



# VoIP - Issues & Problems and the Performance Management Framework

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# Agenda

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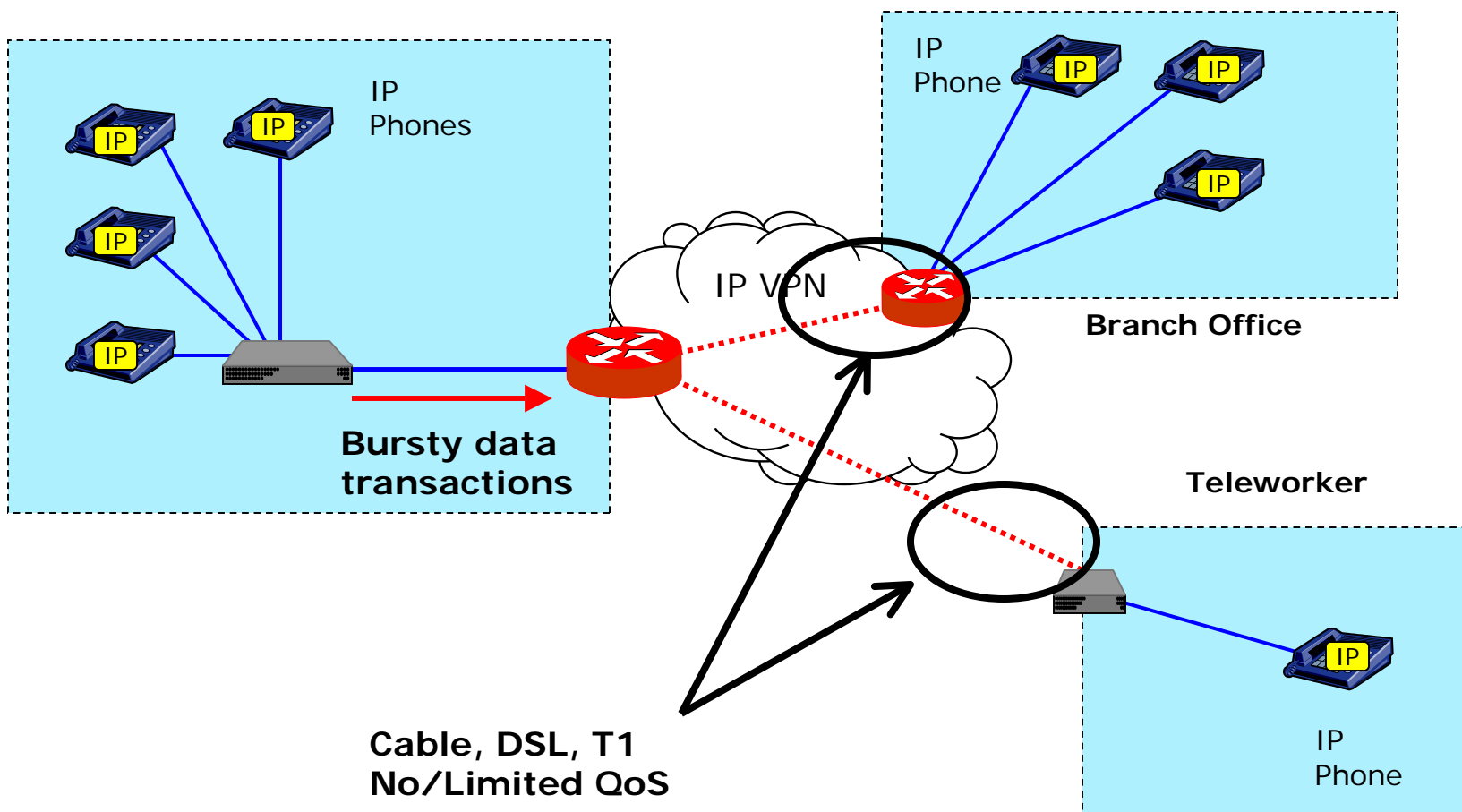
- Voice over IP Performance Problems
- VoIP Performance Management Framework
- RTCP XR

# IP Performance Issues and Problems

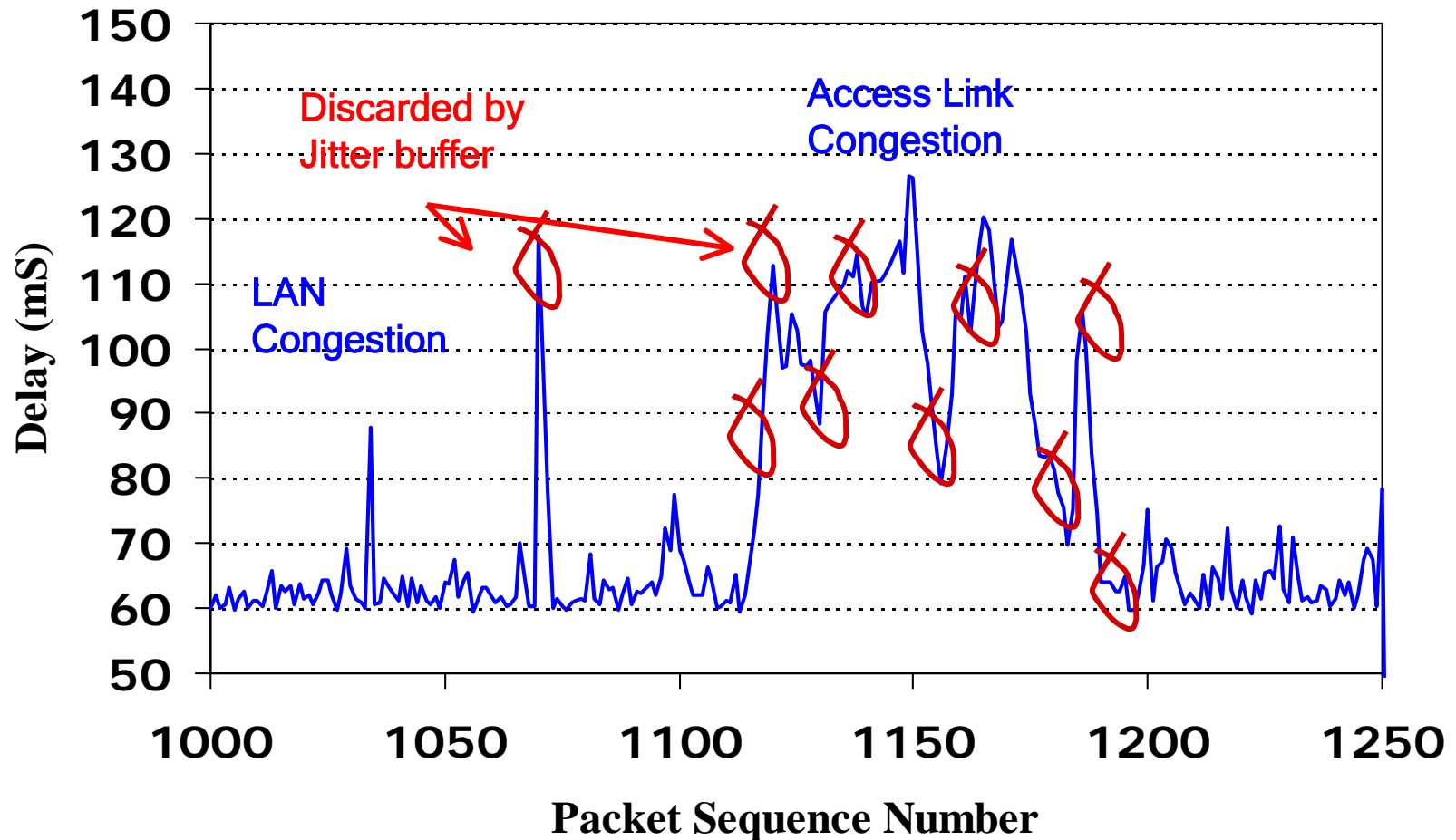
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- The “mantra”
  - Packet Loss -- Leads to quality degradation
  - Jitter -- Leads to packet loss (discards)
  - Delay -- Causes conversational difficulty
- But ...

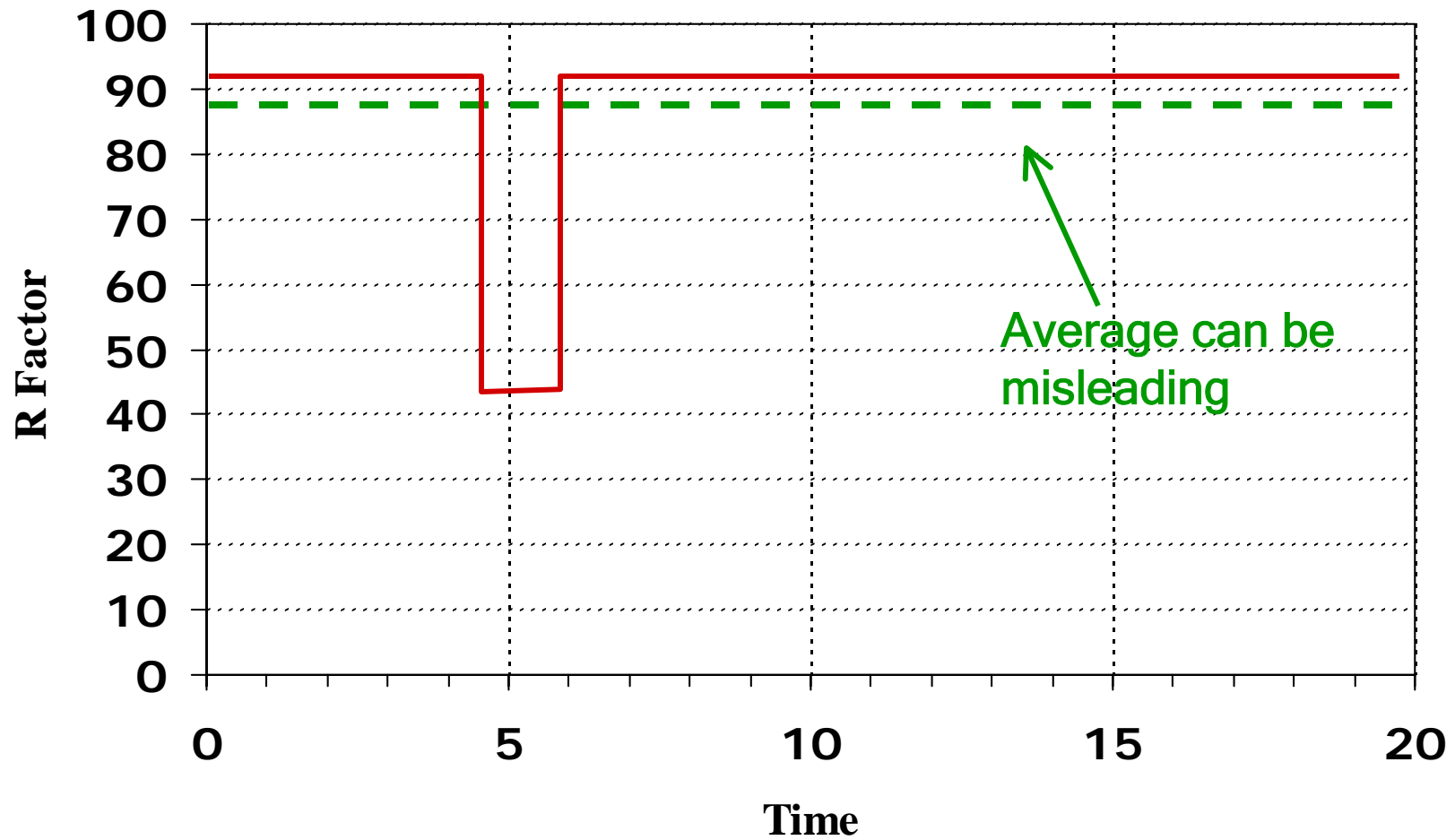
# Many problems are due to **congestion**



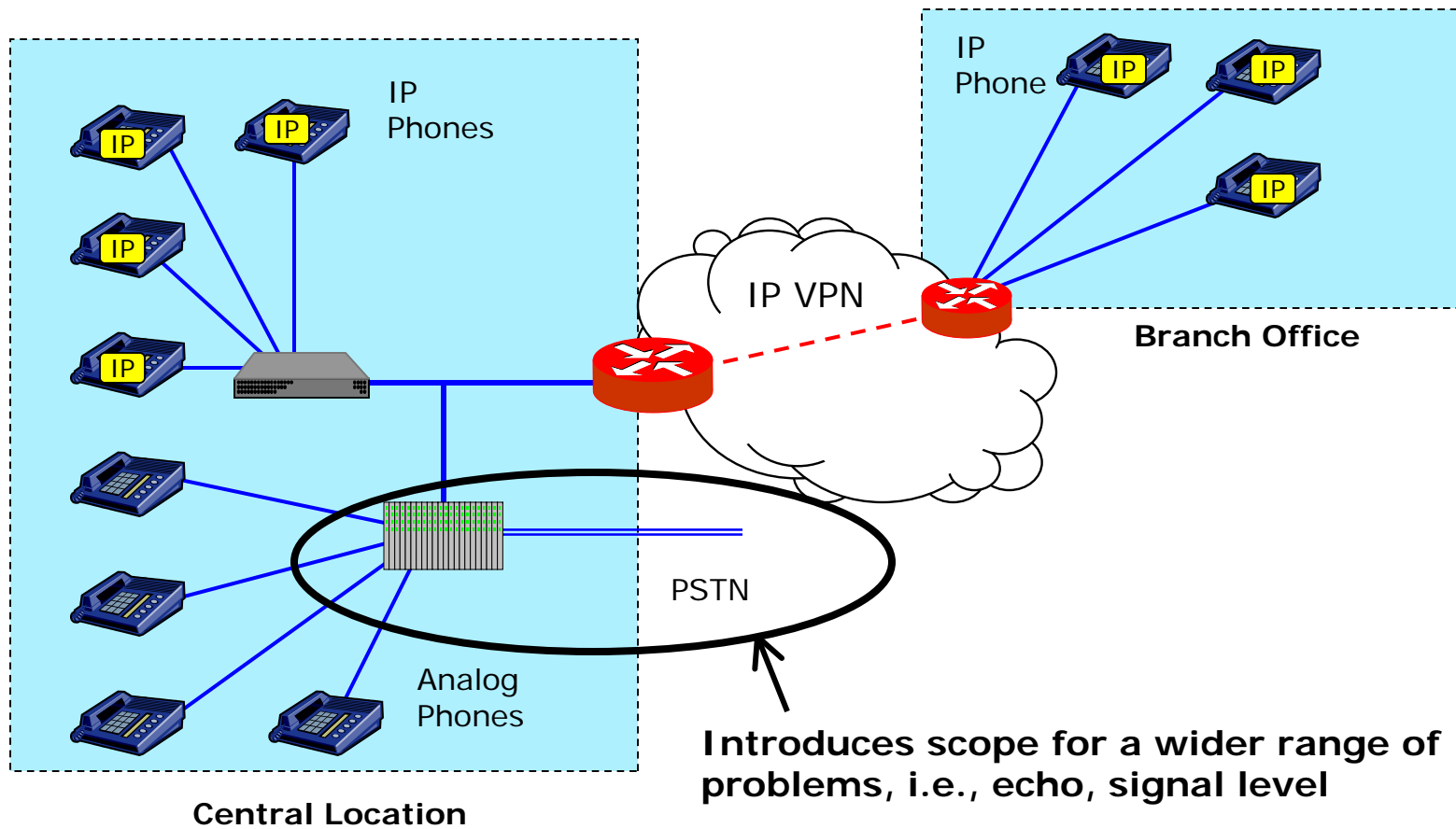
# Leads To Transient IP Problems



# Leads To Time Varying Call Quality

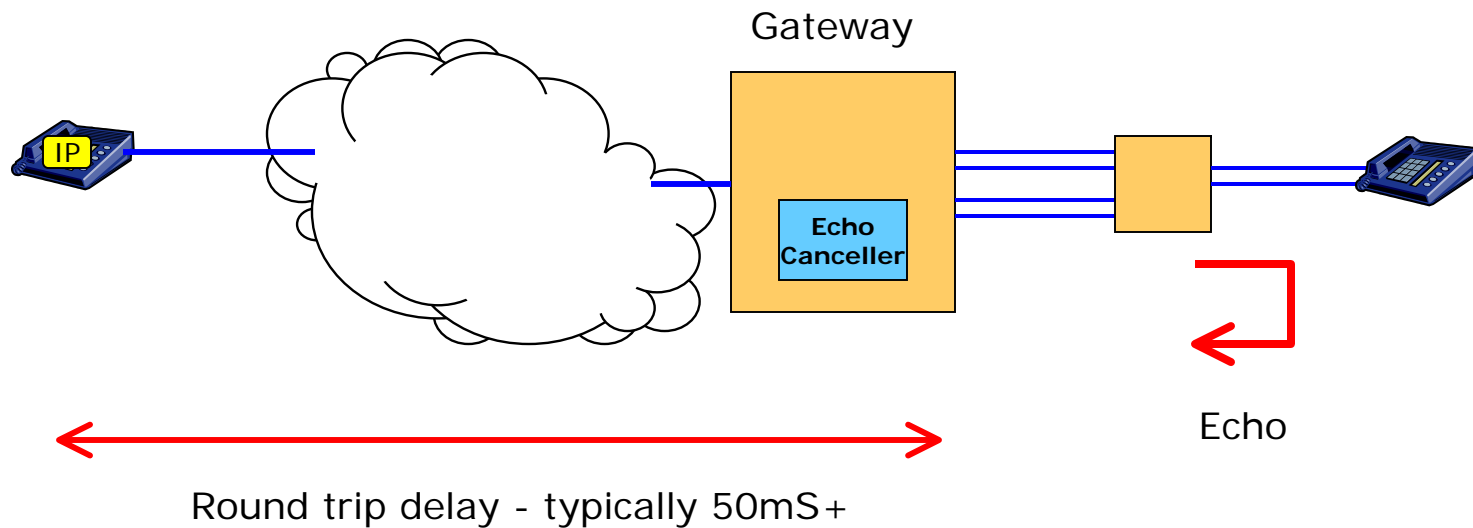


# Signal, Noise and Echo Problems



# Echo Problems

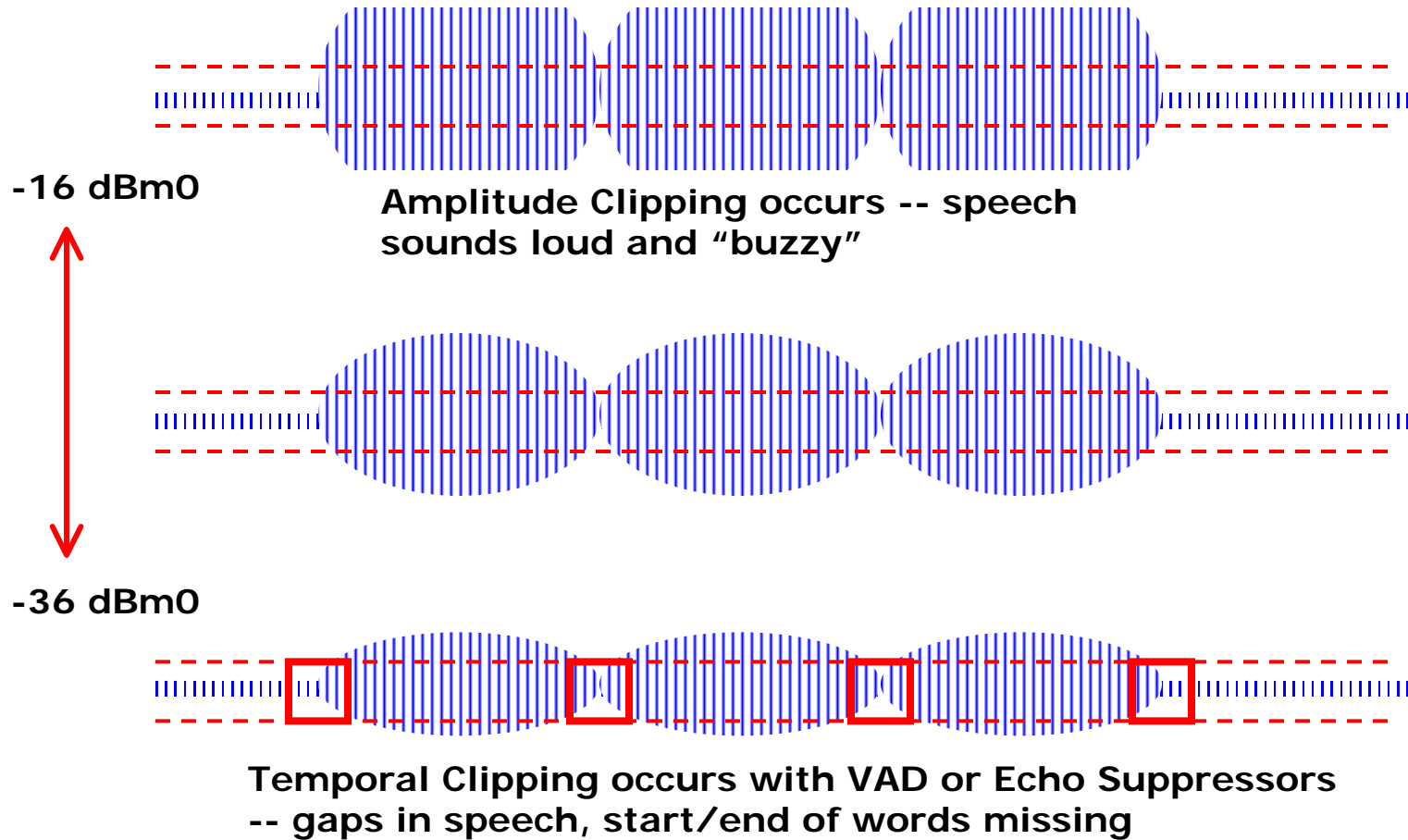
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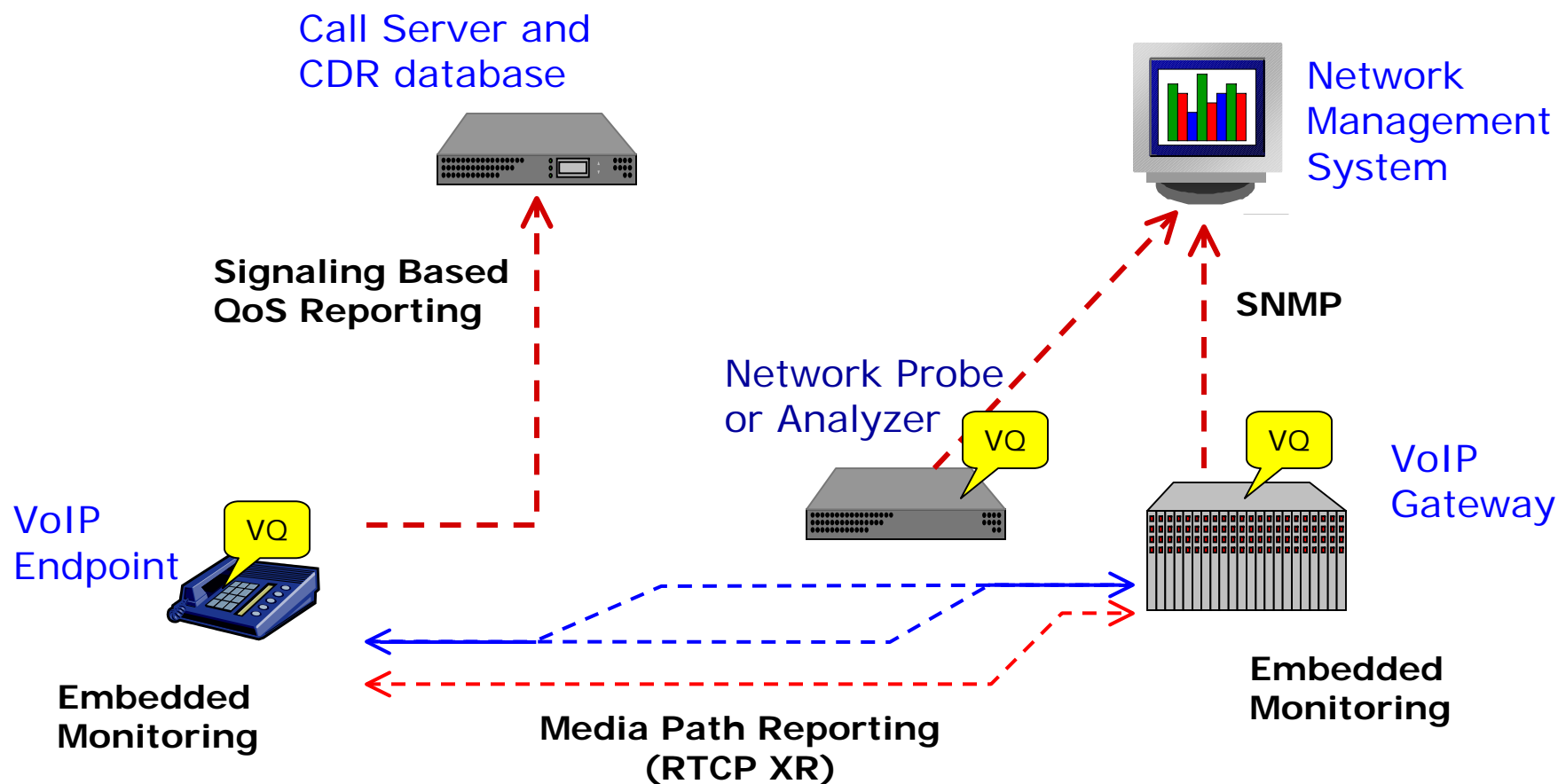
Additional delay introduced by VoIP makes existing echo problems more obvious

# Signal Level Problems

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# VoIP Performance Management Framework



# RTCP XR

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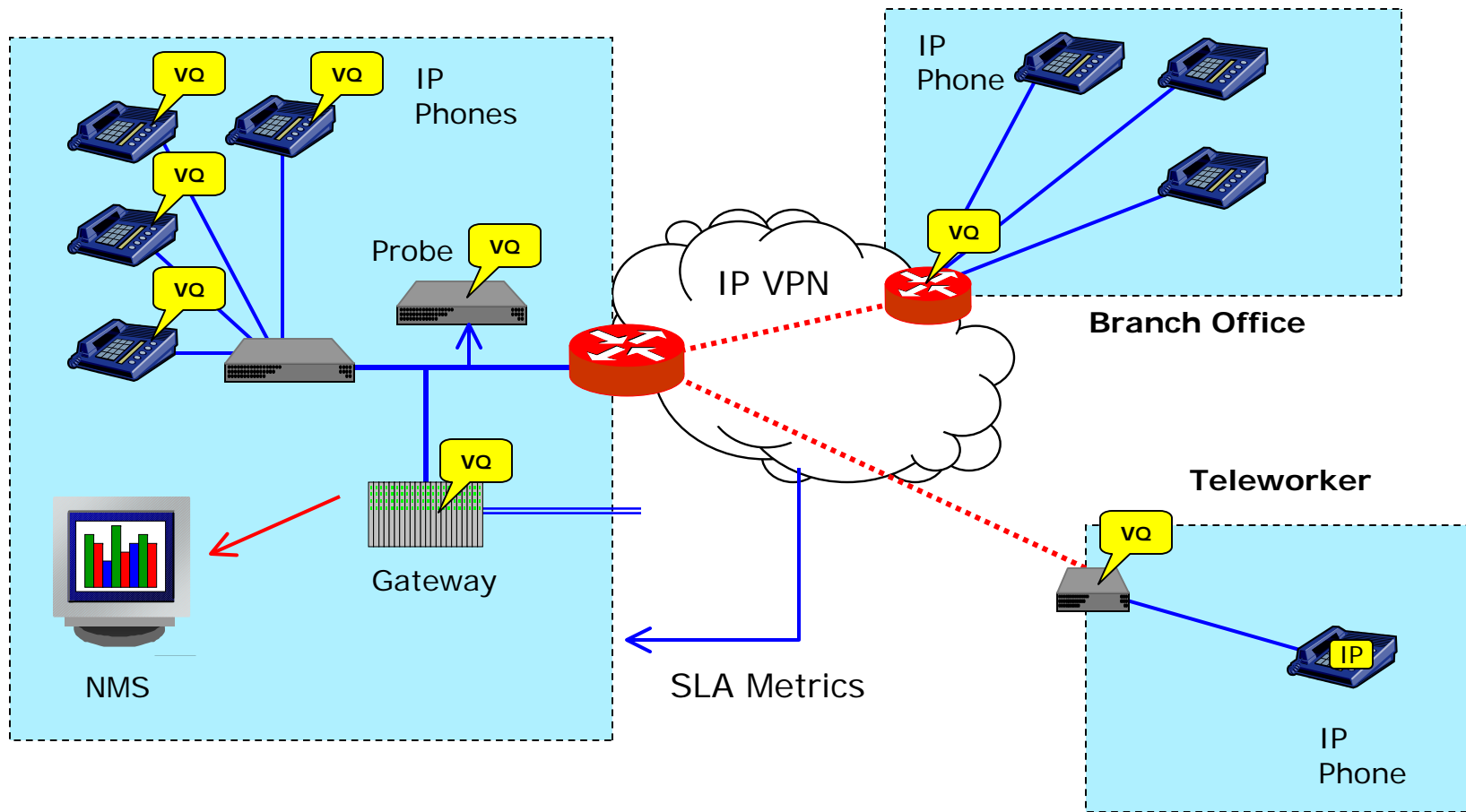
<b>Loss Rate</b>	<b>Discard Rate</b>	<b>Burst Density</b>	<b>Gap Density</b>
<b>Burst Duration (mS)</b>		<b>Gap Duration (mS)</b>	
<b>Round Trip Delay (mS)</b>		<b>End System Delay (mS)</b>	
<b>Signal level</b>	<b>RERL</b>	<b>Noise Level</b>	<b>Gmin</b>
<b>R Factor</b>	<b>Ext R</b>	<b>MOS-LQ</b>	<b>MOS-CQ</b>
<b>Rx Config</b>	<b>-</b>	<b>Jitter Buffer Nominal</b>	
<b>Jitter Buffer Max</b>		<b>Jitter Buffer Abs Max</b>	

# RTCP XR-Based Protocols

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- Media Path
  - RFC3611 RTCP XR -- published Nov 2003
- Signaling
  - SIP QoS Reporting -- draft, final by end Dec 04
  - H.323 reporting (H.460.9) -- published Apr 04
  - Megaco reporting (H.248.30) -- published Apr 04
  - MGCP -- not yet started
- SNMP
  - RTCP XR MIB -- draft, final by March 05

# Enterprise Application Using New Framework



# Summary

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- Voice over IP Performance Problems
  - IP problems
  - Non-IP problems
- VoIP Performance Management Framework
- RTCP XR

## Telchemy Overview

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- Leading provider of technology for VoIP Fault & Performance Management
- Products deployed for 3 years; widely used by Enterprise and Service Providers
- Multiple patents/applications
- Led development of VoIP performance reporting standards in IETF and ITU
- Widely recognized as “Subject Matter Experts” on VoIP performance