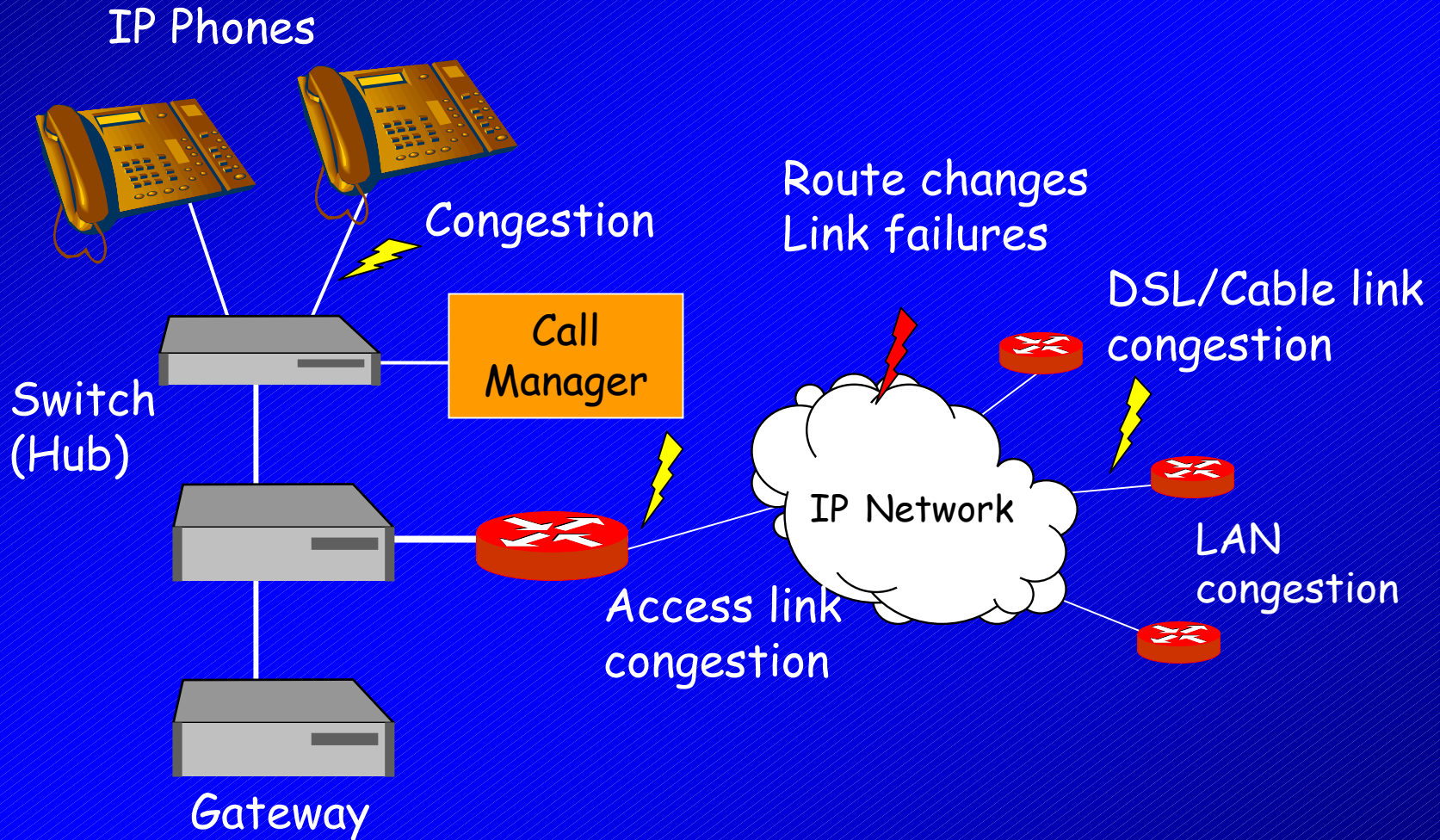# IP Phone Management

Alan Clark
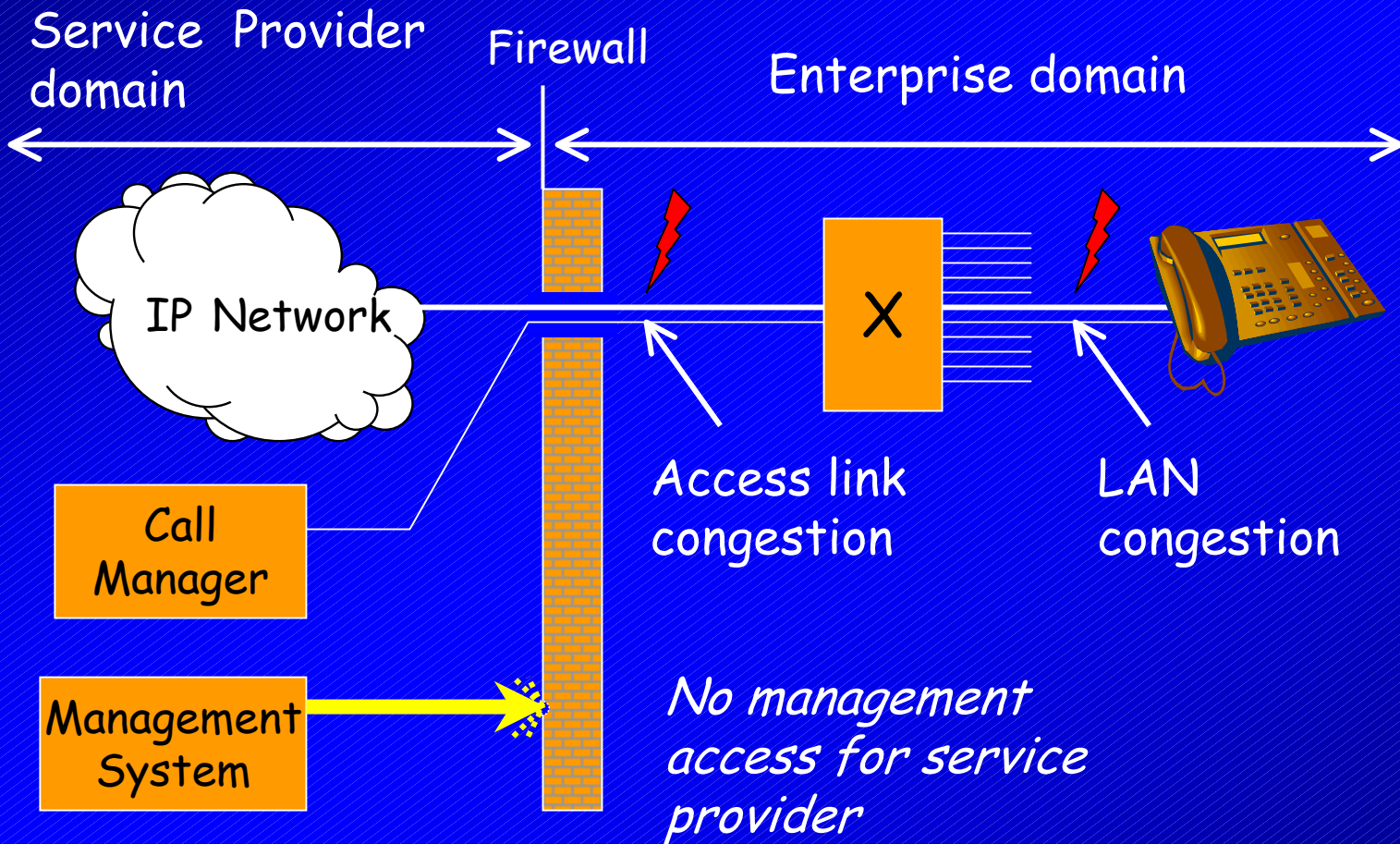
alan@telchemy.com

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IP Phone Management

- Potential call quality problems in Enterprise VoIP and IP Centrex
- Existing management protocols?
- **New!** RTCP Extensions for VoIP
- Practical applications
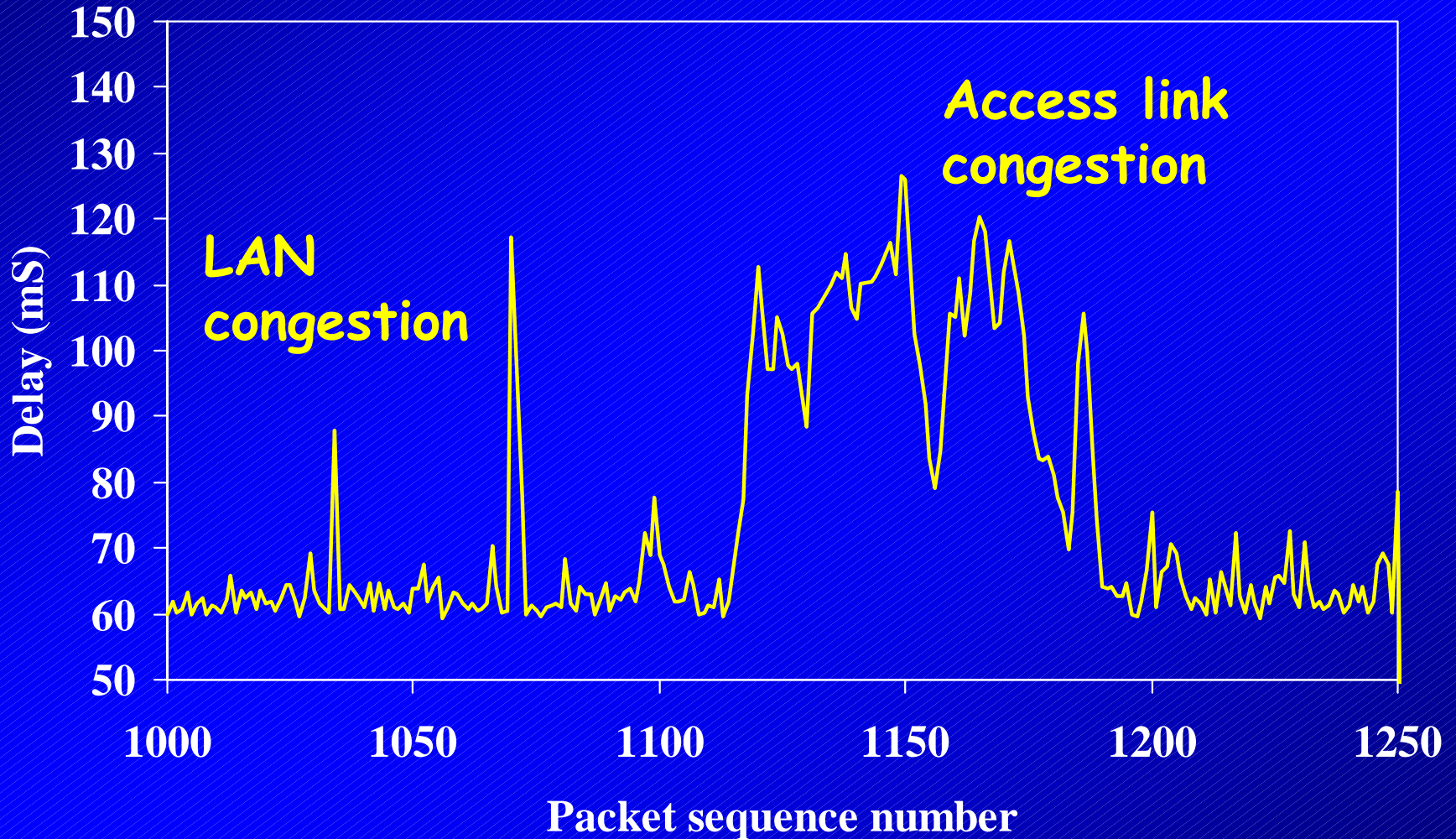
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Enterprise VoIP Application

IP Phones

Congestion

Route changes
Link failures

DSL/Cable link
congestion

Call Manager

Switch (Hub)

IP Network

LAN congestion

Access link congestion

Gateway

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IP Centrex

Service Provider domain

Firewall

Enterprise domain

IP Network

Call Manager

Management System

X

Access link congestion

LAN congestion

No management access for service provider

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Network problems are transient

Delay (mS) vs Packet sequence number, showing LAN congestion and Access link congestion.

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Impact on packet stream

Delay (mS) (y-axis): 150, 130, 110, 90, 70, 50

Average jitter (RFC1889) = 4mS

Packets discarded by end system

Packet sequence number (x-axis): 1000, 1050, 1100, 1150, 1200, 1250

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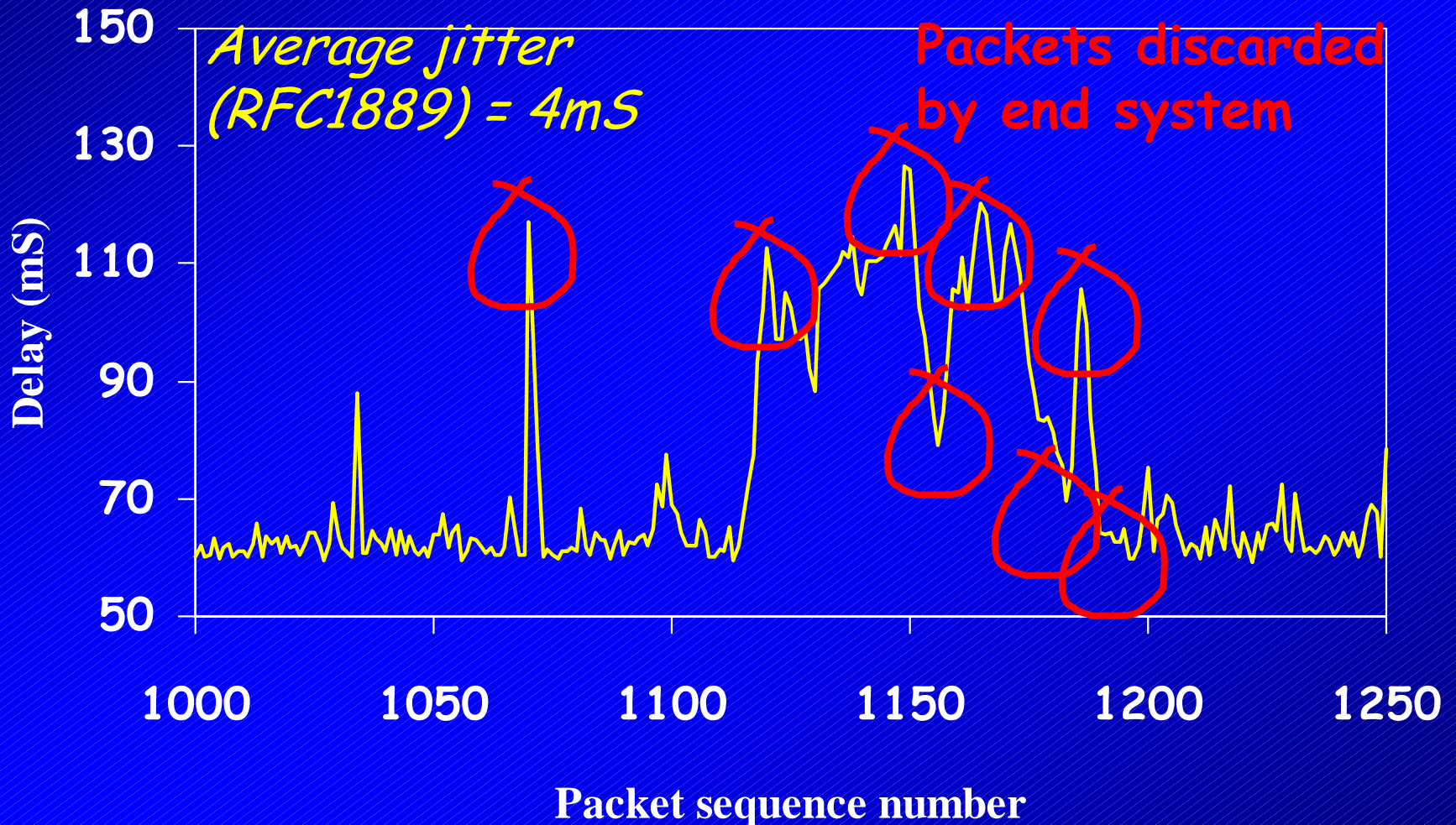
Key management issues

- Many problems are <u>transient</u>, knowing that "*on average things are ok*" is not enough

- Calls cross <u>multiple management domains</u> and network managers may not have access to the whole path

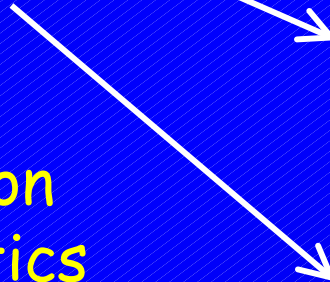- Can put probes at key concentration points but <u>not</u> on every desktop

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Existing Management Solutions

End of call message
(e.g. H.323 DRQ)
to call manager

RFC1889 RTCP

Too much focus on
"average" statistics
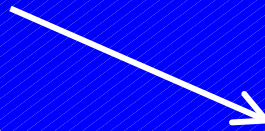
Other ...
- XML, log files,
SW/CFG downloads

~~SNMP~~

Not enough diagnostic
Data available

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RTCP?

- Positive aspects:-
    - Goes through firewalls
    - Generally follows voicepath
    - Low bandwidth overhead
    - Widely supported
    - (Almost) real time reporting
- Negative aspects:-
   - Reported stats are not accurate or helpful

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RTCP Extensions for VoIP

| X-RTCP | RTP | | | RTP |

RTP stream ⟶
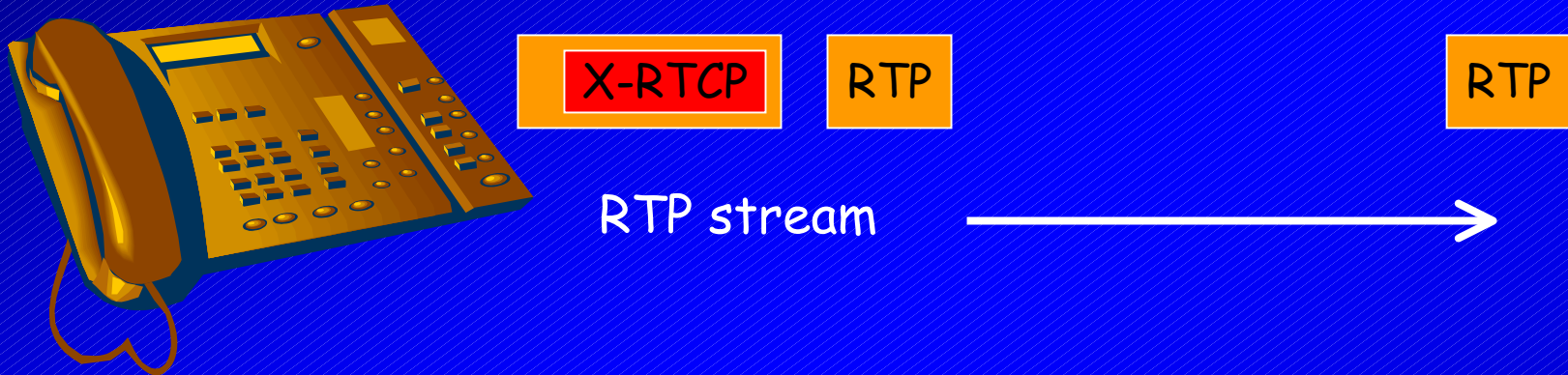
Extended **RTCP** preserves the benefits of RTCP but provides more complete statistics
- losses, discards, burst metrics, delay (mS)
- signal levels, doubletalk, jitter buffer settings
- call quality metrics (R and MOS)
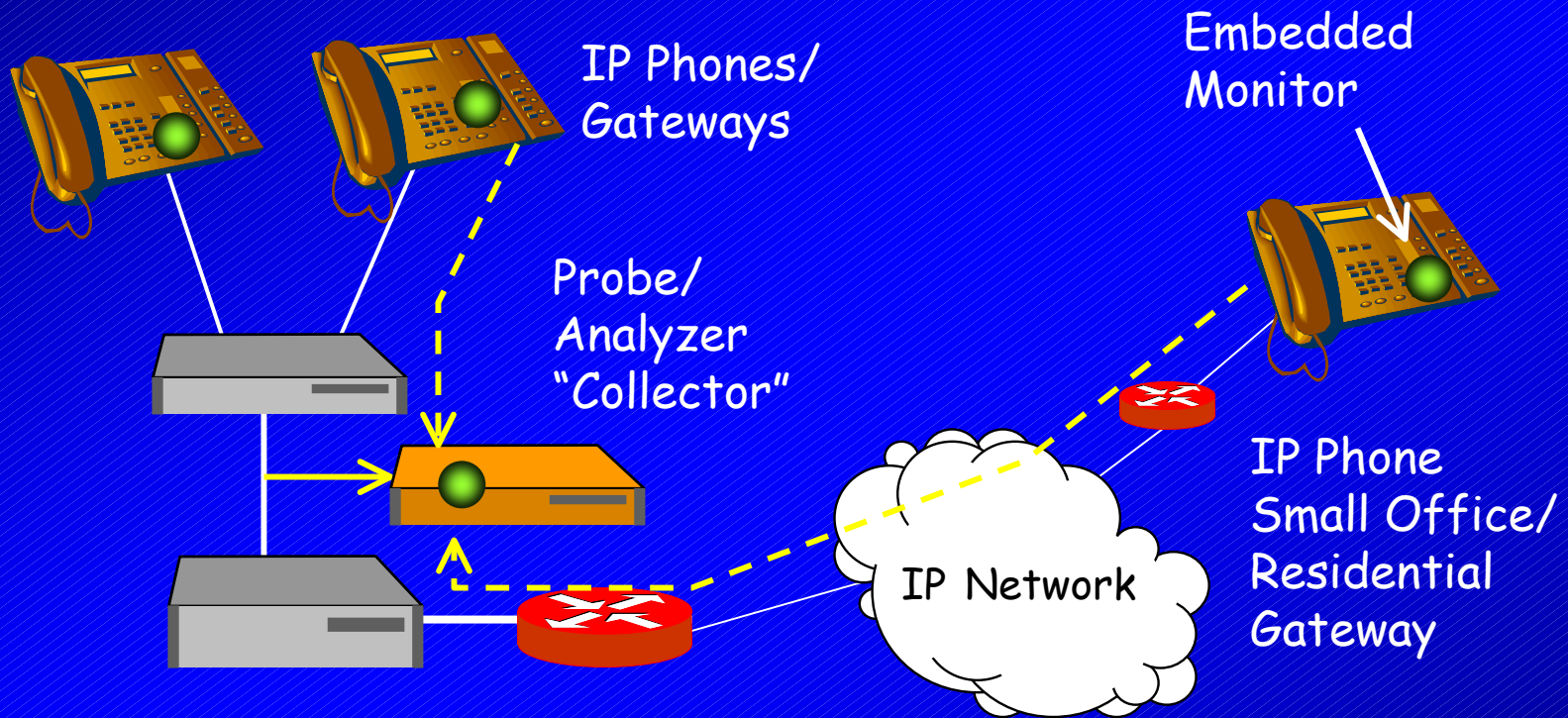- takes approx 100 bits per second of bandwidth

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Capturing time varying QoS

Arriving packets

Discarded

Jitter buffer

Loss events

CODEC
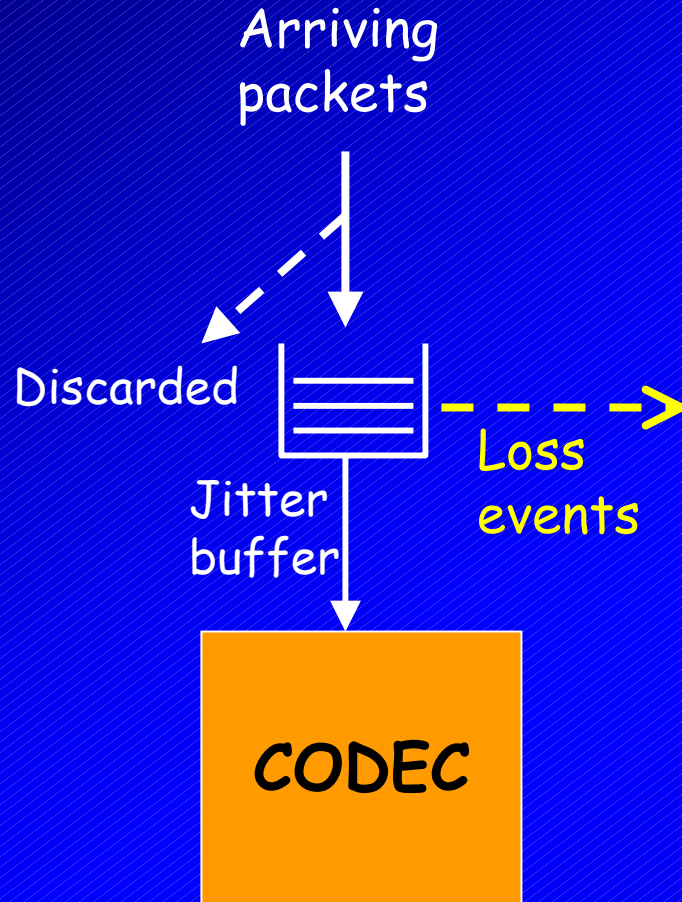
4-state Markov Model
Gather detailed packet loss info in real time

Captures data on burstiness

Metrics calculation

Calculate call quality metrics at end of call Using extended E Model

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Enterprise VoIP solution

IP Phones/
Gateways

Embedded
Monitor

Probe/
Analyzer
"Collector"

IP Network

IP Phone
Small Office/
Residential
Gateway

Extended RTCP reports provide real time feedback
on end-user experience + diagnostic data

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IP Centrex

Service Provider domain

Firewall

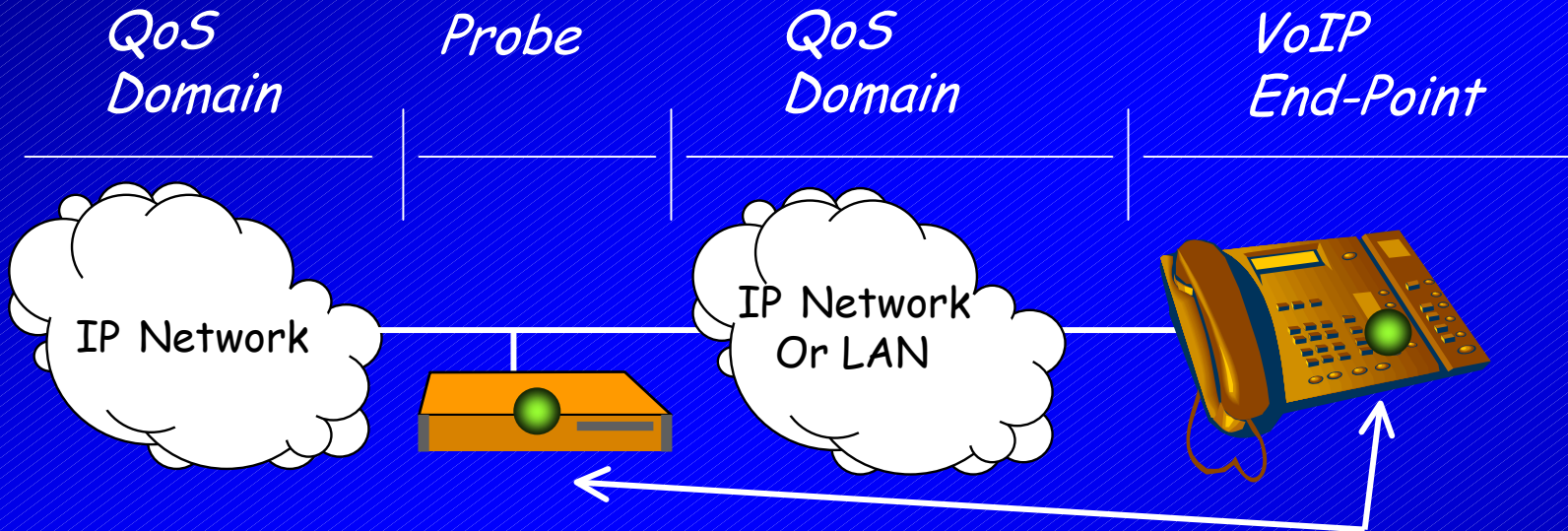Enterprise domain

IP Network

LAN

Call Manager

Extended RTCP reports provide real time feedback on end-user experience + diagnostic data

Probe/ "Collector"

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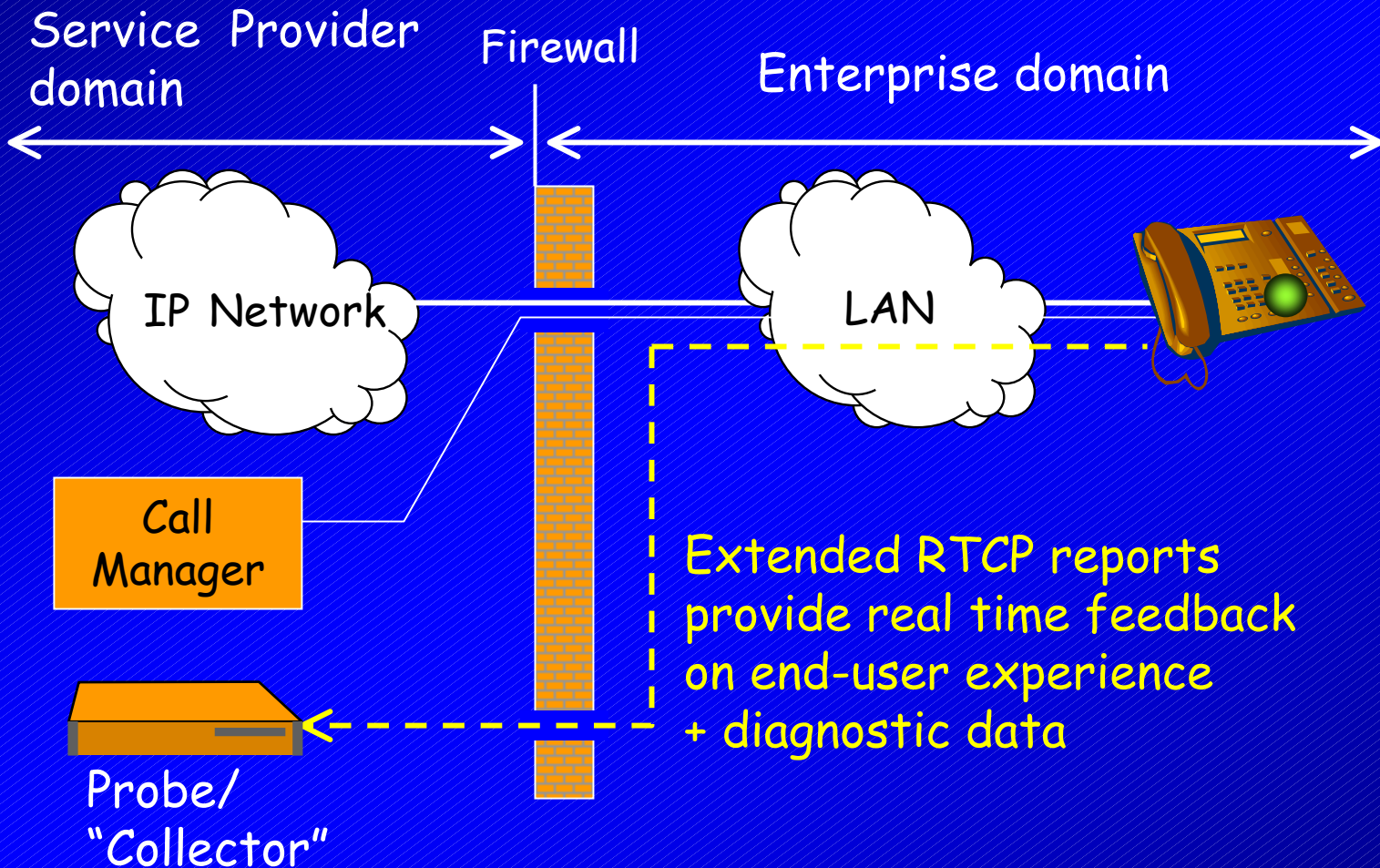
Probes and embedded monitoring?

QoS
Domain

Probe

QoS
Domain

VoIP
End-Point

IP Network

IP Network
Or LAN

Equivalent
monitoring
functions

Probe can collect X-RTCP data
Make comparisons of "here" with endpoint
Make more sophisticated diagnosis

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Summary

- Combining Embedded Monitoring with Extended RTCP provides a powerful solution for Enterprise and IP Centrex management
- Faster detection of problems therefore lower management costs
- Closer to end-user's experience
- Easier to see if a problem is network or equipment related

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About Telchemy

- Founded in August 1999
- Based in Atlanta, GA
- Develops technology for managing quality of service for Voice over IP and Video
- Goal to be a key technology source for the industry – leading edge, optimal solutions to key problems, efficiently implemented
- VQmon technology
  - Partners include AceTronics, Artiza, Brix Networks. Brooktrout, Finisar, Macnica, Sightsys, Texas Instruments, Trinity Convergence

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