RTCP XR VoIP Metrics Overview

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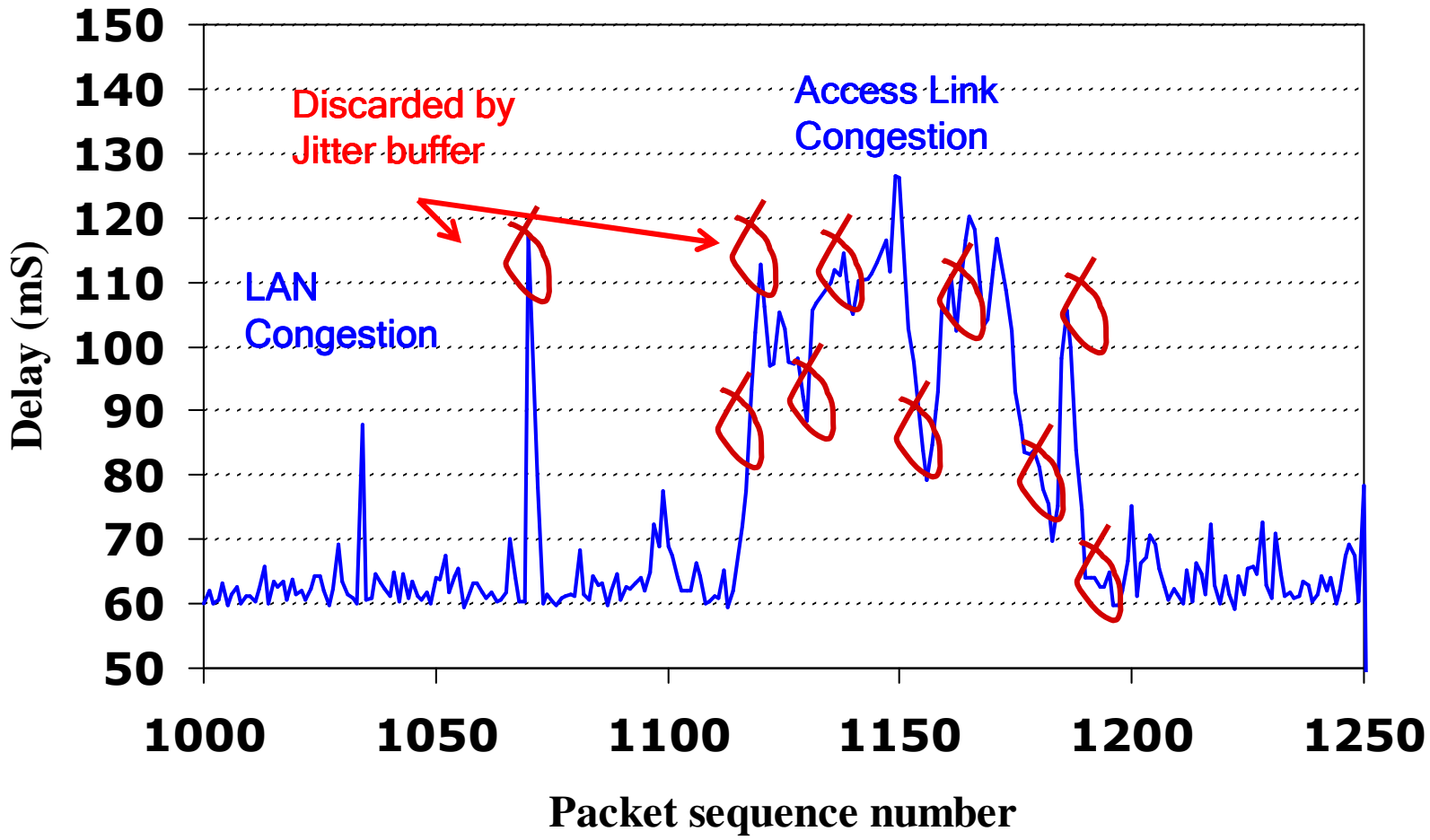
Outline

- VoIP Management Requirements
- Time varying packet level impairments
- Rationale behind XR VoIP Metrics
- Outline of metrics
- Integration into IP endpoints
- Future work

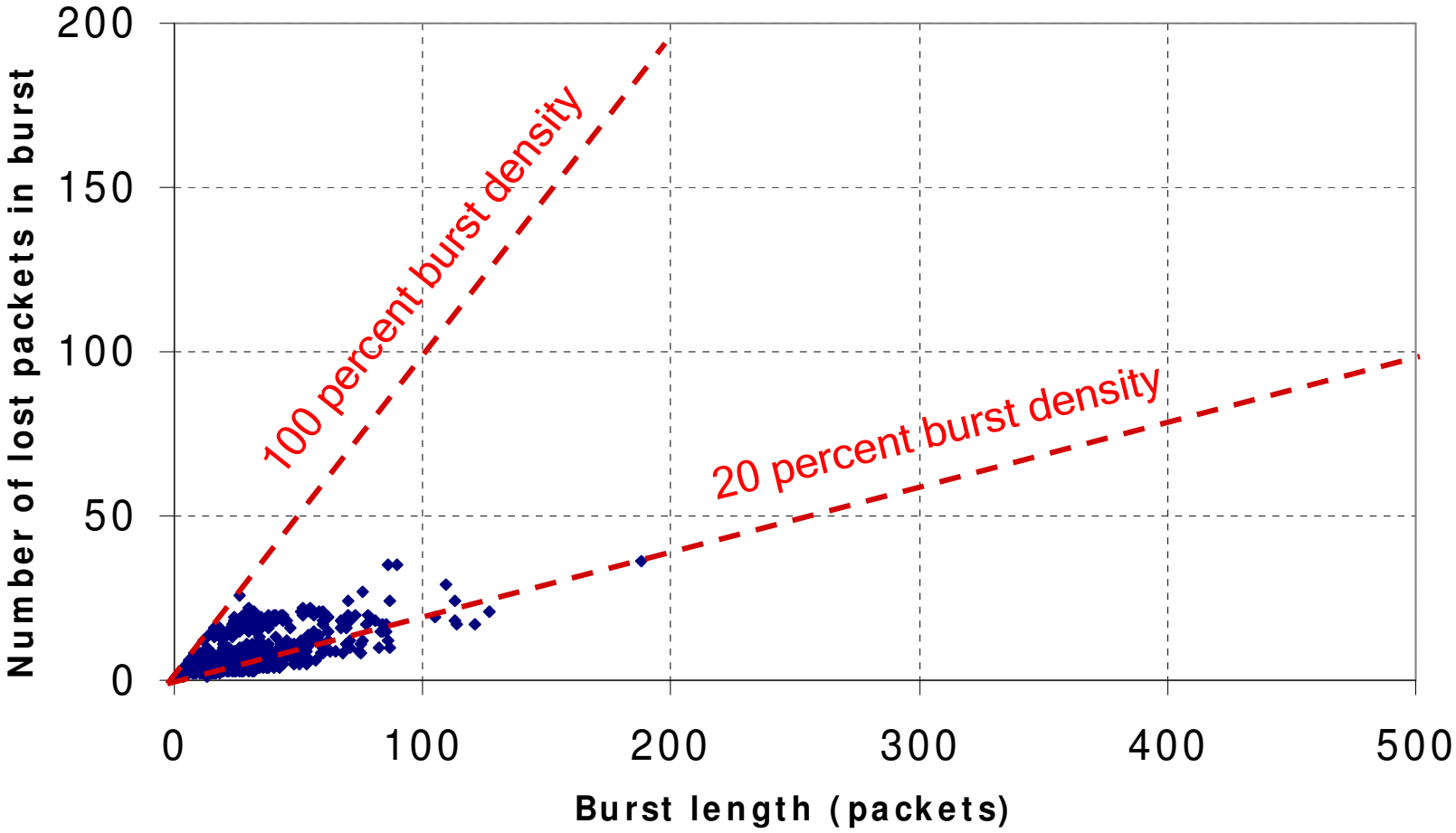
VoIP Management Requirements

- Calls can experience transient problems
- Impairments include loss, jitter, high/low signal level, echo, noise, delay
- Ideally
  - Need to monitor every call
  - Need to provide enough data to post-analyze
  - Need to deal with system level problems such as echo
- Protocols also need to be firewall friendly, in order to support IP Centrex, Residential VoIP and similar applications

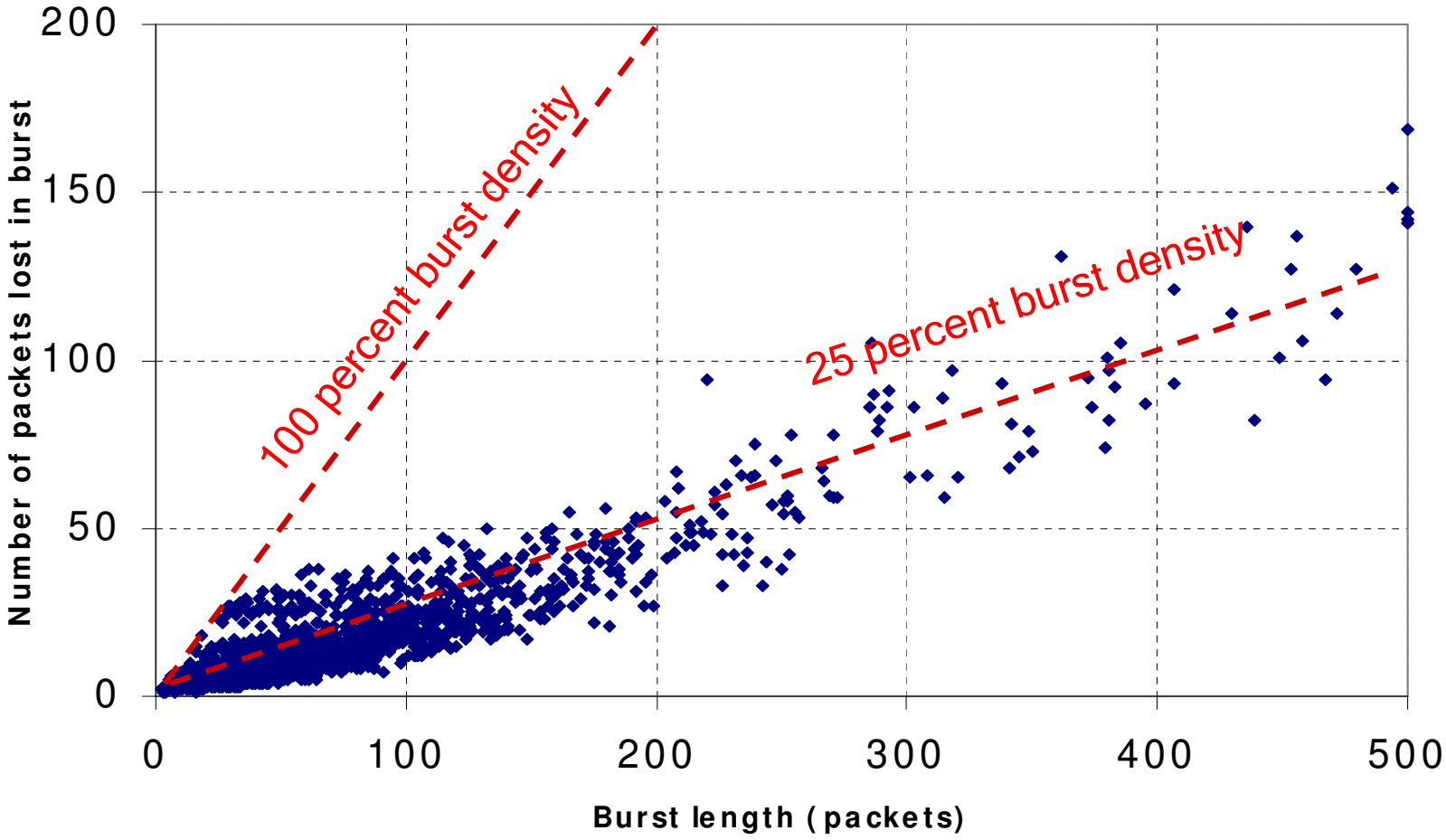
Jitter is caused by congestion - transient!!



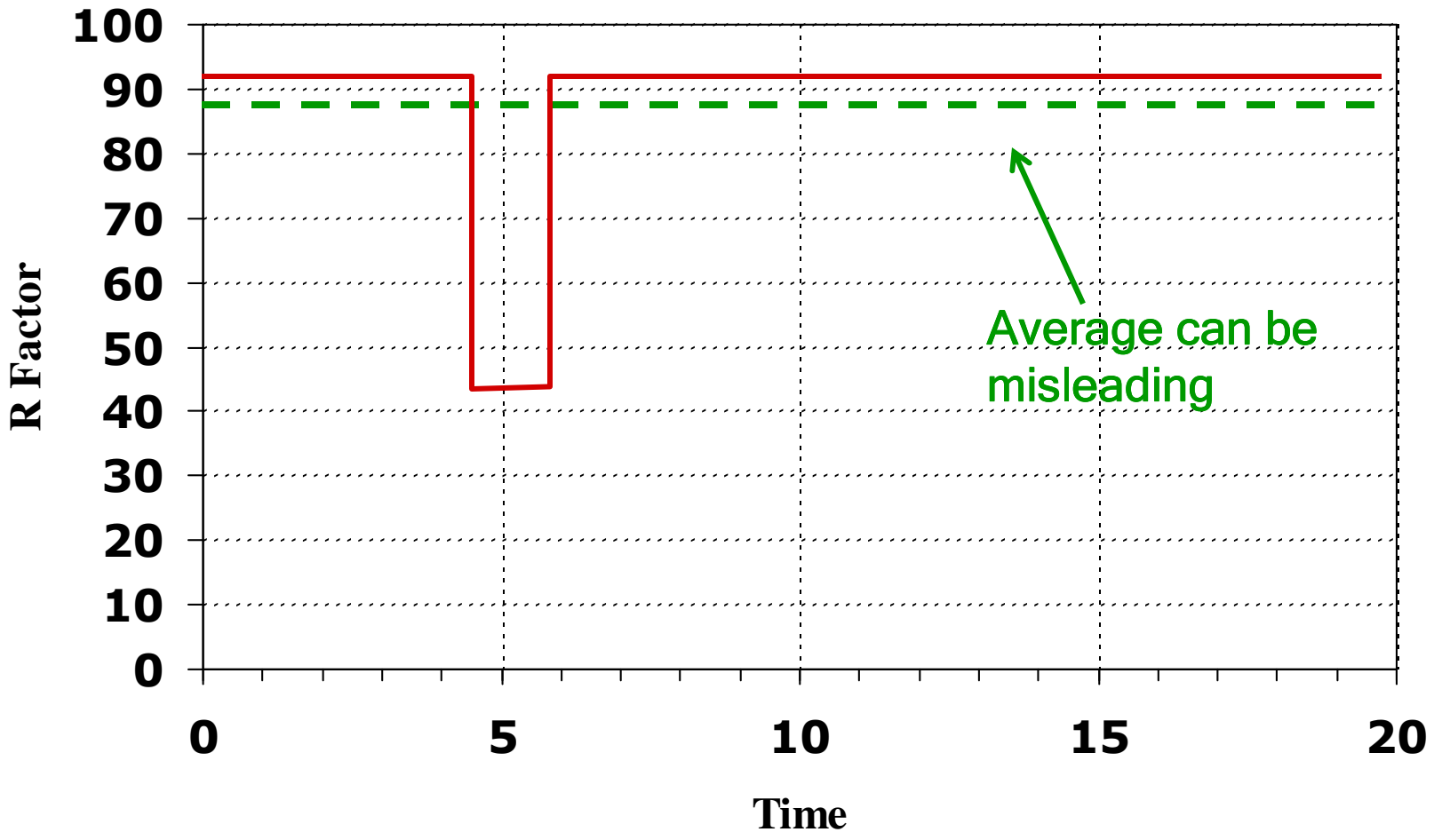
Packet Loss Distribution



Packet Loss and Discard Distribution



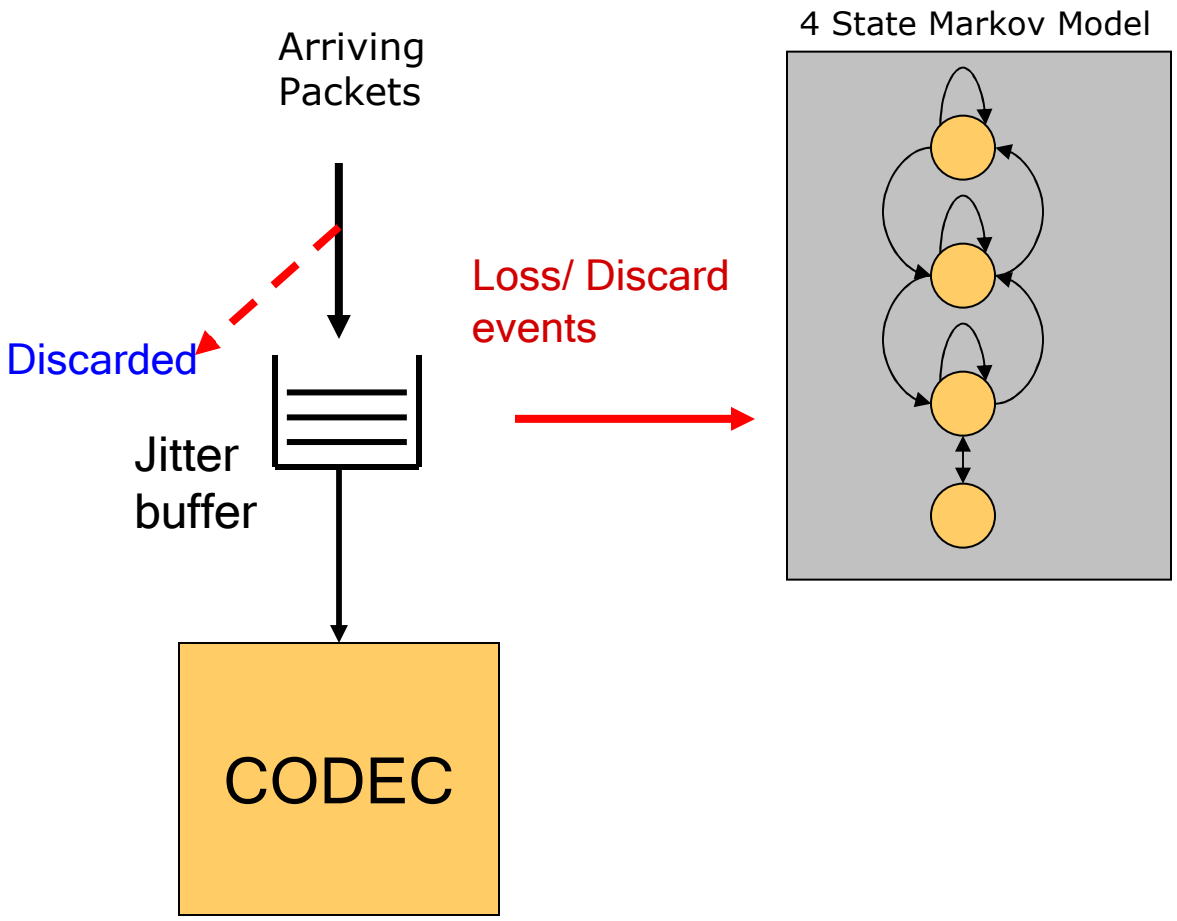
Leads to time varying call quality



Implications?

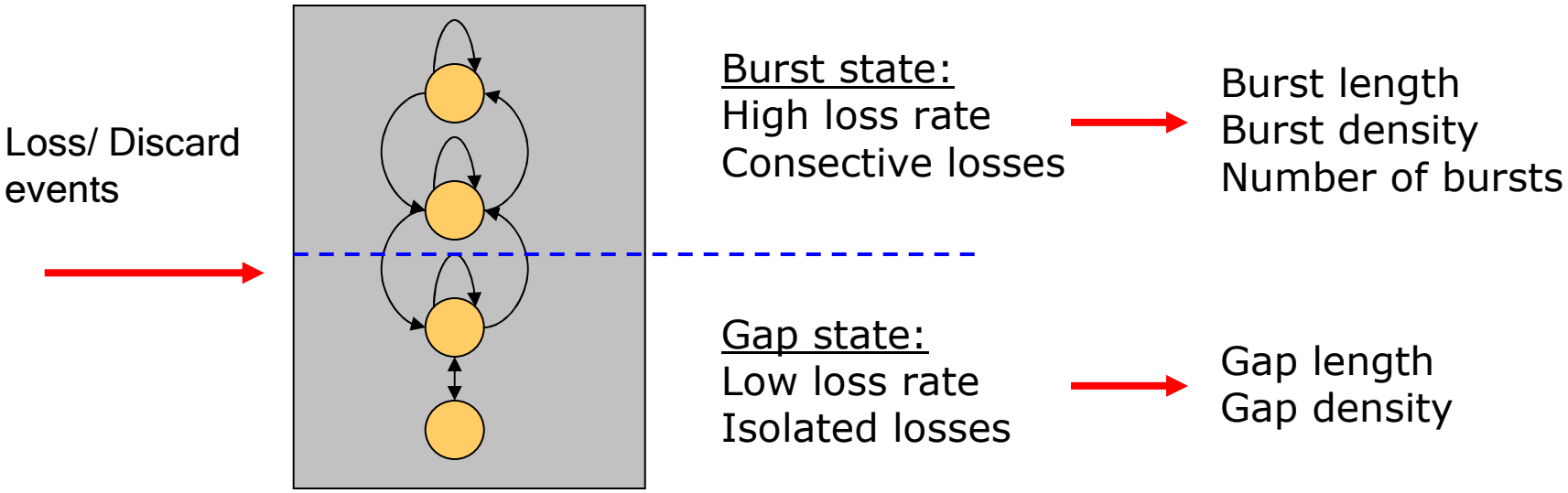
- Loss and jitter are time varying
- Jitter leads to packet discard (similar impact to packet loss)
- Need to measure distribution of lost and discarded packets

Measuring loss/discard distribution



Statistical Model
Gather detailed packet loss info in real time

Packet Loss Model

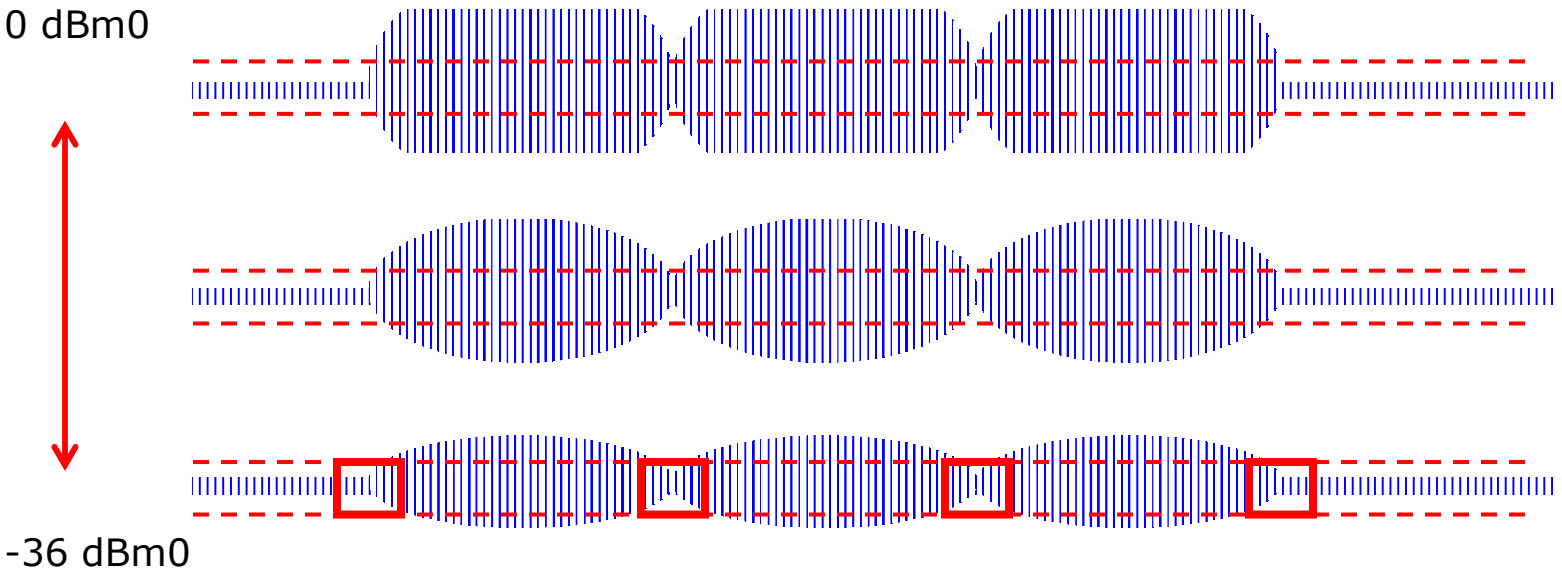


Computationally efficient way to gather information on packet loss/discard distribution

Packet loss model standardized in ETSI TS 101 329-5 Annex E and RFC3611

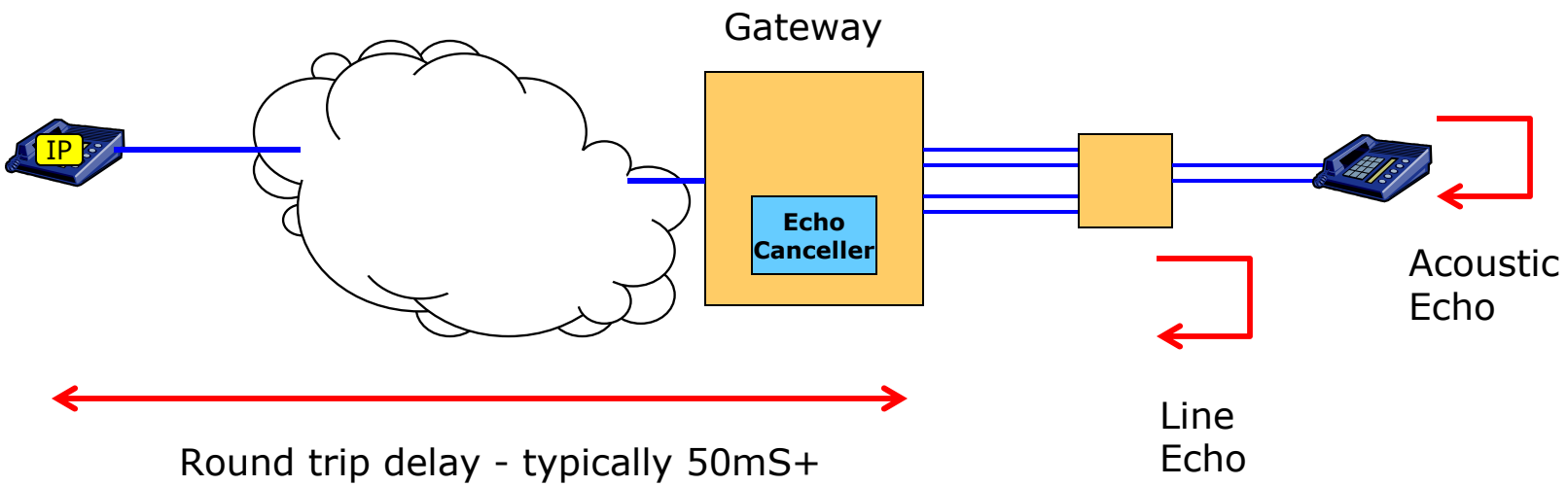
Signal Level Problems

Amplitude Clipping occurs -- speech sounds loud and "buzzy"



Temporal Clipping occurs with VAD or Echo Suppressors -- gaps in speech, start/end of words missing

Echo problems



Echo is a “system level” problem, involves interaction between several network components and impairments

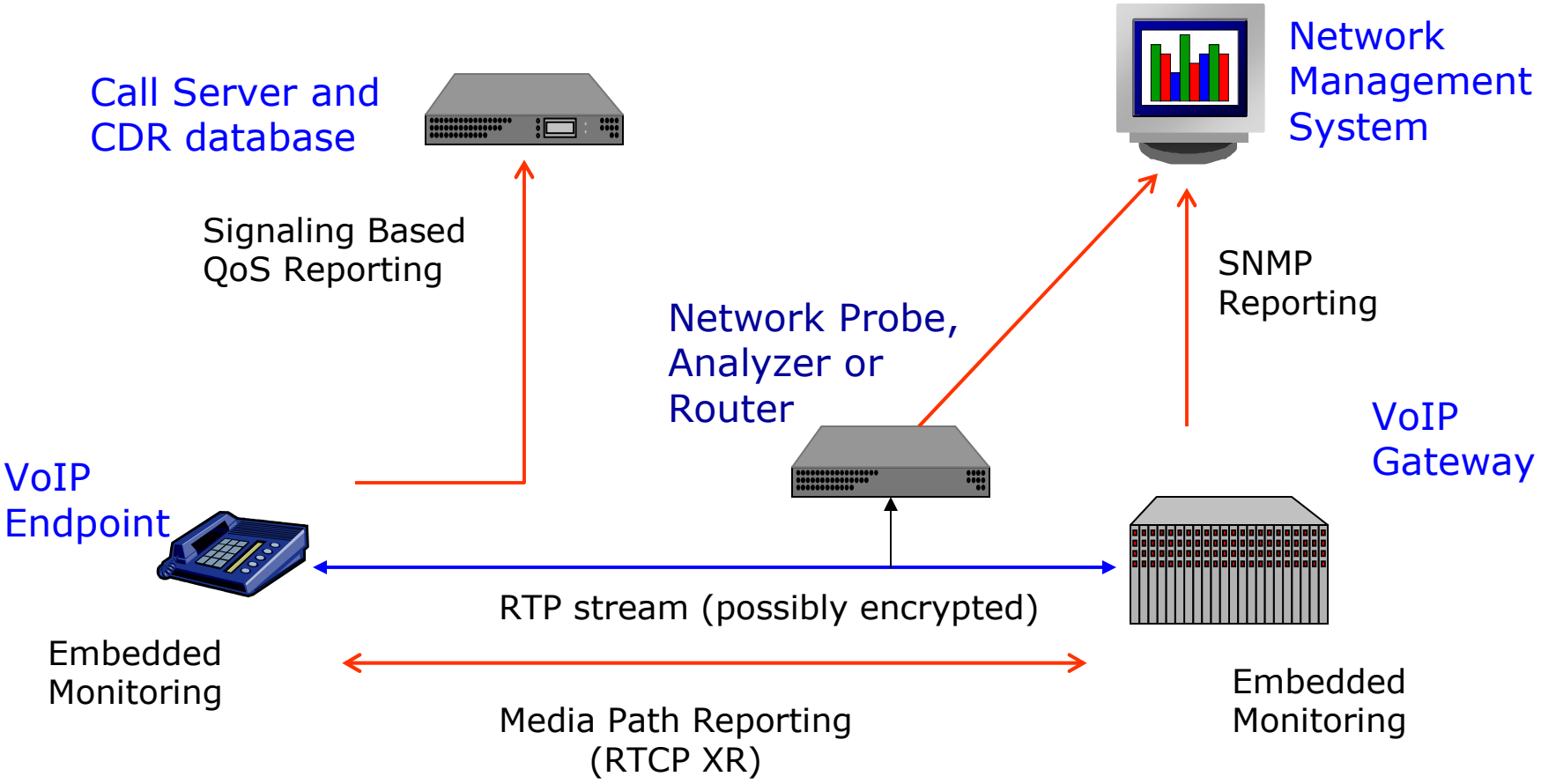
Need to consider “analog” impairments

- Signal level, noise level, echo level
- Difficult to measure mid-stream (packet decoding, Secure RTP…)
- Easy to measure inside DSP (already handling voice samples and canceling echo)
- Why not make the DSP do the work of measuring these parameters?

Basic design philosophy behind RTCP XR

- Embed measurement in the endpoints
- Correlate data in real time - send less data that is more meaningful
- Measure distribution of lost and discarded packets
- Leverage the DSP to measure analog parameters
- Provide support for understanding system level problems such as echo
- Use a protocol that exists and is firewall friendly

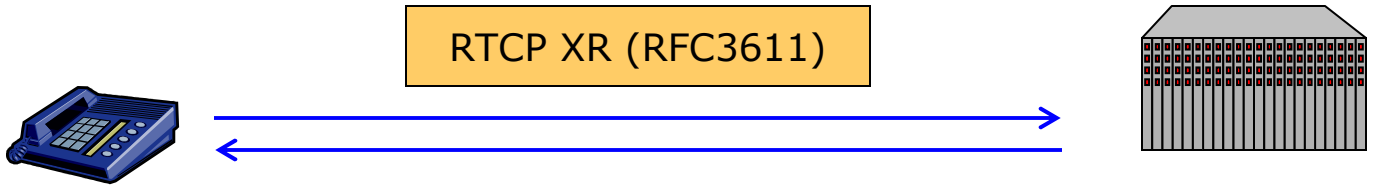
VoIP Performance Management Framework



RFC3611 - RTCP XR

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

The role of RTCP XR



1. Provides a useful set of metrics for VoIP performance monitoring and diagnosis
2. Supports both real time monitoring and post-analysis
3. Extracts signal level, noise level and echo level from DSP software in the endpoint
4. Exchanges info on endpoint delay and echo to allow remote endpoint to assess echo impact
5. Provides midstream probes/ analyzers access to analog metrics if secure RTP is used
6. Traverse firewalls……

New/ Future Work

- High Resolution metrics
- Video metrics
- Modem/Fax quality metrics