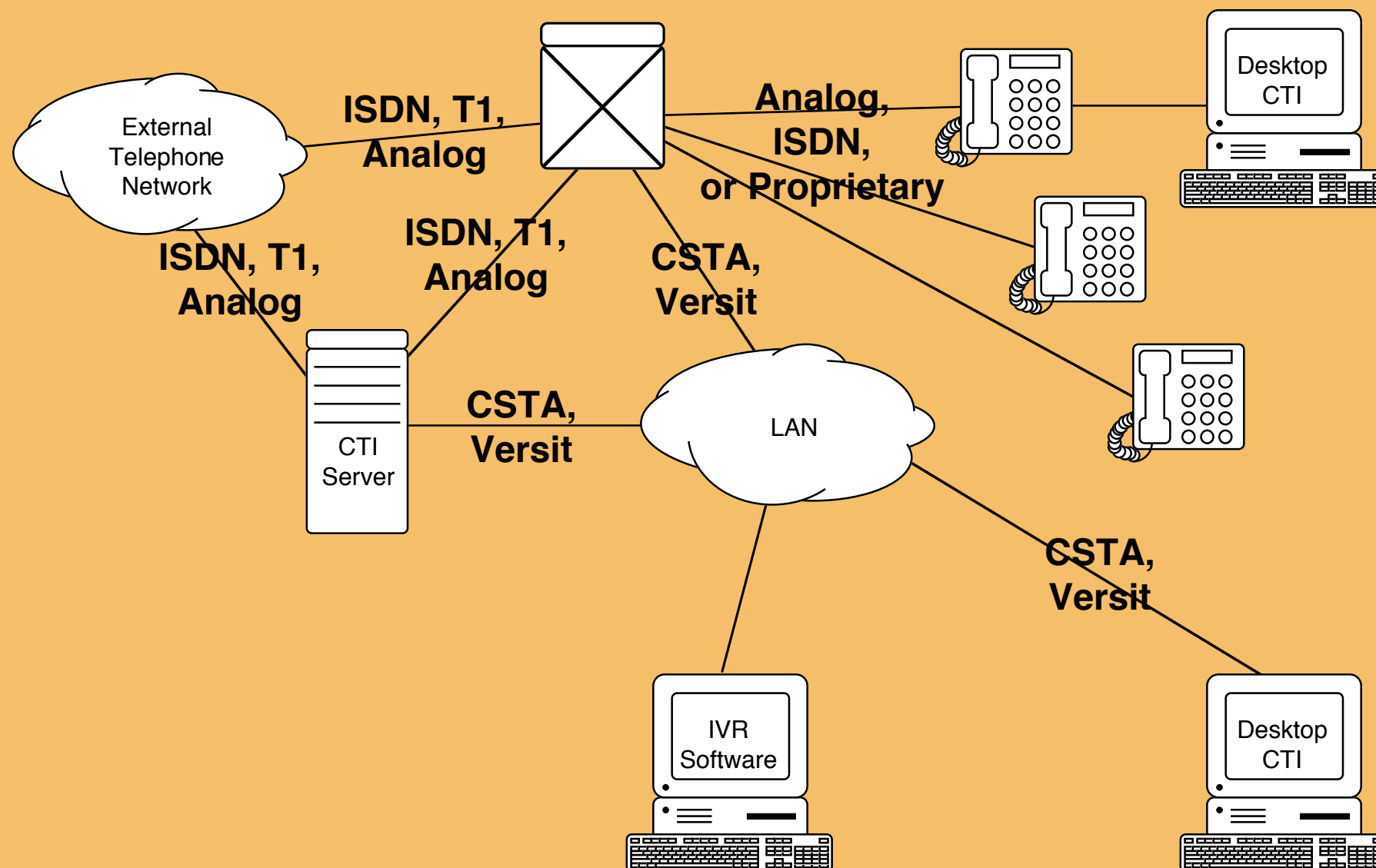
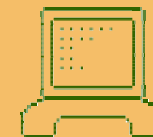
# CT Servers in Legacy Configurations



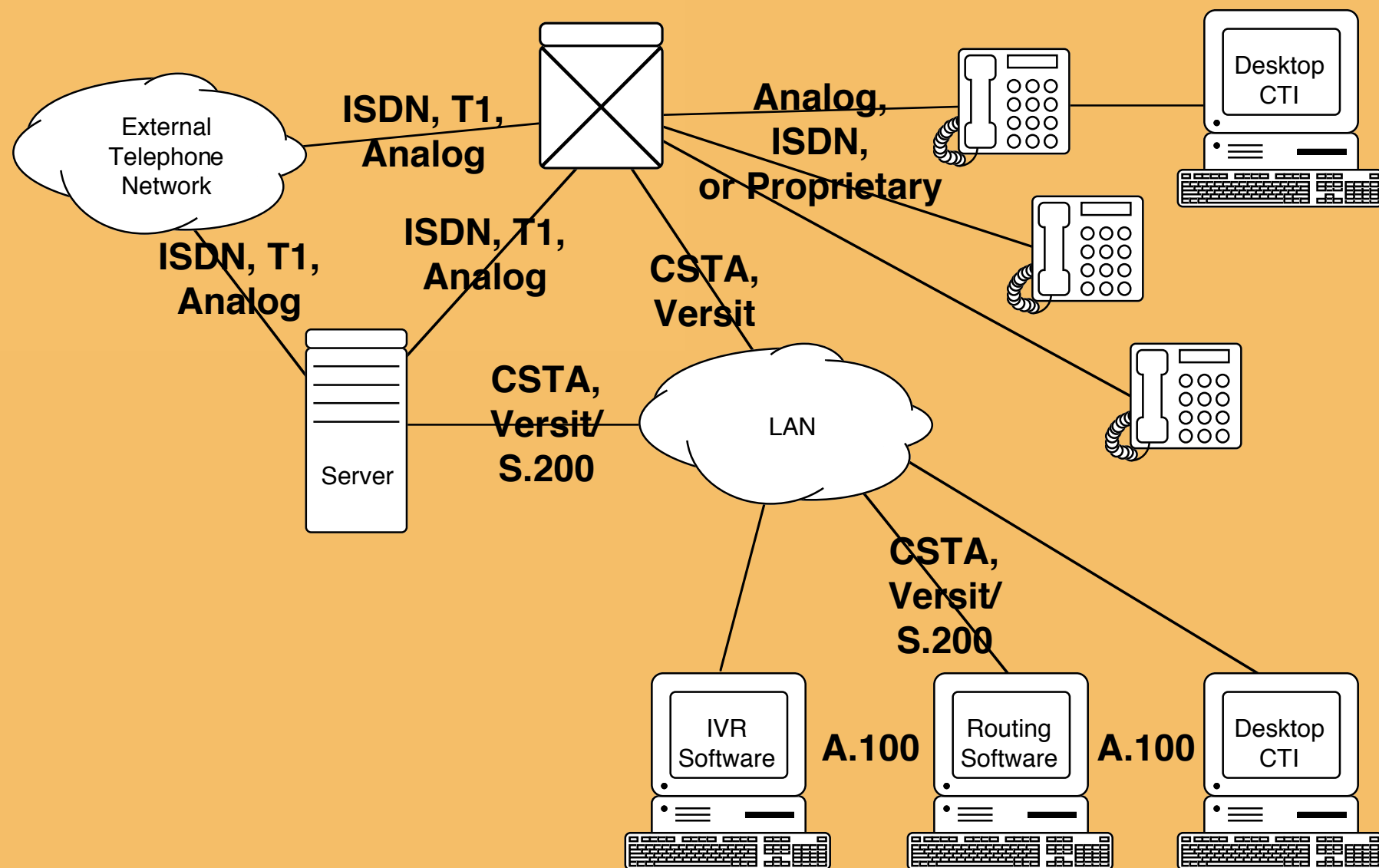
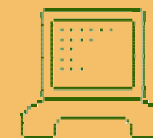
# CT Servers in Legacy Configurations



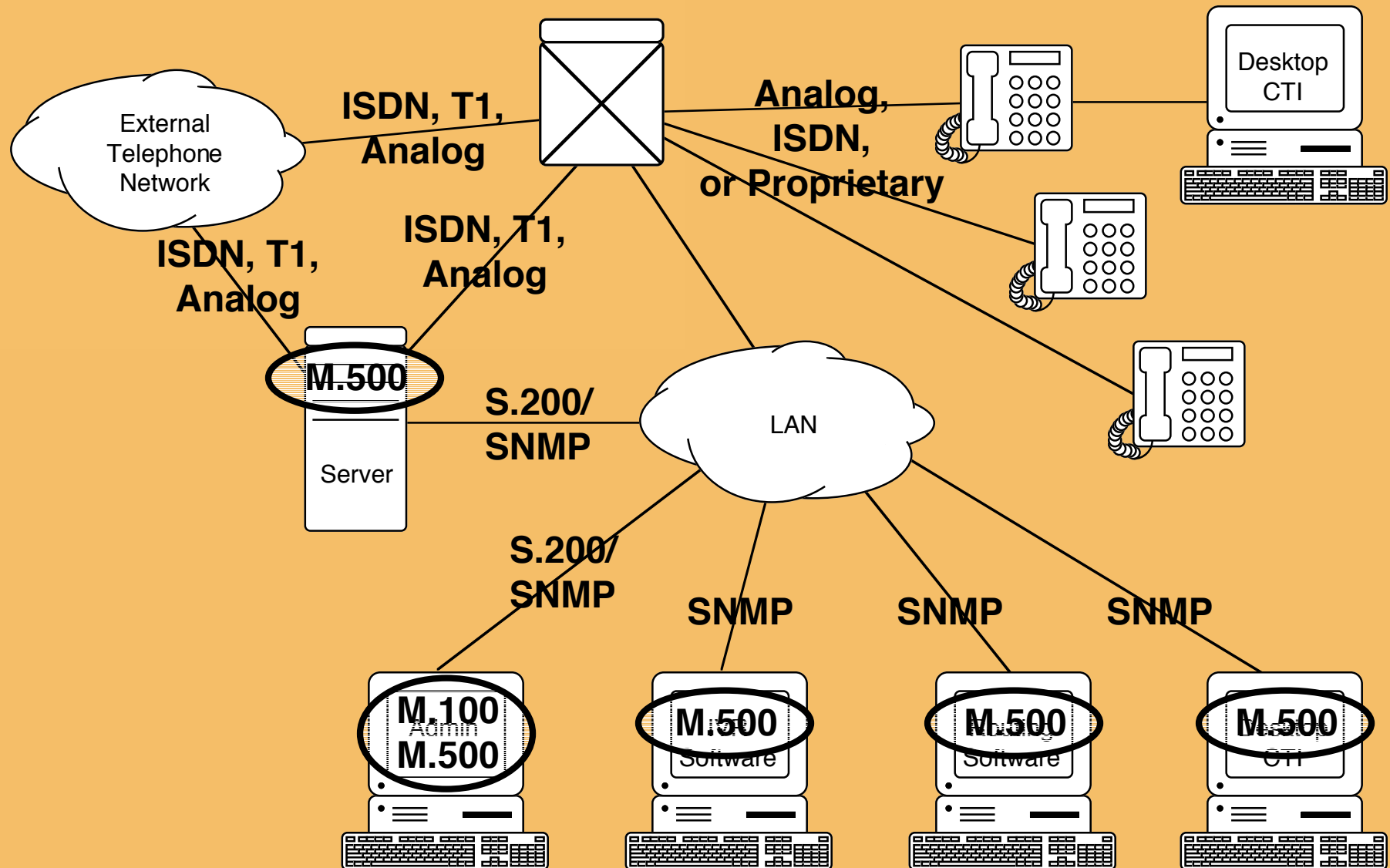
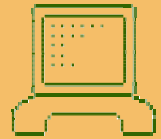
# CT Servers in Legacy Configurations



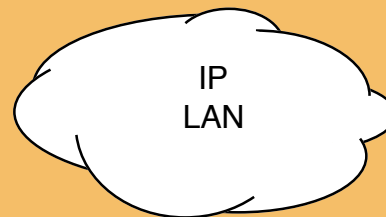
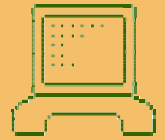
# CT Servers in Legacy Configurations



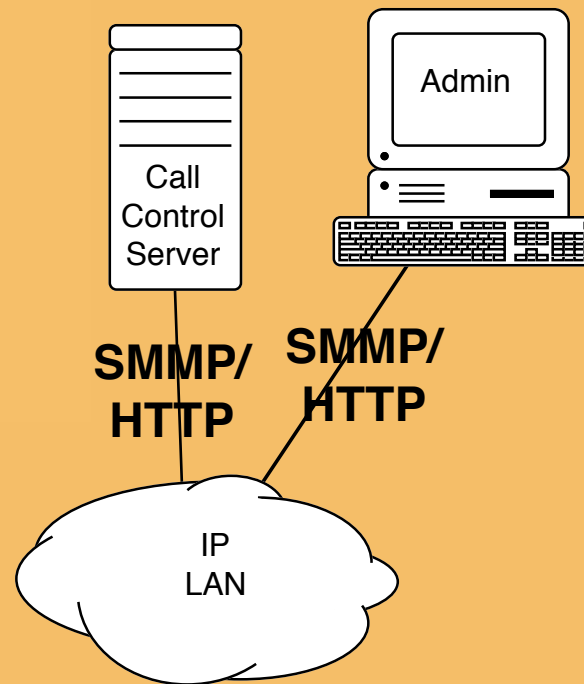
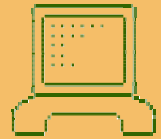
# CT Servers in Legacy Configurations



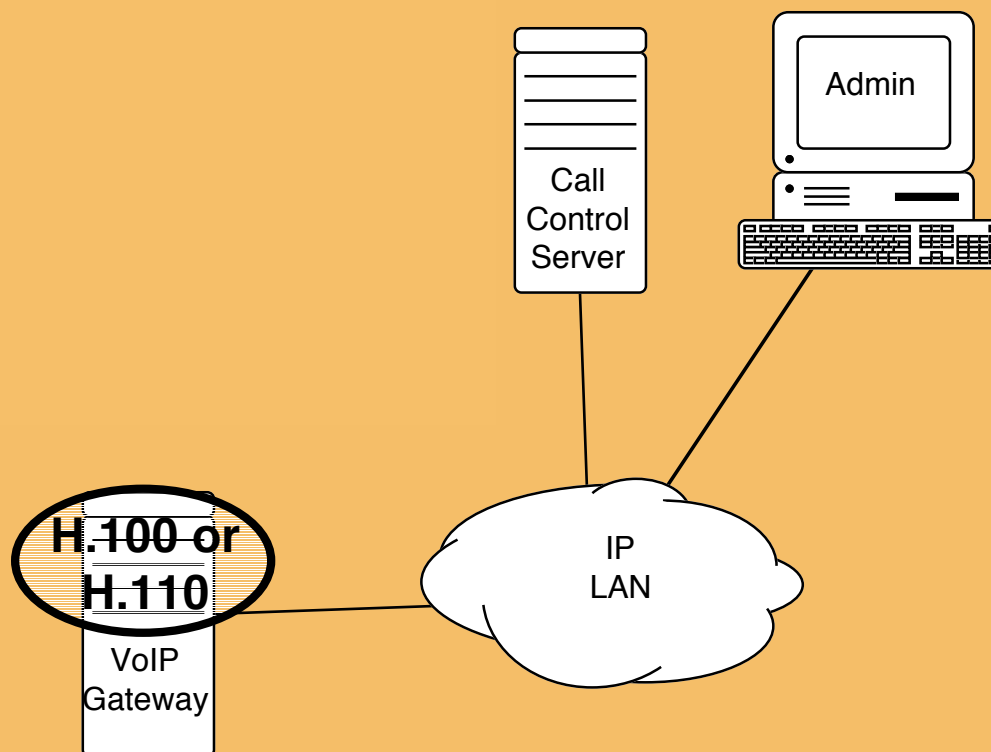
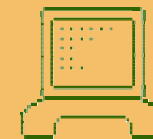
# New Generation Telephone System



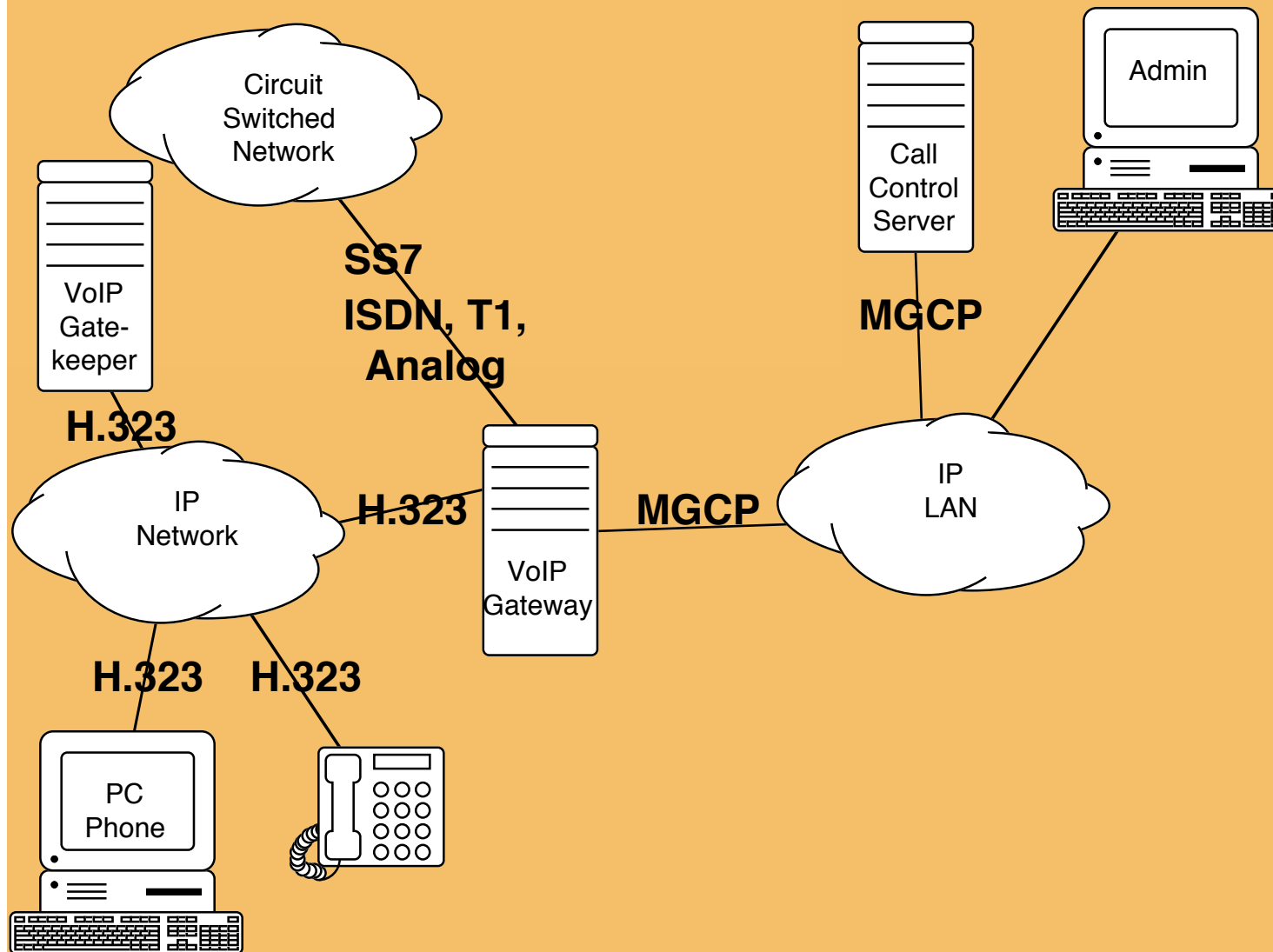
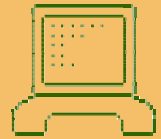
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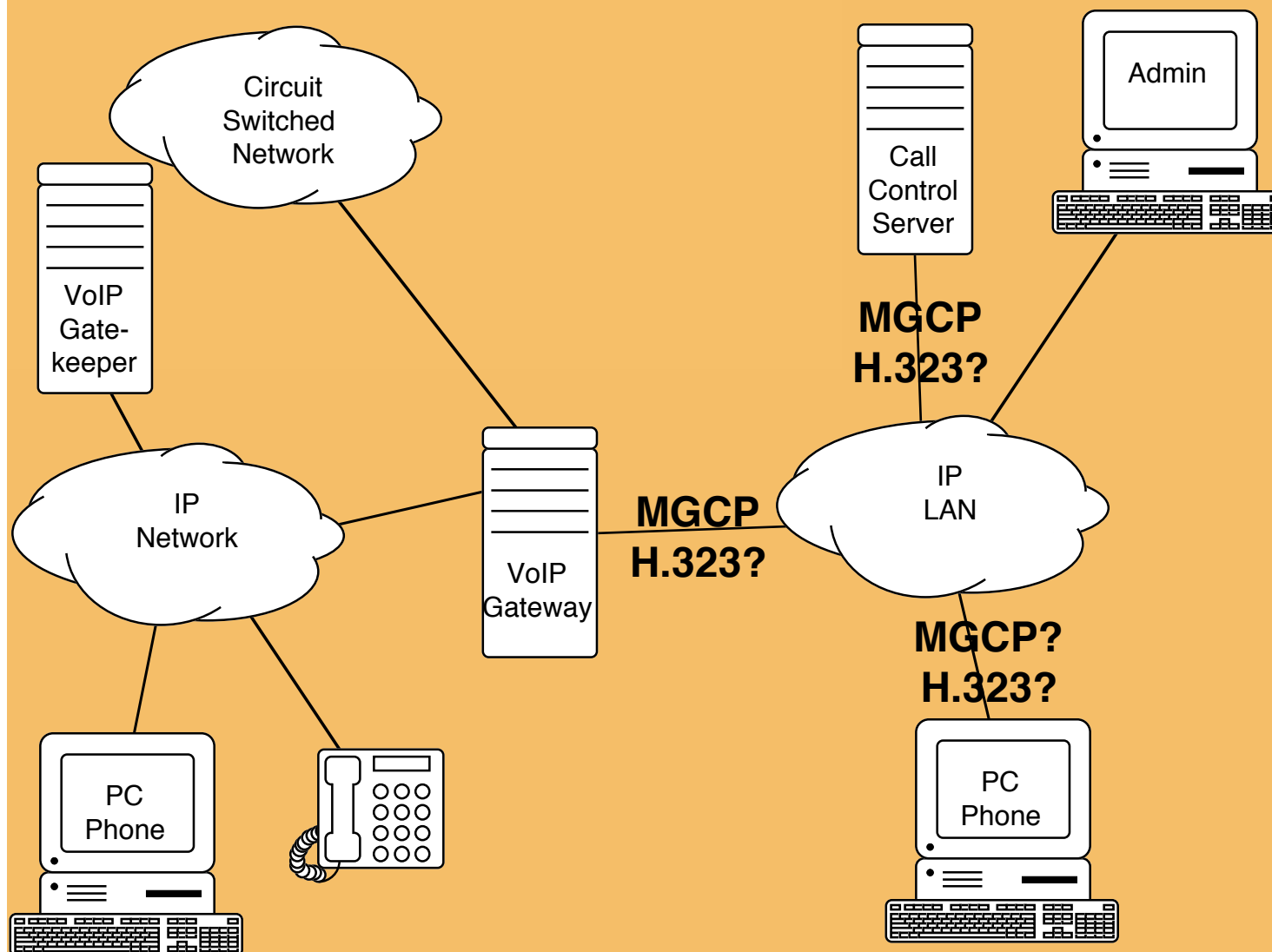
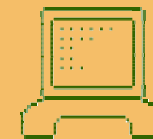
# New Generation Telephone System



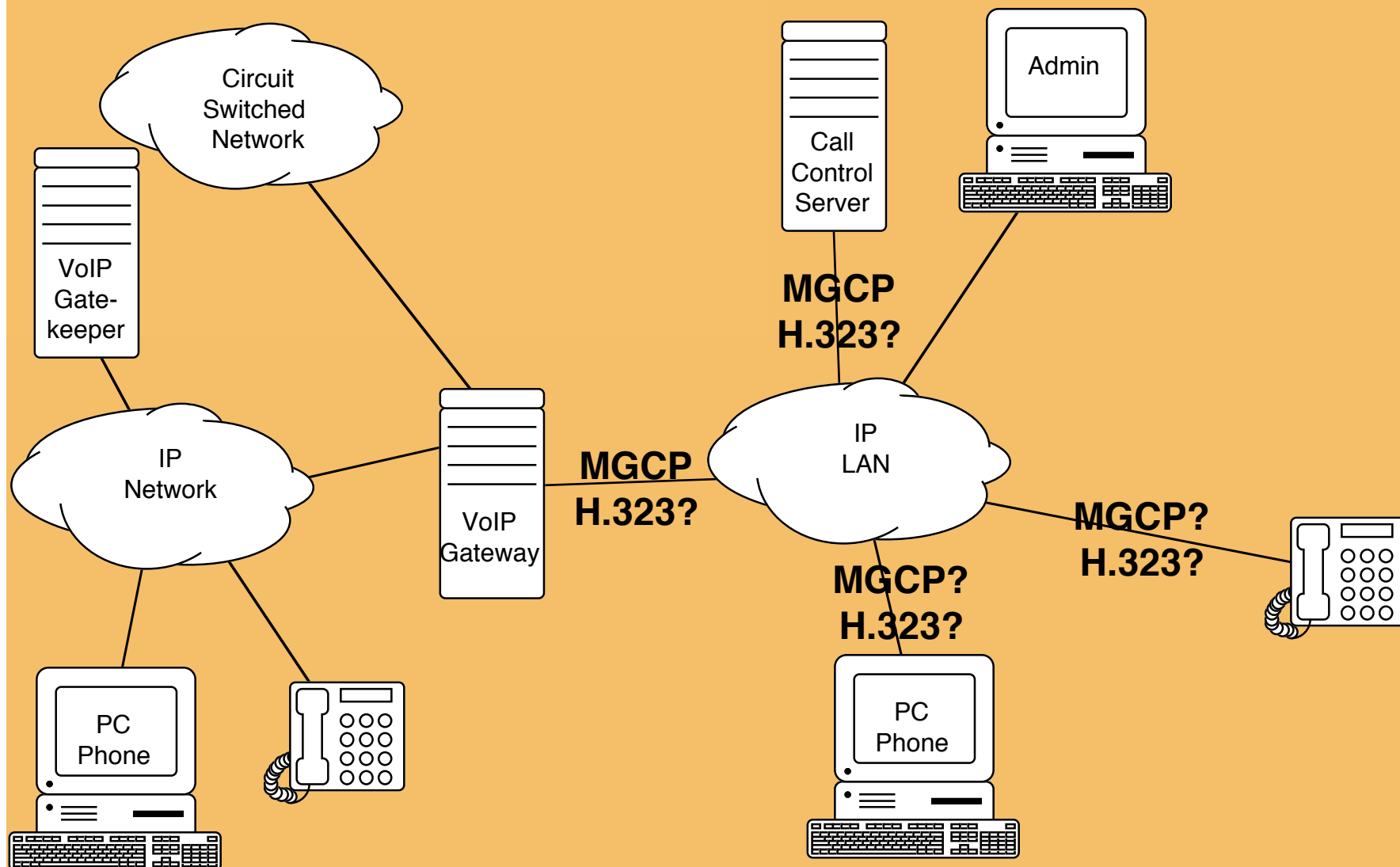
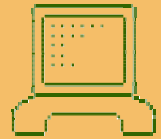
# New Generation Telephone System



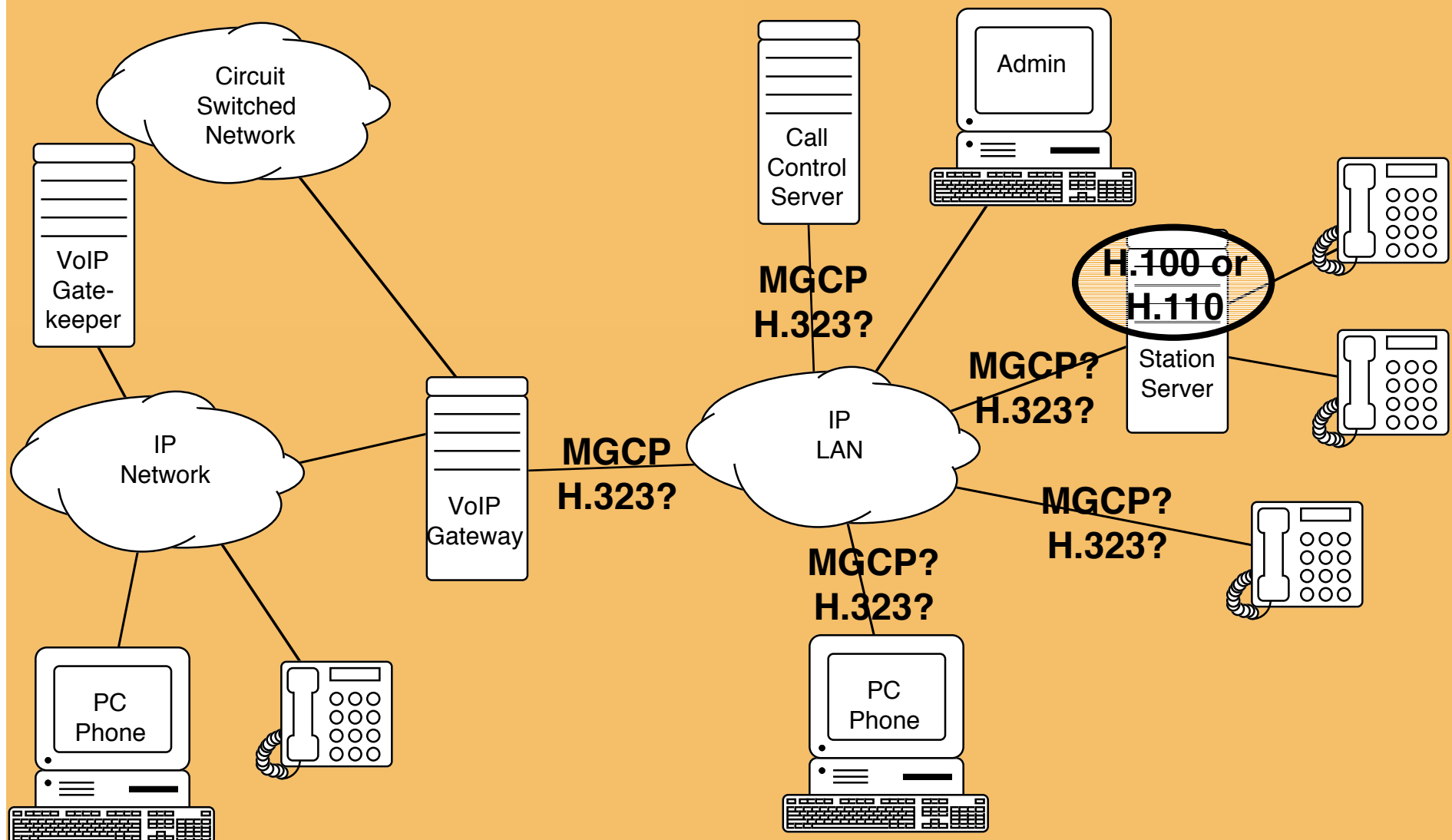
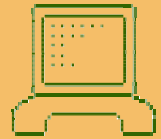
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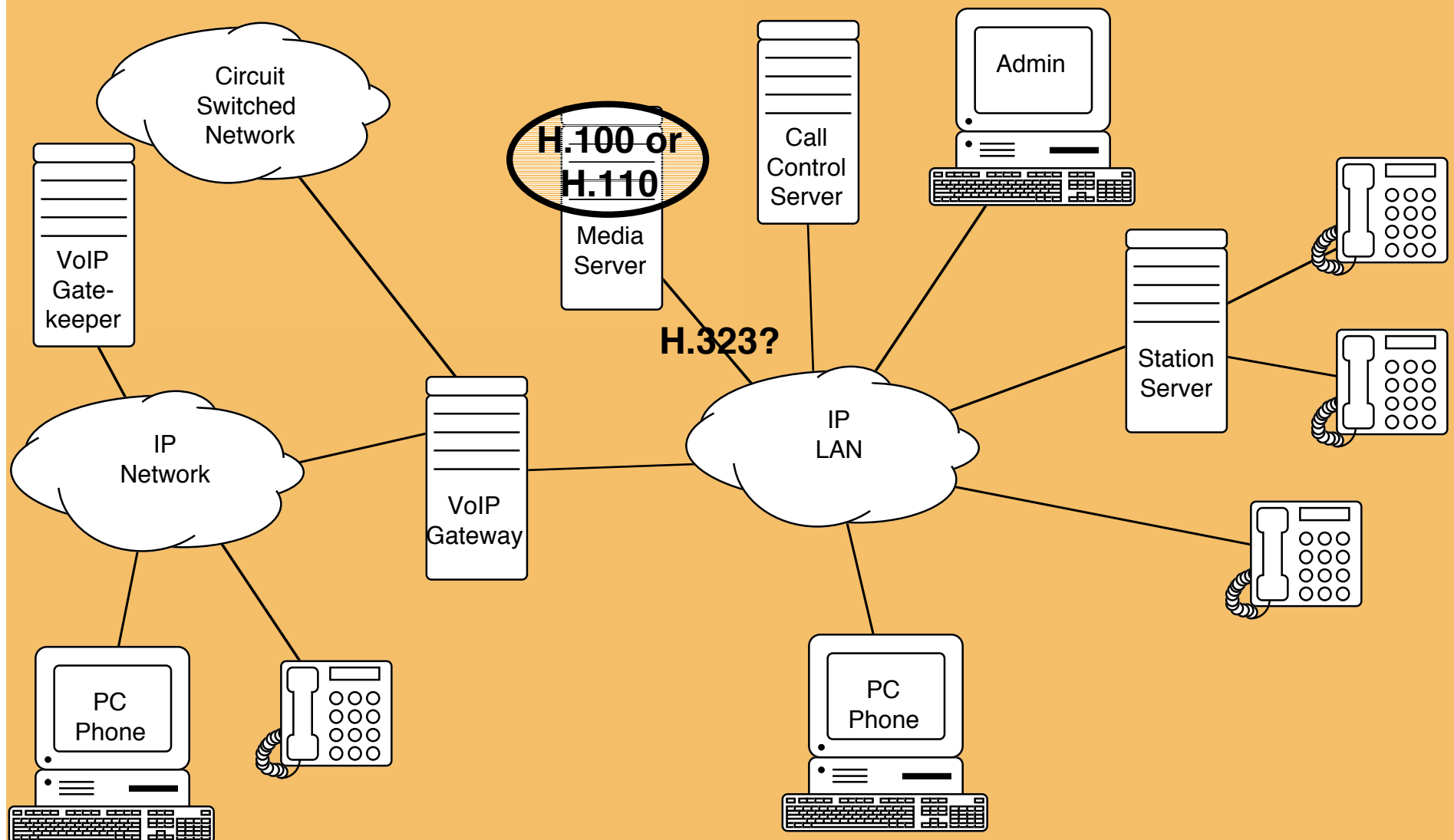
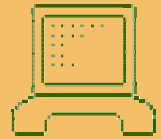
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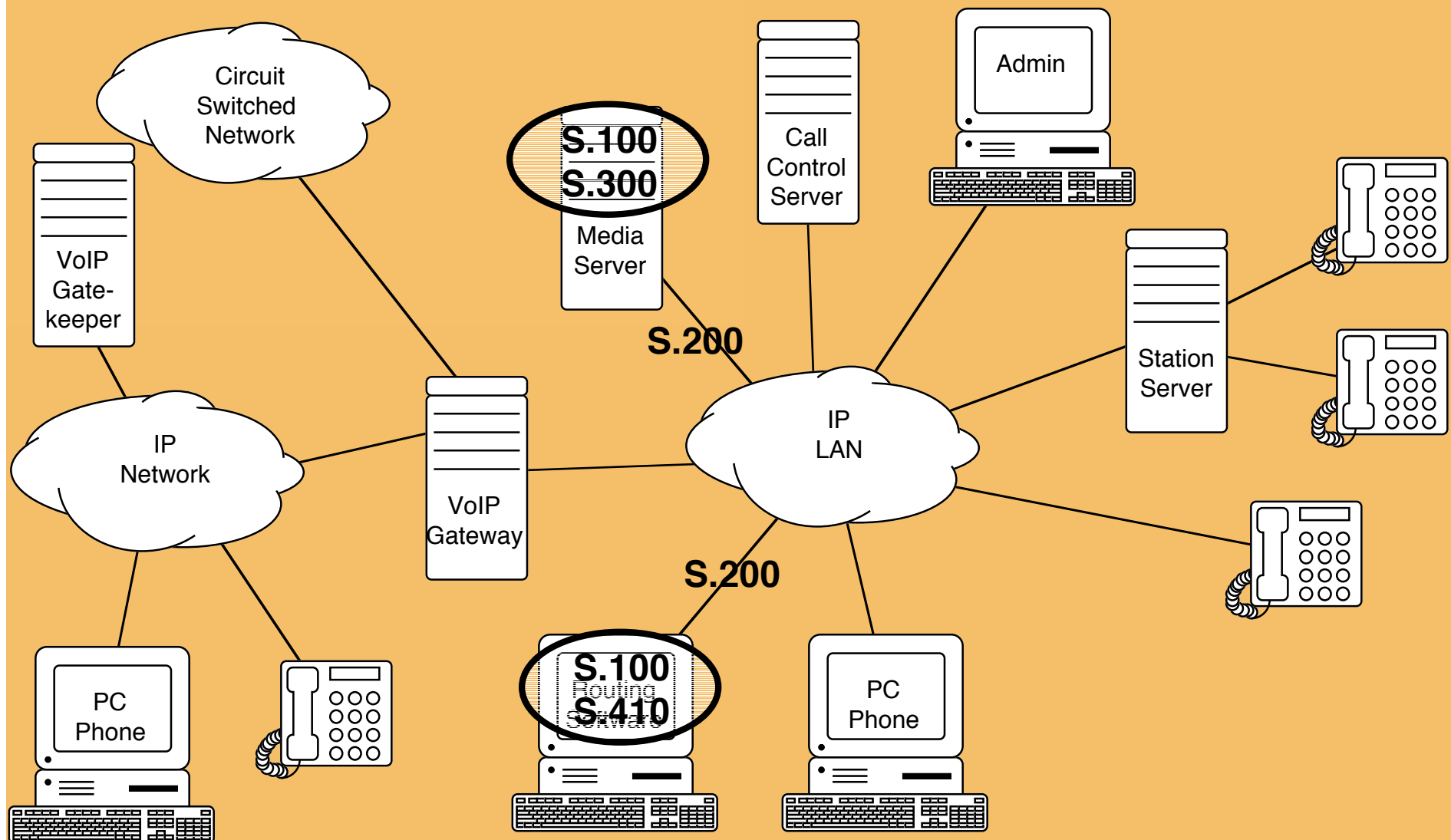
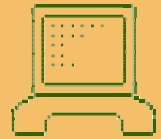
# New Generation Telephone System



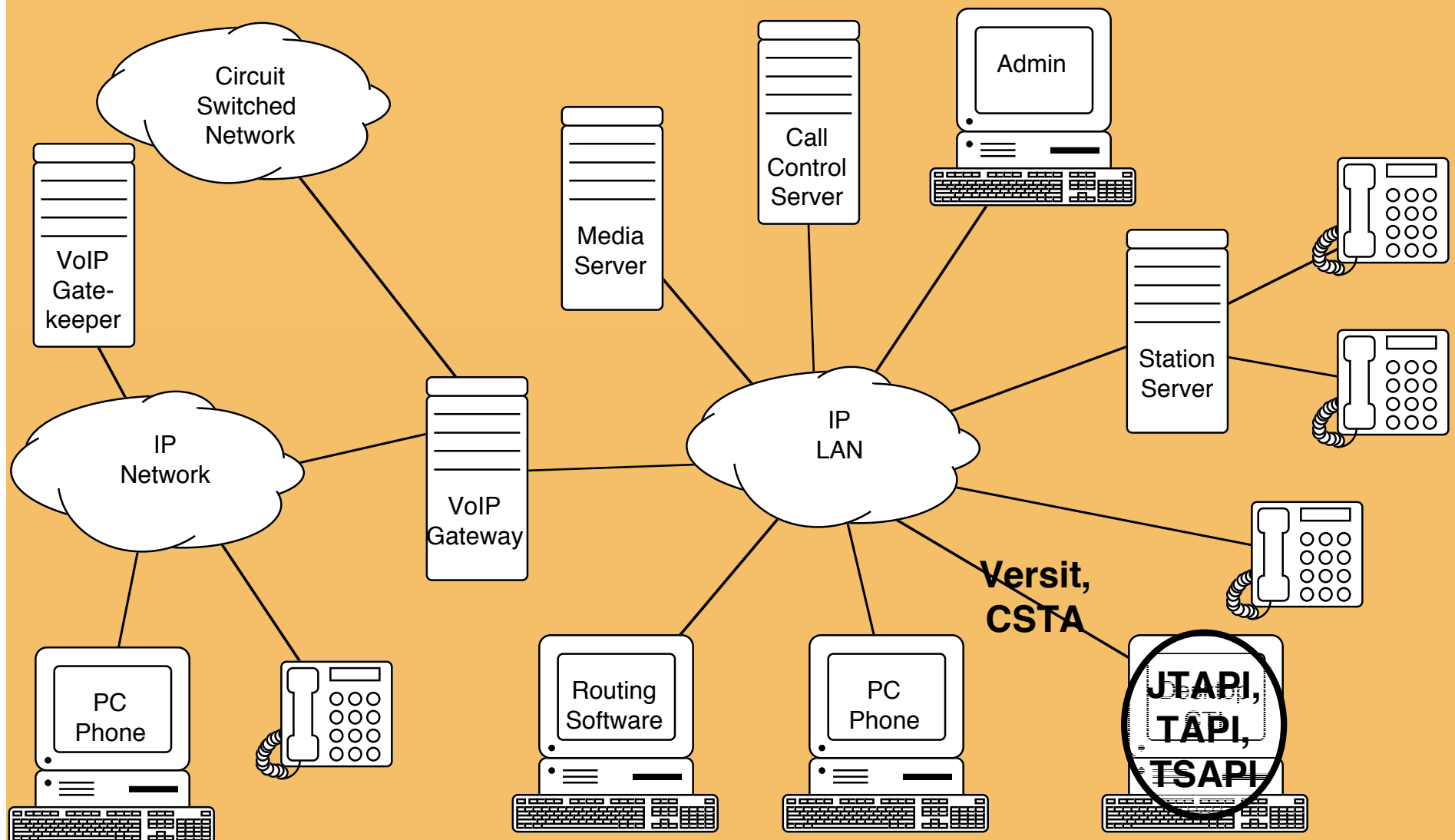
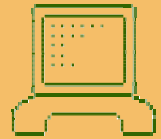
# New Generation Telephone System

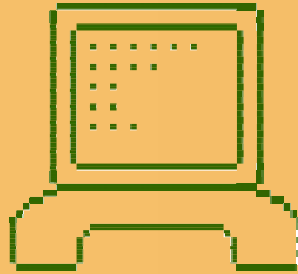


# New Generation Telephone System



# New Generation Telephone System

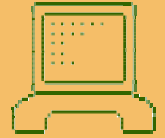




Getting Started:

# How to shop for products

# Become Familiar with Specifications



## ■ Standardized terminology

- Allows comparison of different vendor's products

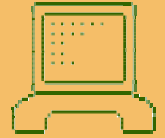
## ■ Standardized models

- Provides framework for designing solution independent of specific products
- Serves as checklist for product features

## ■ Resources include:

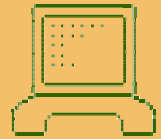
- [www.ECTF.org](http://www.ECTF.org)
- [www.CTExpert.com](http://www.CTExpert.com)

# Know Your Requirements



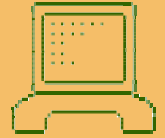
- Don't take anything for granted
- What do you have that you don't really need?
- What do you need?
- If it ain't broke don't fix it
- Leave all your options open

# Know your Priorities



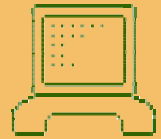
- Where do you stand to gain the most benefit?
  - CTI Applications?
  - Media Services Applications?
  - Admin?
  - Switching Fabric?

# Don't make any assumptions



- Support for one specification doesn't guarantee that there is support for another
- Support for an API on one platform doesn't guarantee that any other platforms are supported
- IP Telephony is just a new switching fabric

# Maturity Checklist



## ■ Framework

- ECTF

## ■ Call Model

- C.001

## ■ Published APIs / Multi-platform

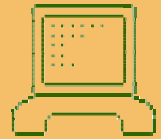
- TAPI, TSAPI, JTAPI, S.100, M.100

## ■ Open Protocols

- H.323, MGCP, Versit/CSTA, S.200

## ■ Plug & Play Products

# What should you be doing?



## ■ Get tough with vendors

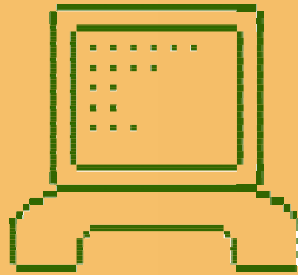
- Get “Questions for Vendors” from ECTF
- Encourage vendors to implement and ship products based on specifications (not just to talk about it)

## ■ Think modular

- Shop for components
- Support manageable diversity
- Build in a modular fashion by taking advantage of interoperability specifications wherever possible

## ■ Don't rush

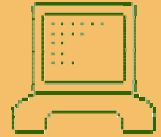
- If appropriate, defer purchases or invest in products that will help you migrate over time



# Q&A



# For More Information



- C.001 specifications and Versit CTIE:

<http://www.ectf.org>

- Lucent TSAPI information at:

<http://www.lucent.com/enterprise/who/docs/product11.html>

- Novell TSAPI information at:

<http://www.novell.com/catalog/qr/sne24310.html>

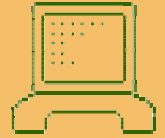
- JTAPI information at:

<http://java.sun.com/products/jtapi/index.html>

- TAPI information at:

<http://www.microsoft.com/communications/telephony.htm>

# For More Information



- S.100 R2 and S.200 specifications and the ECTF product directory can be found at:

**<http://www.ectf.org>**

- JTAPI information at:

**<http://java.sun.com/products/jtapi/index.html>**

- TAPI information at:

**<http://www.microsoft.com/communications/telephony.htm>**