Telchemy

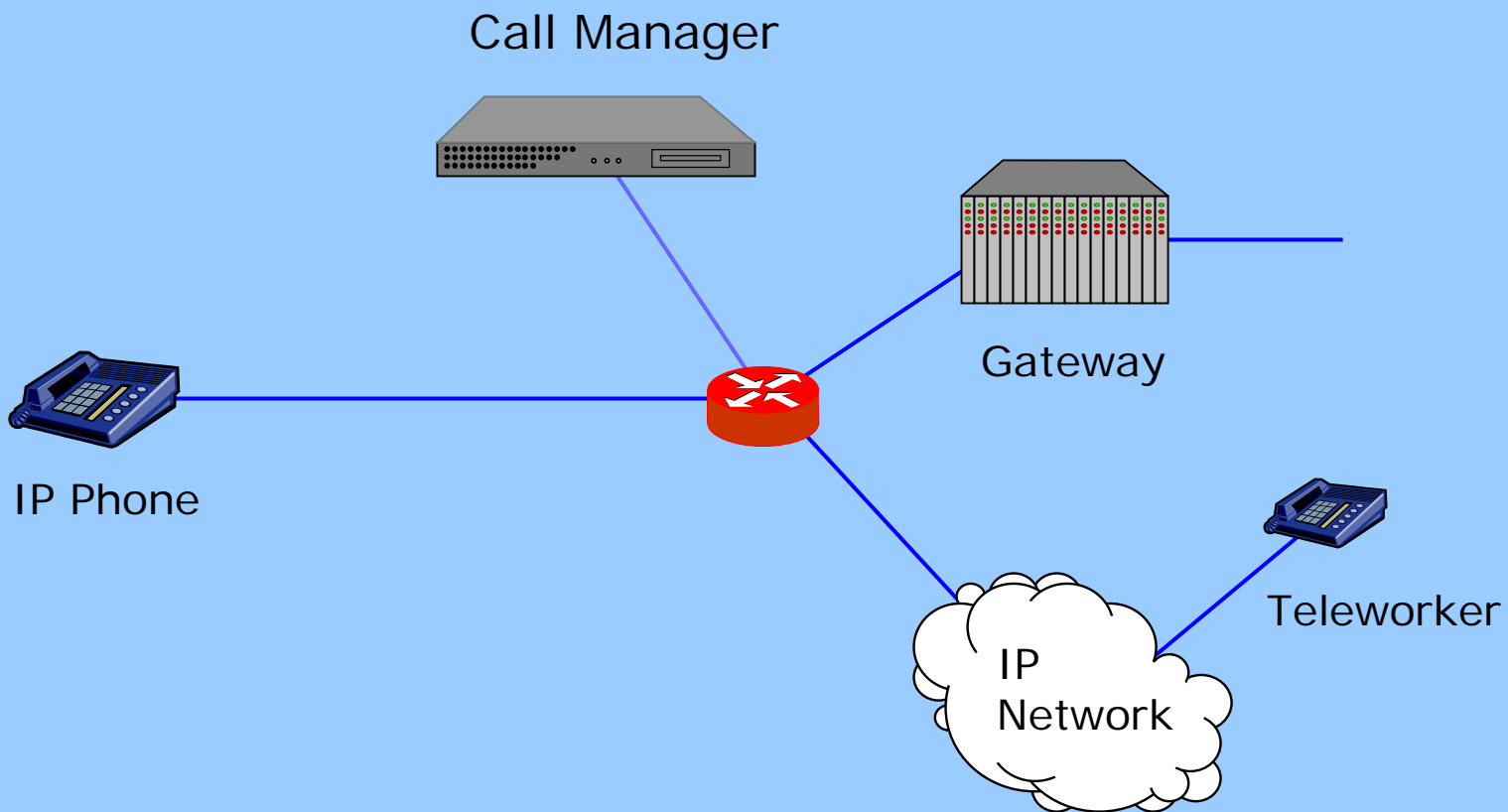*Actively Managing Multimedia*

Managing and Troubleshooting Enterprise IP Telephony

Dr Alan Clark

CEO, Telchemy Incorporated
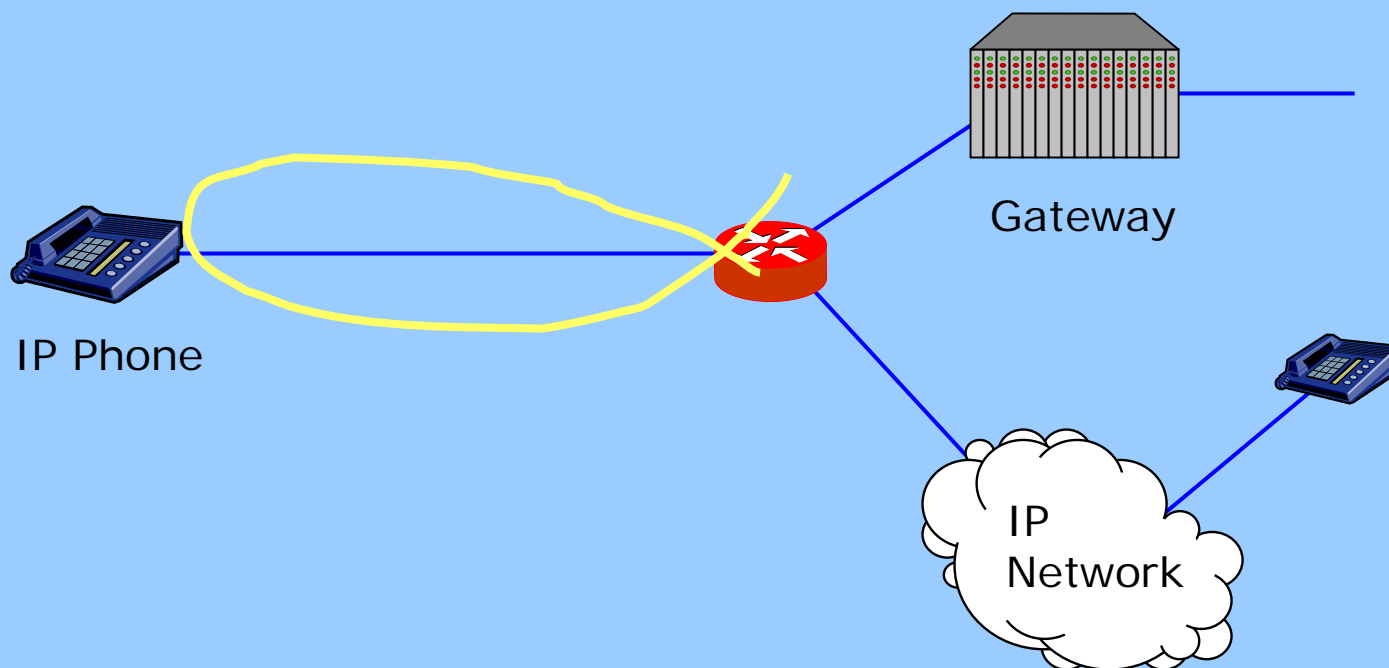
http://www.telchemy.com

Typical IP PBX System

Call Manager

Gateway

IP Phone

Teleworker

IP Network

VoIP Performance Problems

LAN problems:
- Duplex mismatch
- Bad cables/connectors

Gateway

IP Phone

IP Network

VoIP Performance Problems

PSTN:
- Line Echo
- Signal Level

Gateway

IP Phone
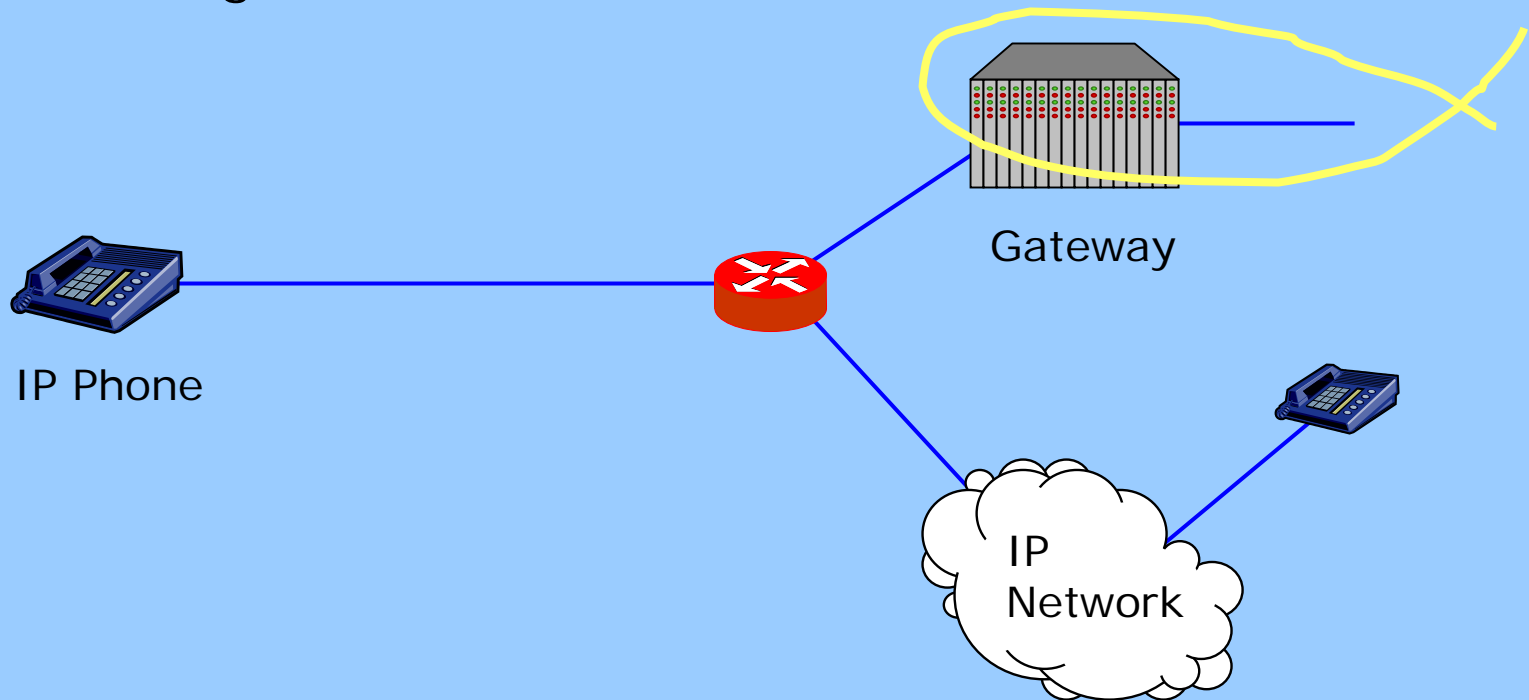
IP Network

VoIP Performance Problems

Access Link:
- Congestion

Gateway

IP Phone
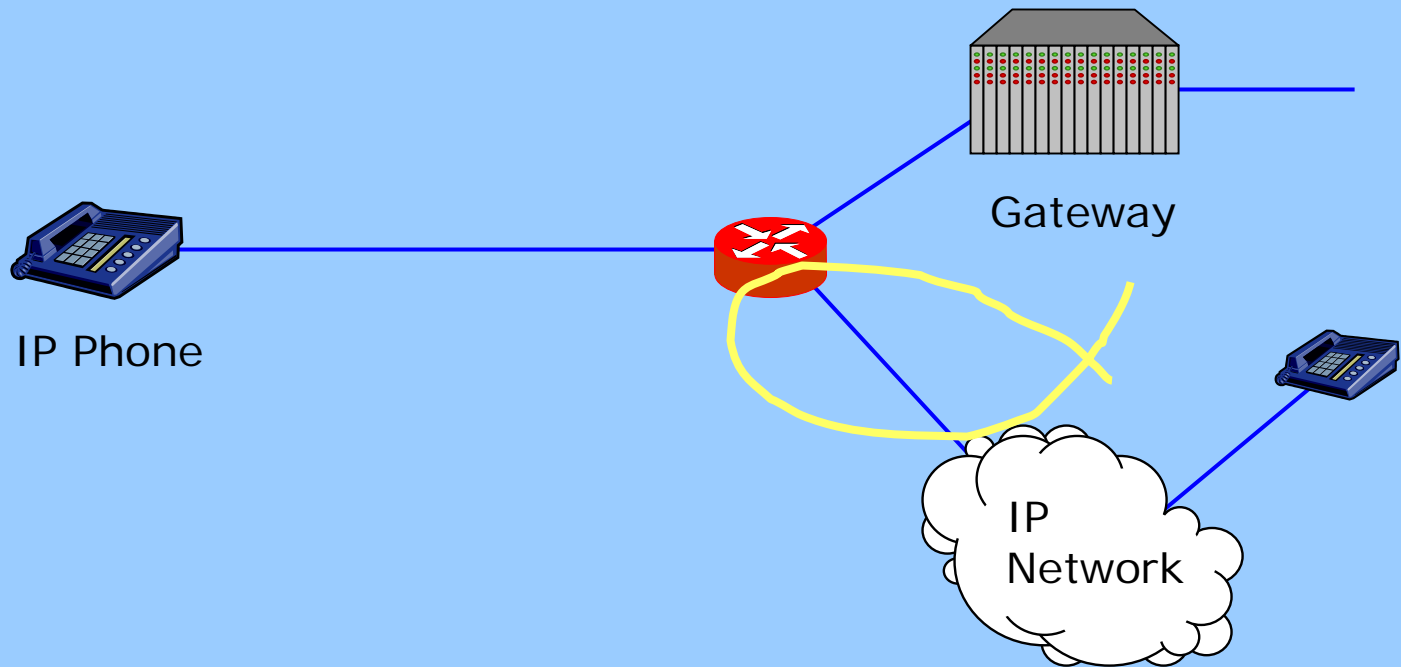
IP Network

VoIP Performance Problems

Core IP Network:
- Congestion
- Delay

Gateway

IP Phone

IP Network
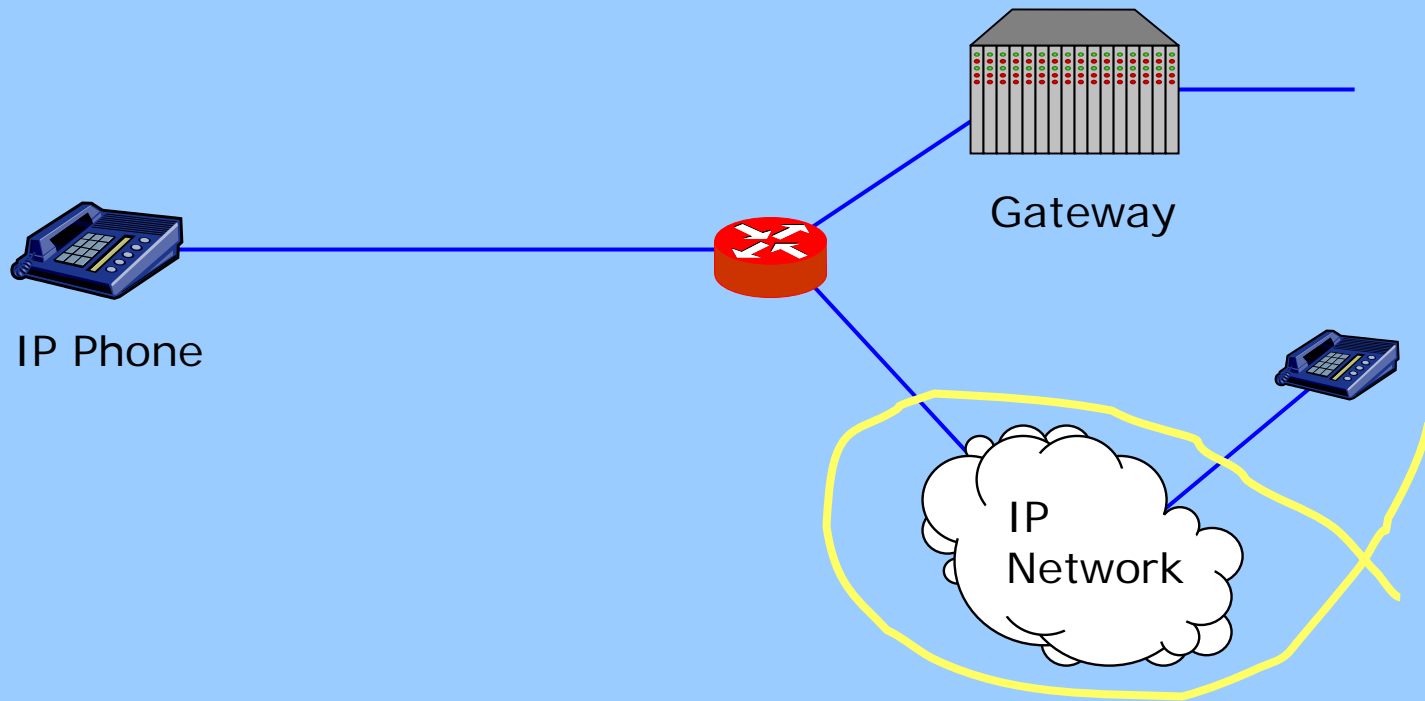
VoIP Performance Problems

Teleworker:
- Cable/DSL Congestion

Gateway

IP Phone

IP
Network

VoIP Performance Problems

Acoustic
Echo

Packet loss, delay, Jitter

Line
Echo

Gateway

IP Phone

IP
Network
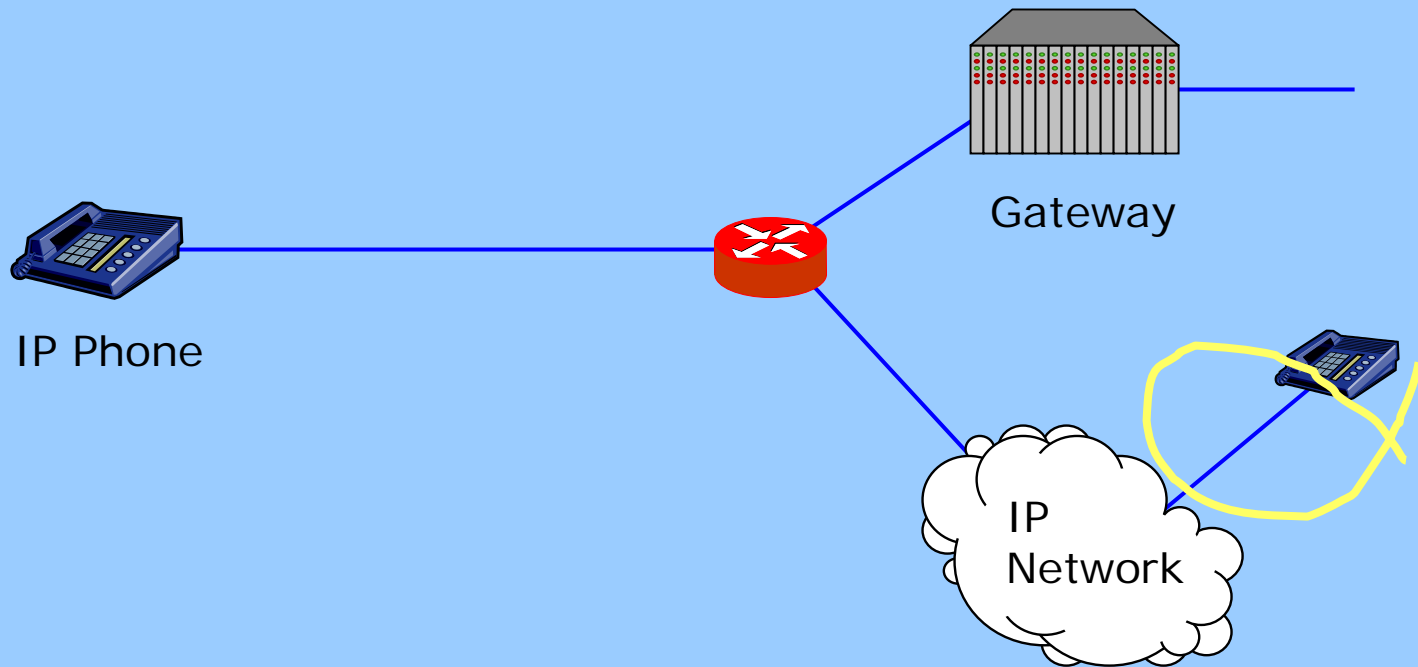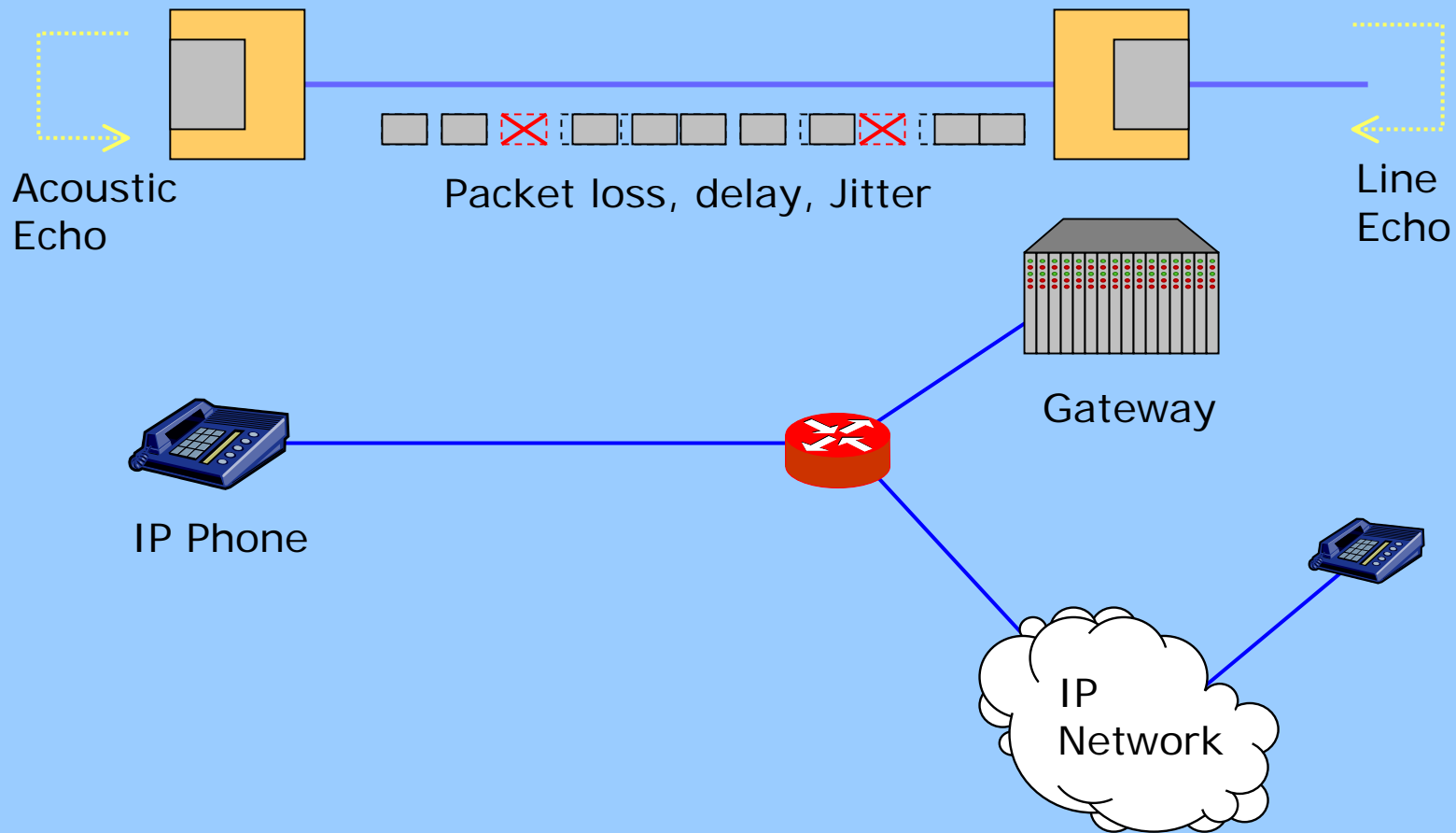
Impairments are <u>time varying</u>
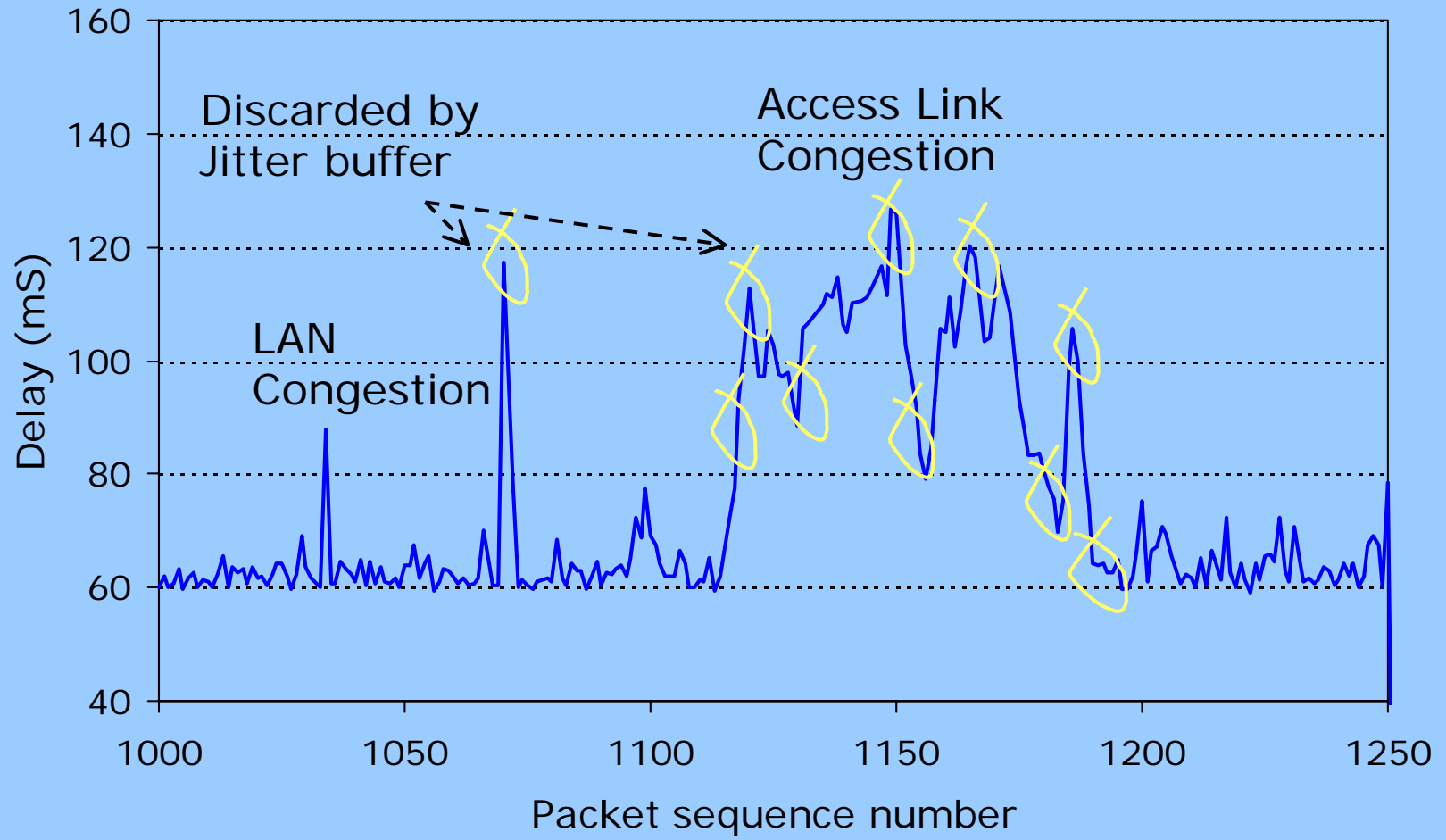
Diagnosing Problems

1. Packet loss is bursty and bursts are "sparse"
   - Use tools that measure bursty loss

2. Jitter results in packet discard
   - Measure "discards" not "jitter"

3. Problems are transient
   - Use non-intrusive monitoring to capture information about problems when they occur

4. Monitor = Manage = Diagnose
   - Use the same basic tools/ technologies for monitoring performance and diagnosis

Management Architecture

NMS/
SMS

Call
Server

SNMP +
RTCP XR MIB

H.460.9
H.248.rtcpxr
SIP XR Event

IP
Phone

RFC3611 RTCP XR

IP
Gateway
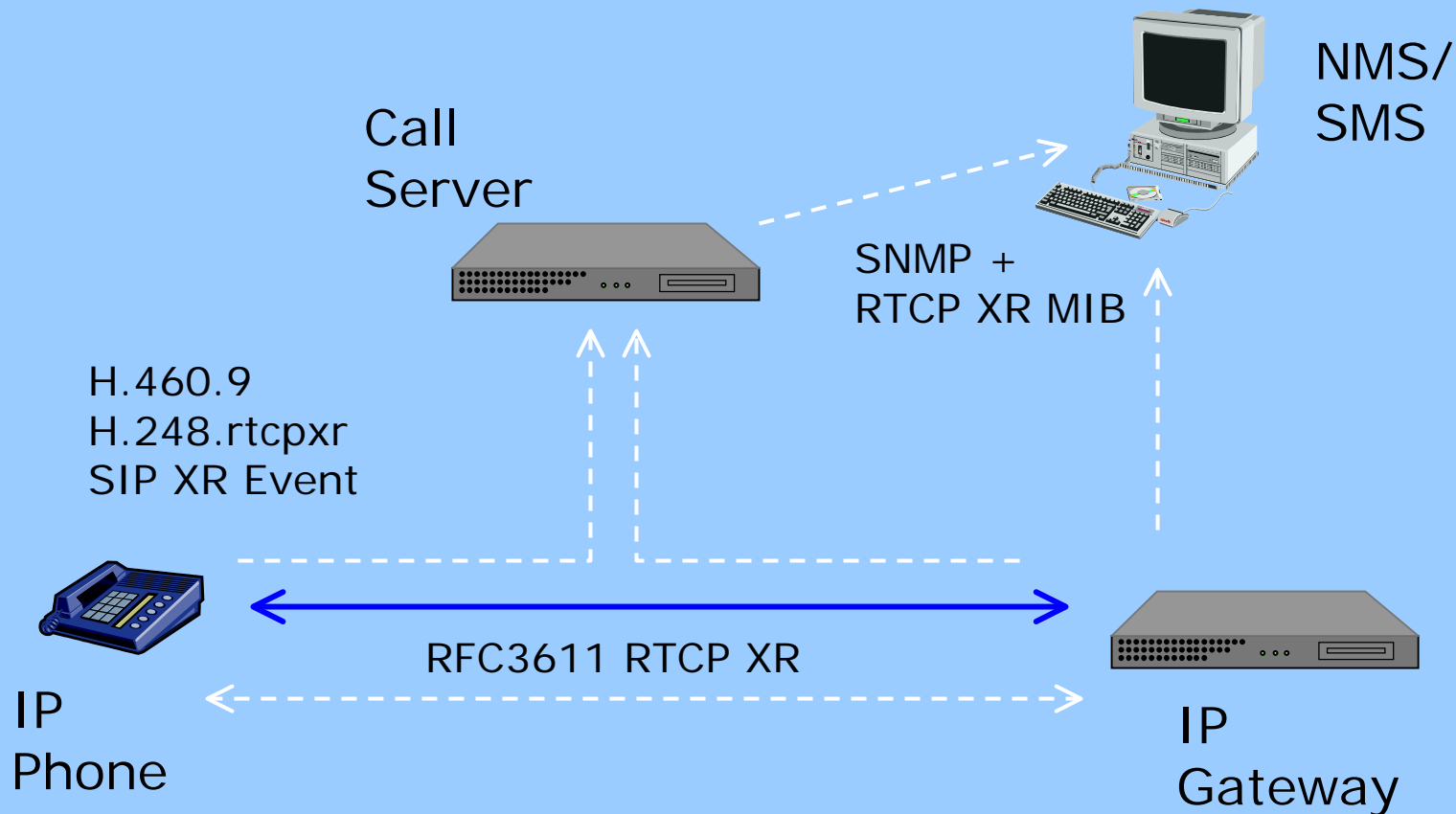
All these protocols based on *Unified VoIP Performance Metrics*

Unified VoIP Performance Metrics

Packet Loss/ Discard
- Packet Loss rate, Packet Discard Rate
- Burst length/density, Gap length/ density

Delay
- Round trip delay
- End system delay

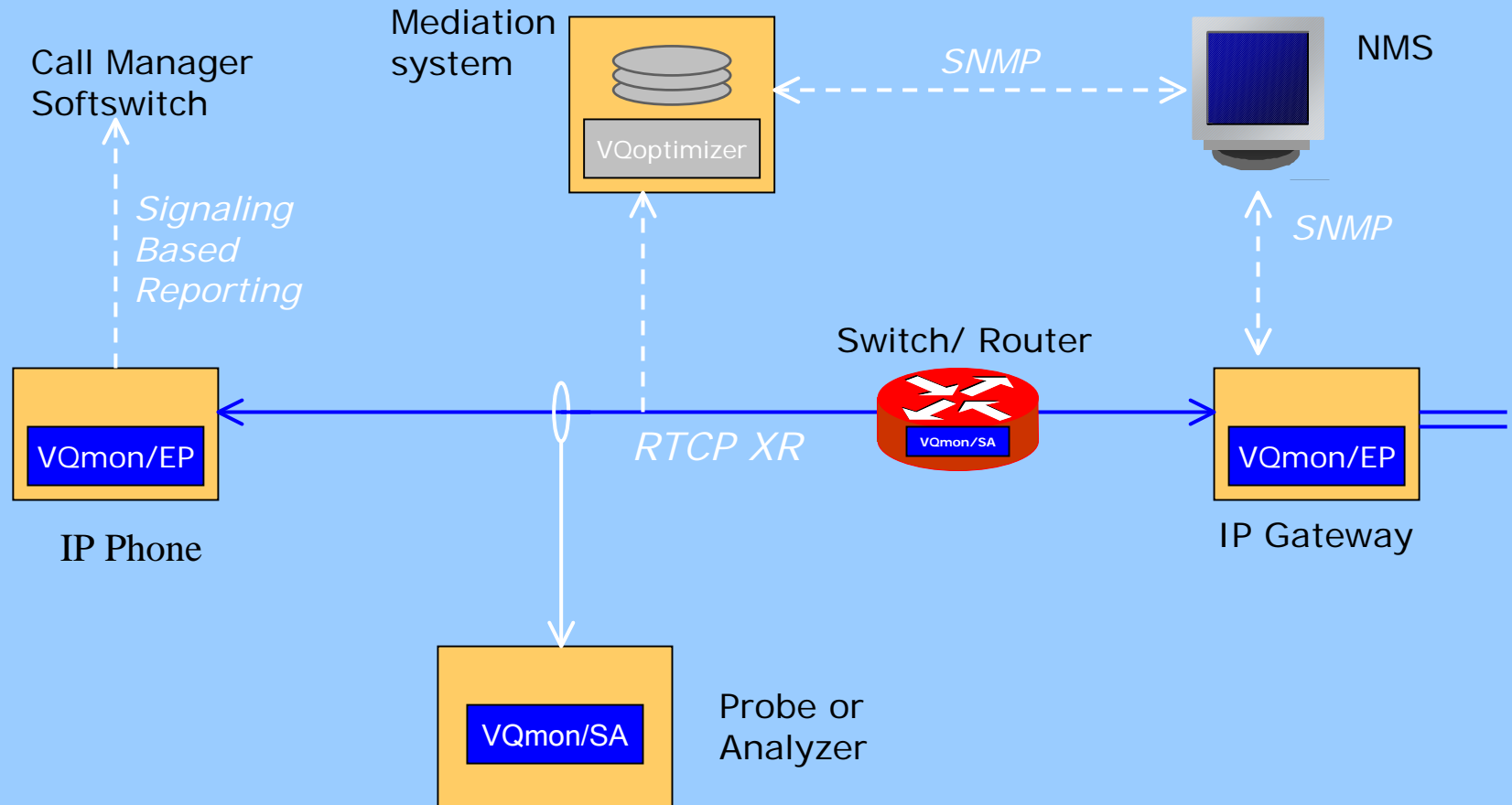## Analog
- Signal level, Noise level
- Echo return loss

Call Quality
- R Factor
- Conversational and Listening Quality MOS

Configuration
- Jitter buffer configuration
- PLC algorithm

Example Management Architecture

Mediation system

VQoptimizer

SNMP

NMS

Call Manager
Softswitch

*Signaling
Based
Reporting*

Switch/ Router

VQmon/SA

SNMP

VQmon/EP

RTCP XR

IP Phone

VQmon/SA

Probe or
Analyzer

VQmon/EP

IP Gateway

Summary

- Packet loss, jitter and delay are not enough - use tools that <u>understand</u> VoIP performance