# VoIP Performance Management

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# Outline

- VoIP Performance Problems
- Embedded performance monitoring
- Data collection
- Application scenario

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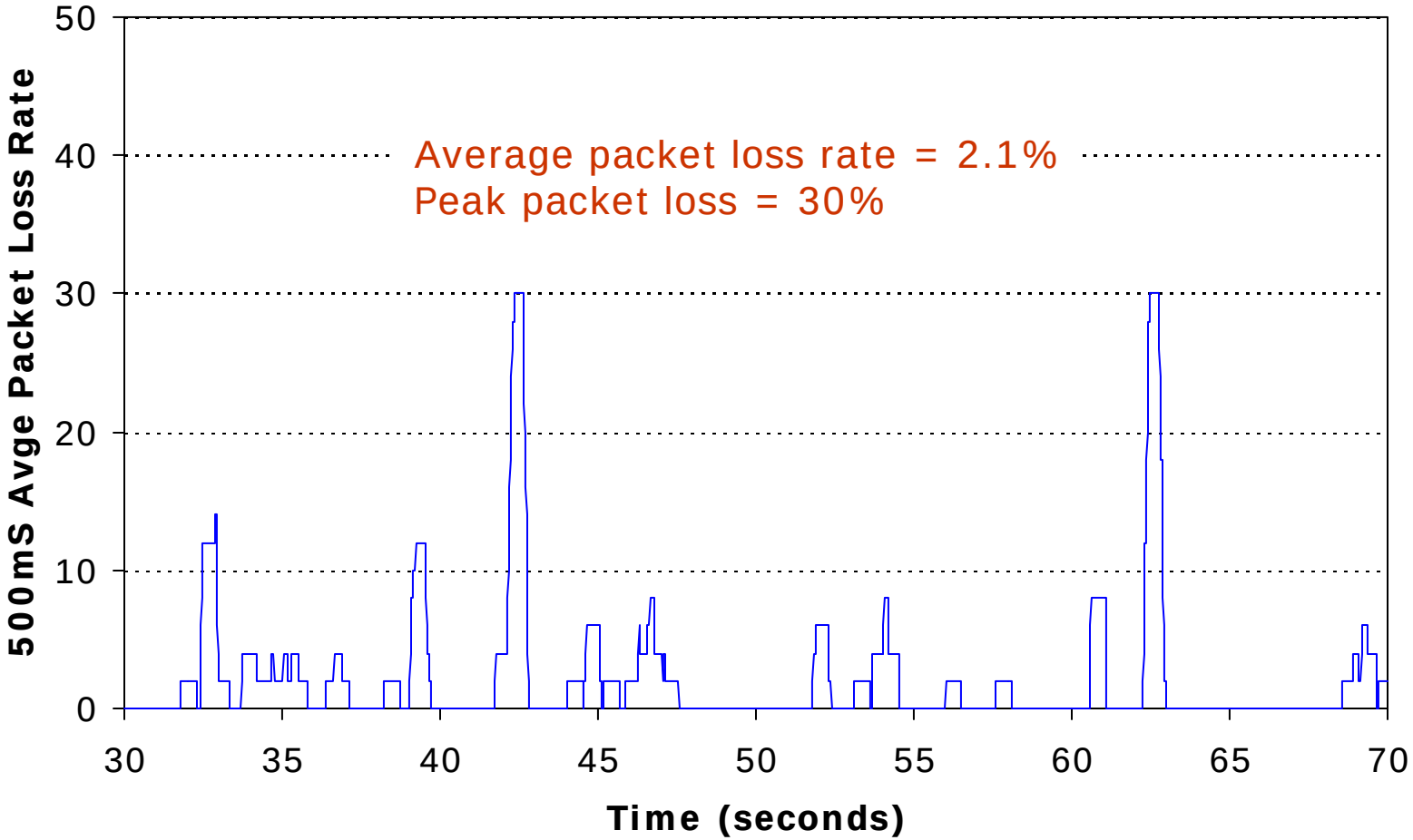
# Packet Loss is strongly time varying

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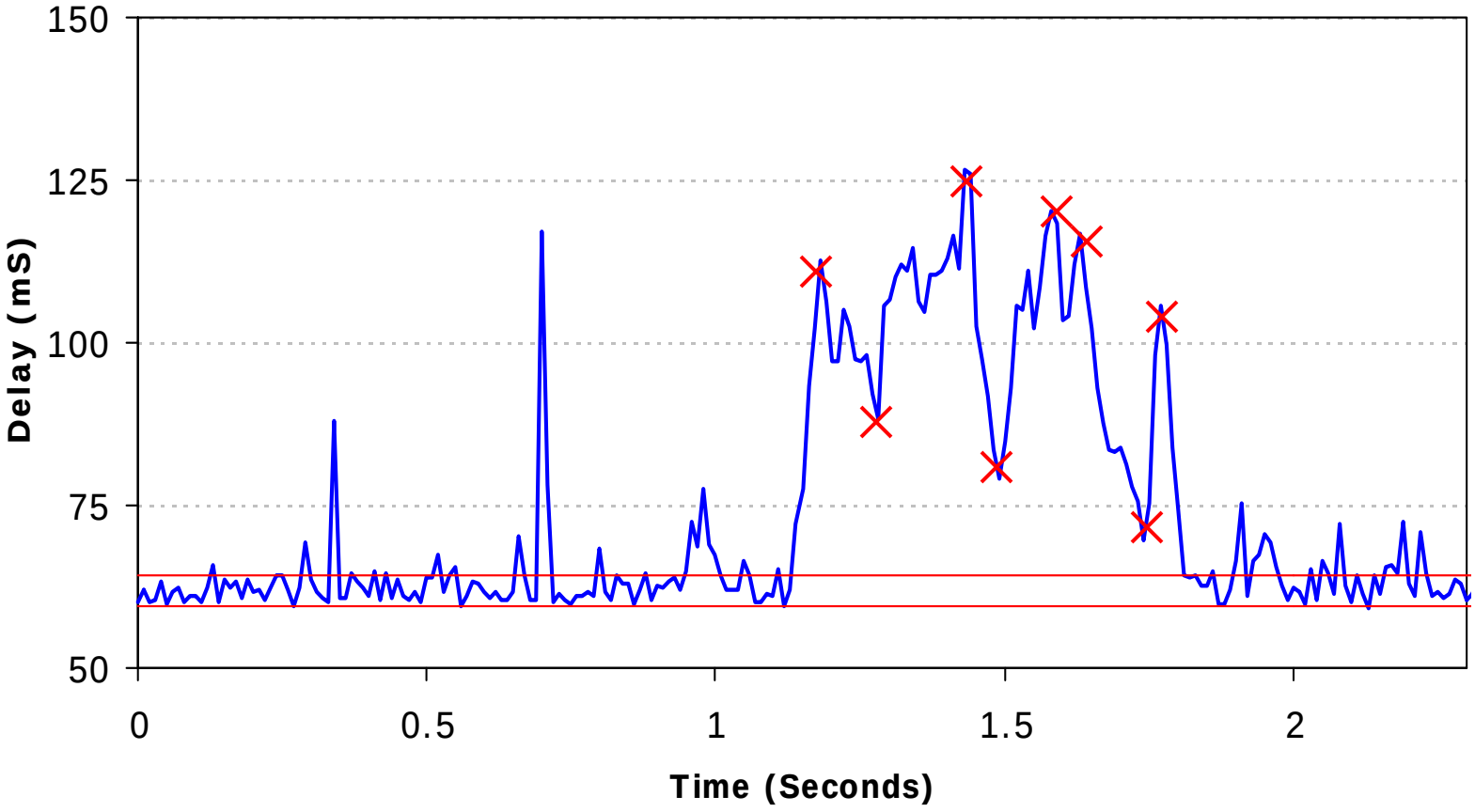
# Jitter – leads to time varying packet discards

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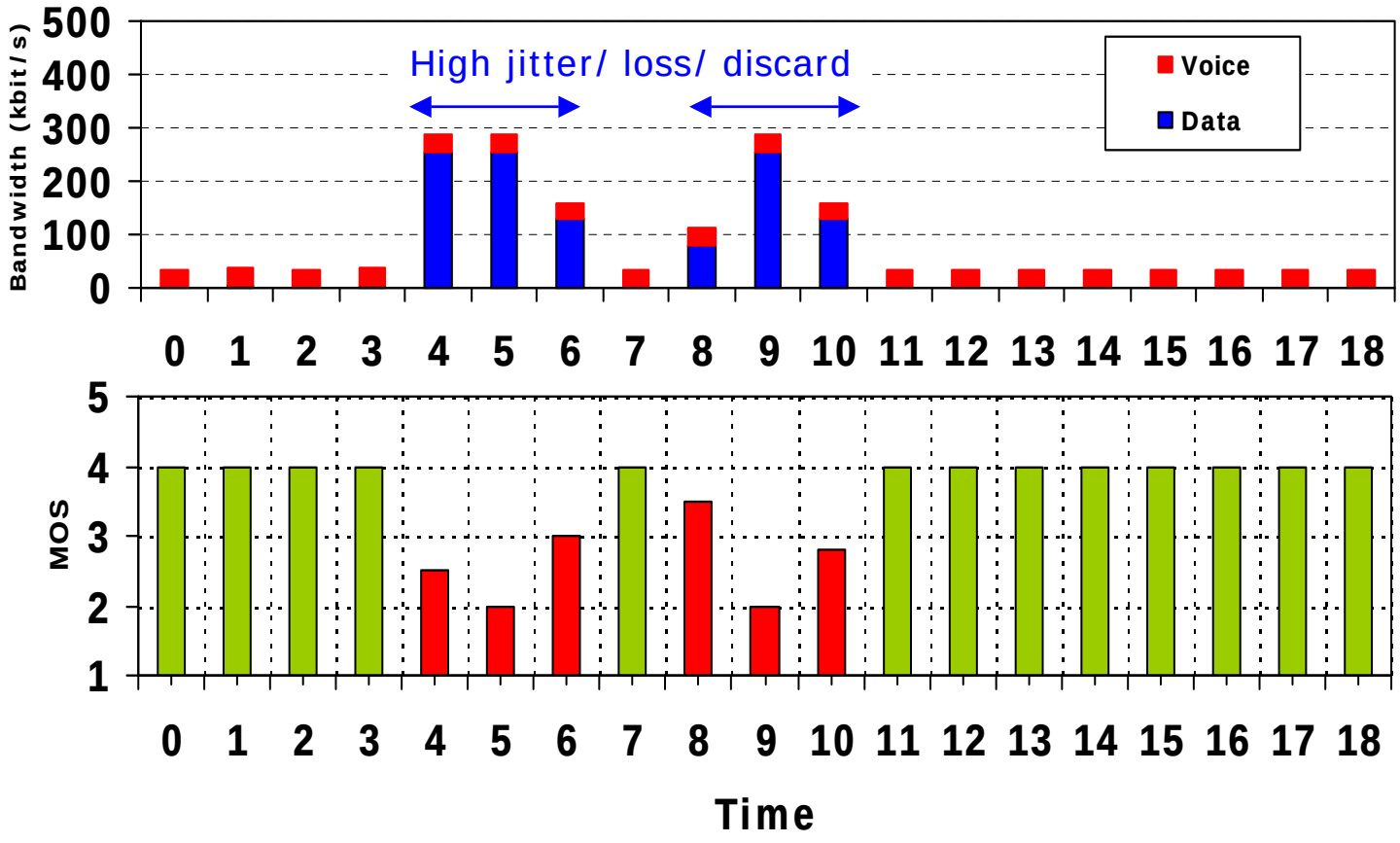
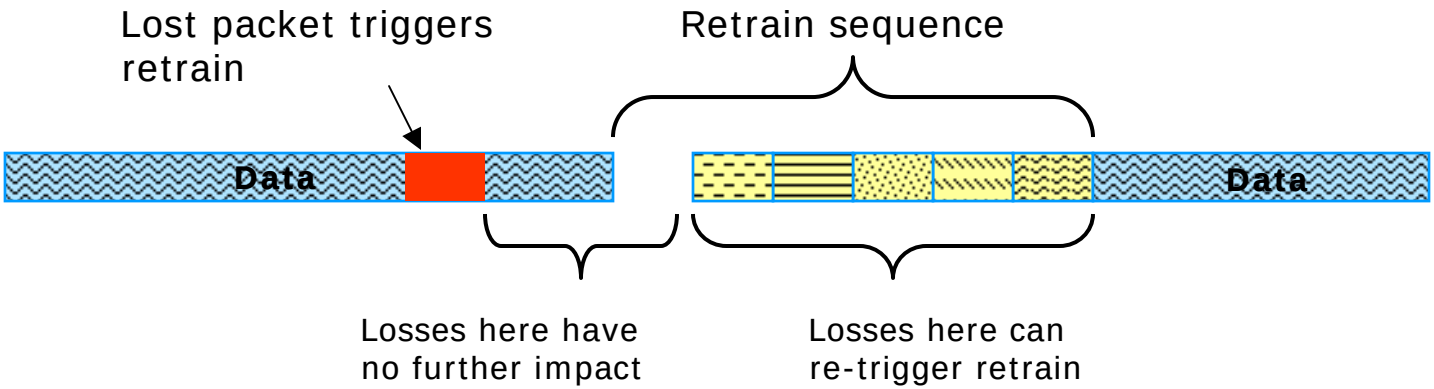
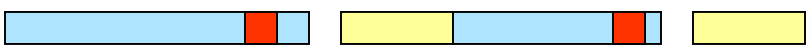
# Impact on Voice Quality



# Impact of packet loss on modem/fax calls




Bursty packet losses
- modem/fax disconnects



Widely dispersed packet losses
- lose throughput but connection ok

Hence - reliability and throughput depend strongly on packet loss distribution

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# Other key factors affecting performance

- Signal level
  - Can be too high or too low
- Noise level
  - Can be too high or too low
- Echo return loss
  - Major problem if delay > 50ms
- Delay
  - 50+ ms – exacerbates echo problems
  - 300+ ms – causes conversational difficulty

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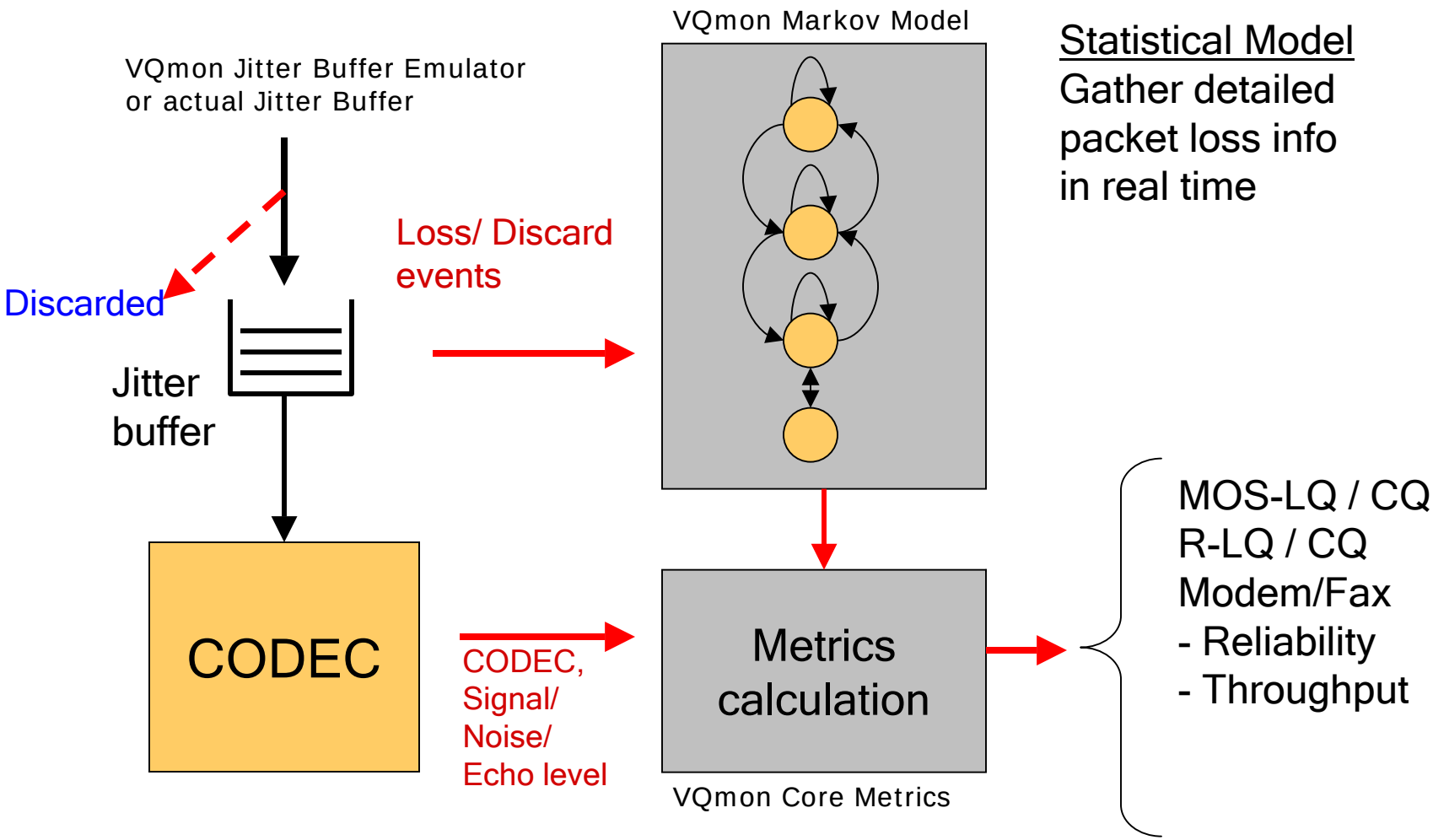
# Inside VQmon




Statistical Model
Gather detailed
packet loss info
in real time

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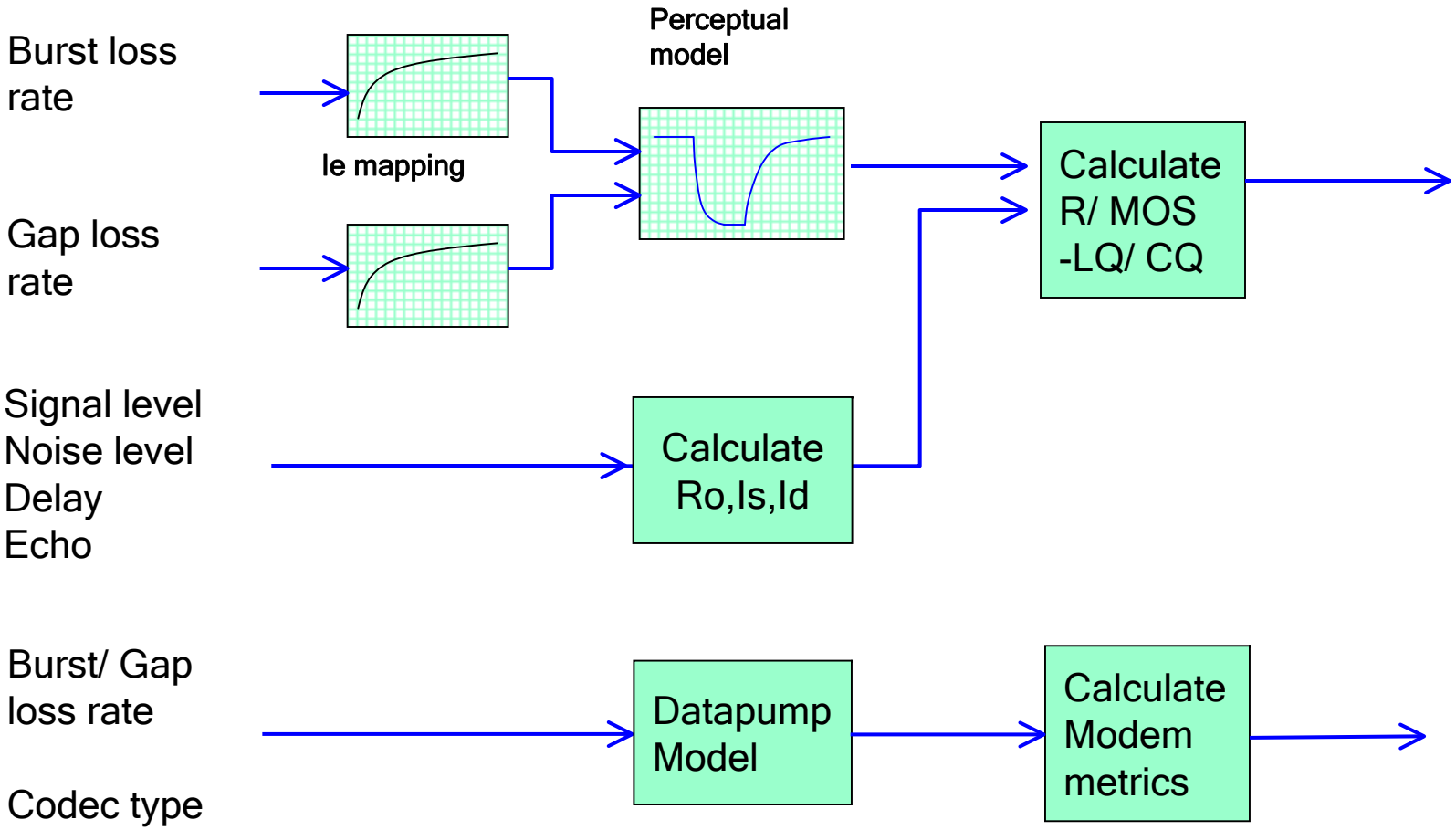
# VQmon 2.0/2.1 computational model

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# Typical VoIP performance metrics

**Call Quality (NB/WB)**
- R-LQ
- R-CQ
- MOS-LQ
- MOS-CQ

- Modem/Fax Throughput
- Modem/Fax Reliability

**Signal Metrics**
- Signal Level
- Noise Level
- Originating RERL
- Terminating RERL

**Burst Metrics**
- Burst R
- Burst Count
- Burst Loss Rate
- Burst Length (Packets)
- Burst Length (mS)
- Gap R
- Gap Count
- Gap Loss Rate
- Gap Length (Packets)
- Gap Length (mS)
- Loss/Discard Rate
- Loss Rate
- Discard Rate

**Degradation factors**
- Due to Loss (%)
- Due to Discard (%)
- Due to Delay (%)
- Due to Codec (%)
- Due to Signal Level (%)
- Due to Noise Level (%)
- Due to Echo Level (%)
- Due to Recency (%)

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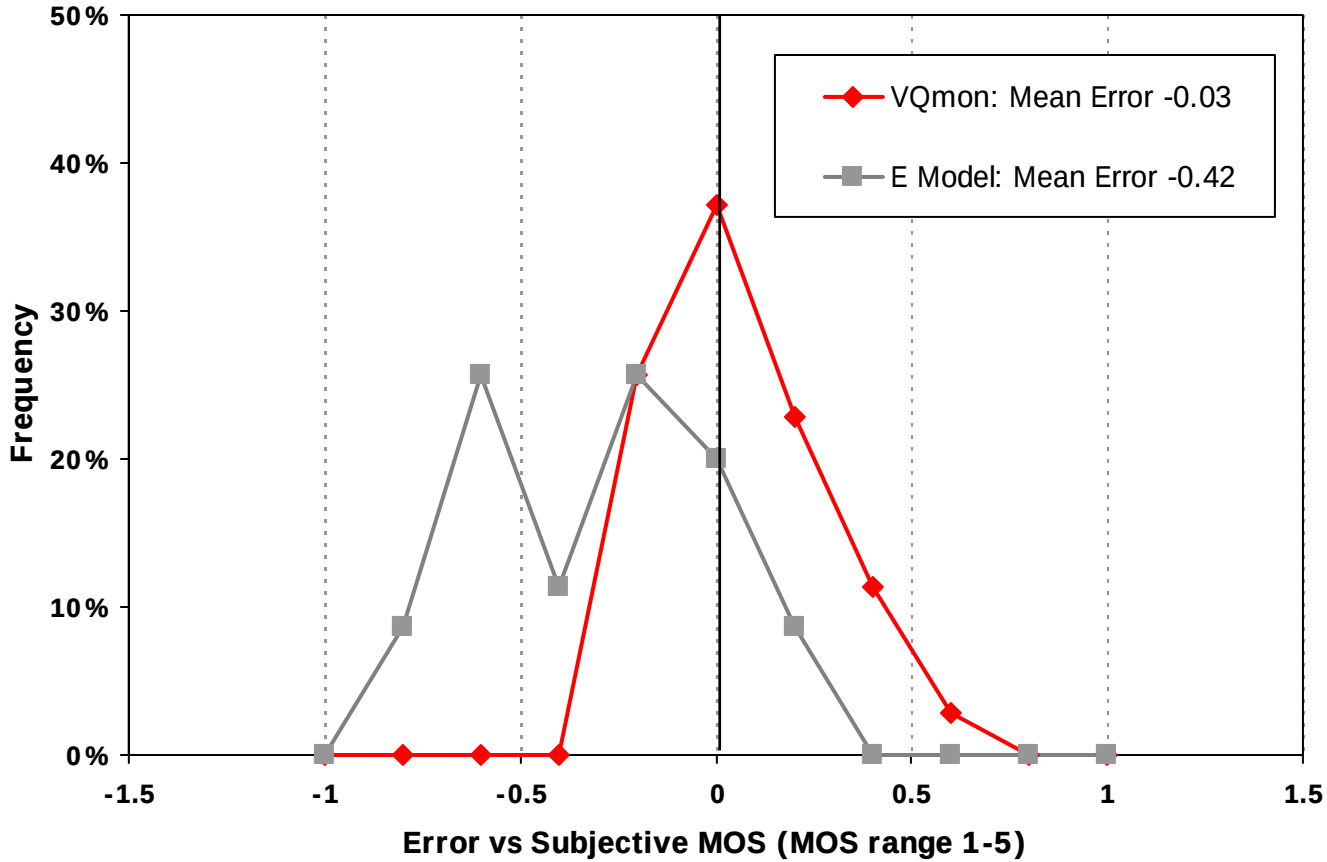
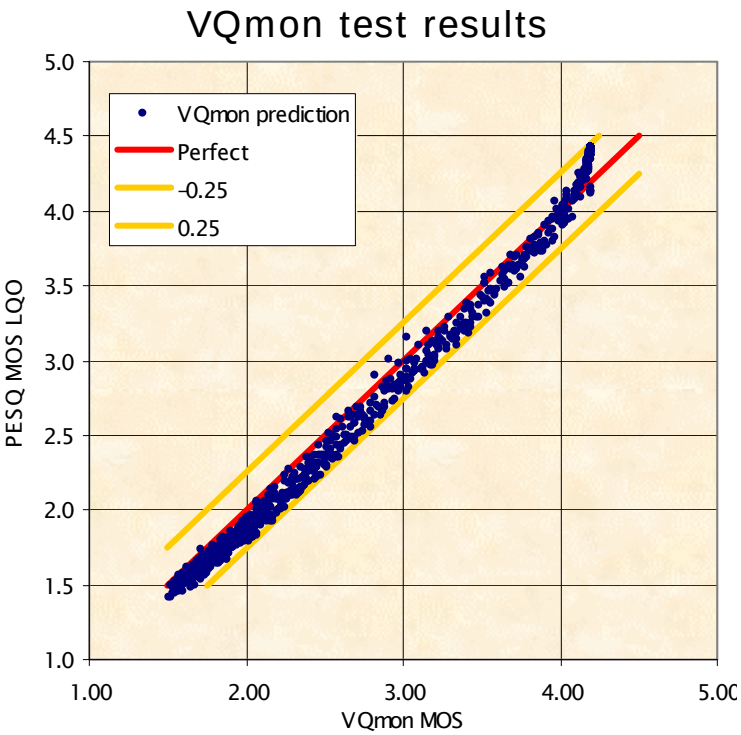
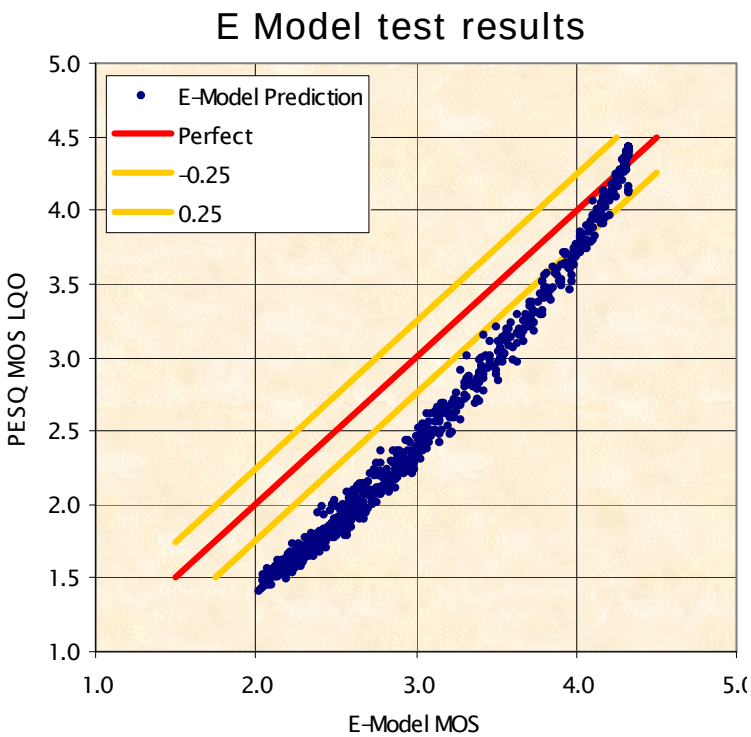
# Subjective test results




Source ITU, subjective test data from France Telecom, comparisons performed by the University of Bochum (Germany)

# Objective test results




Tests performed according to P.564 ..ITU standard for testing the accuracy of MOS estimation algorithms against PESQ

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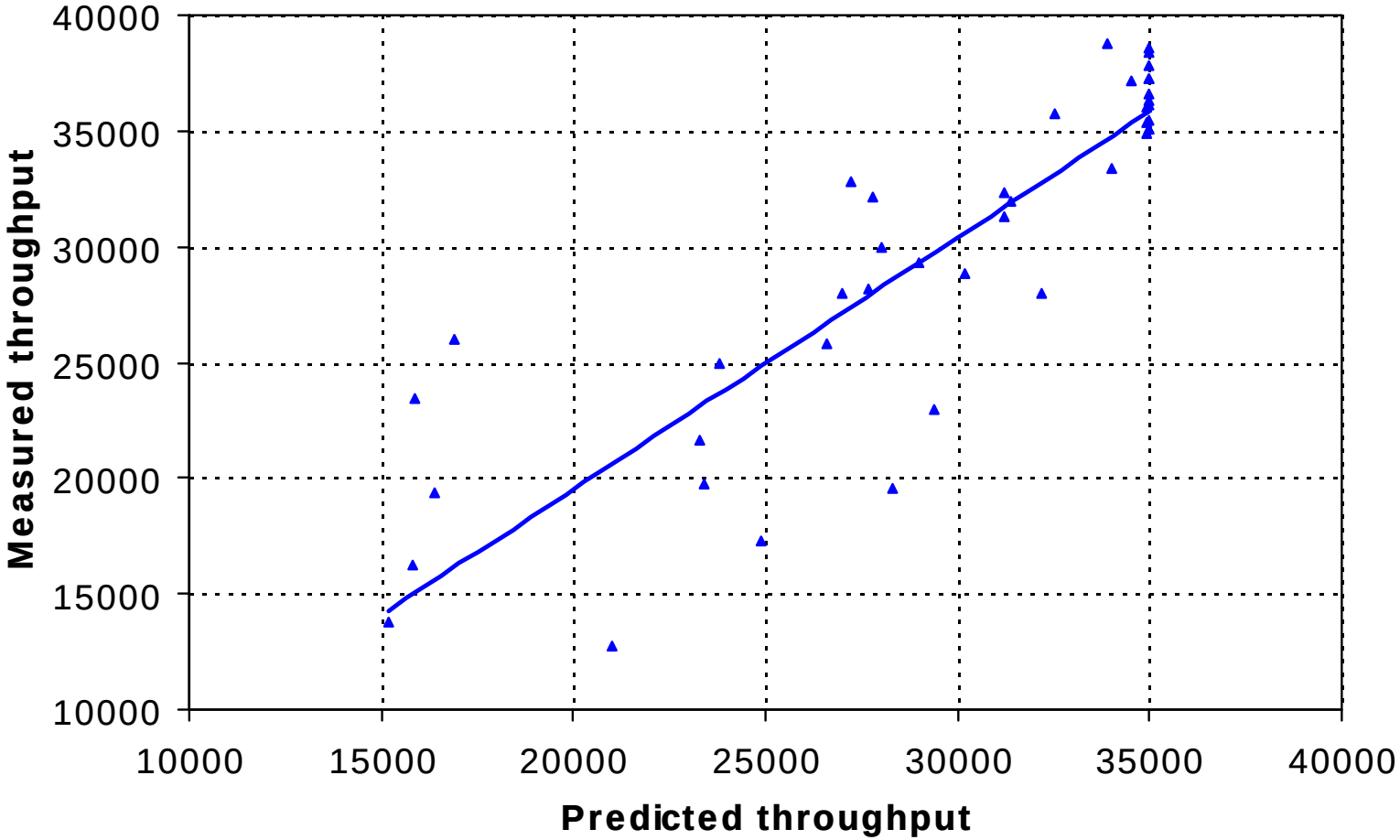
# Modem/Fax - Throughput Prediction

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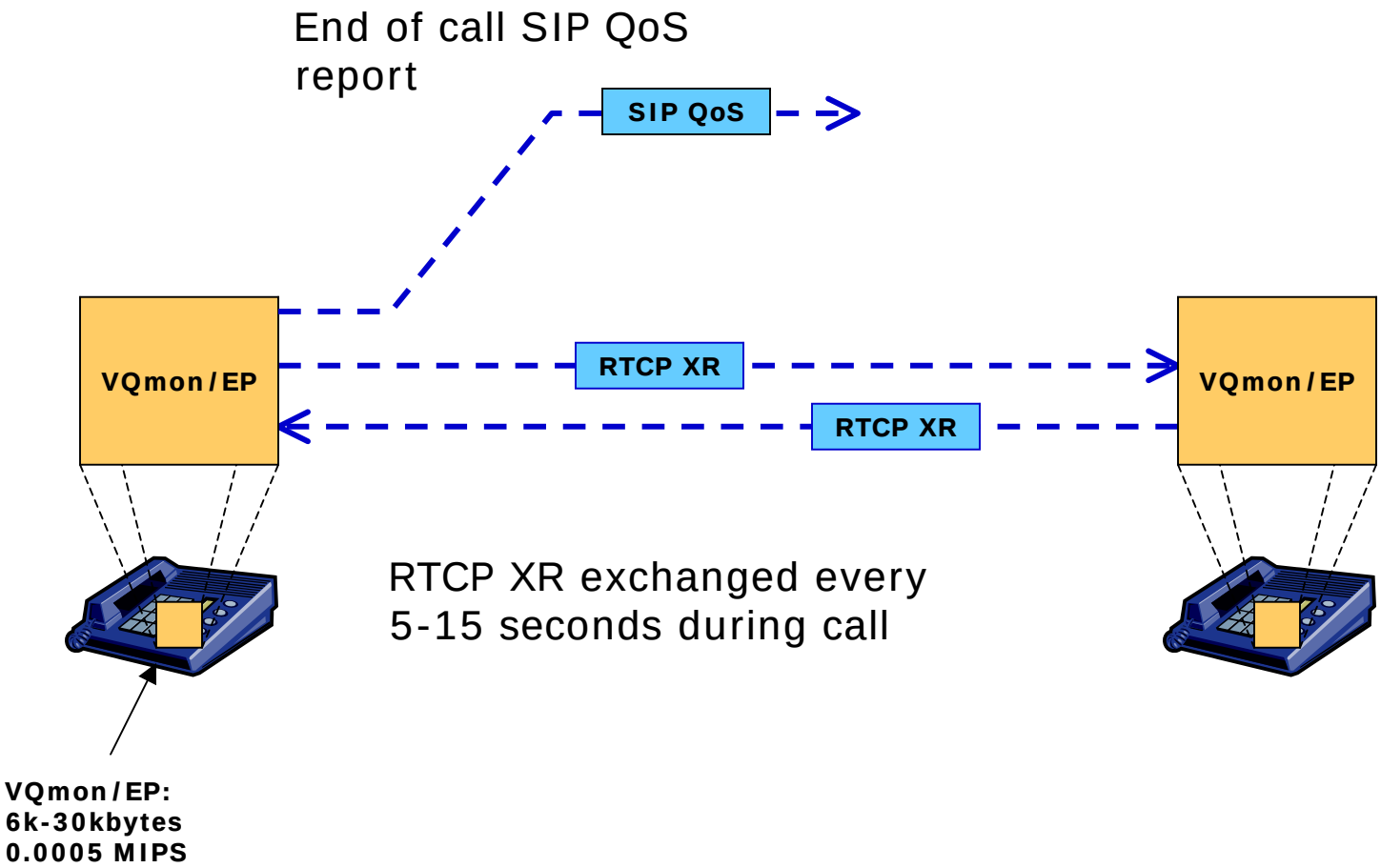
# VoIP Performance Management Model

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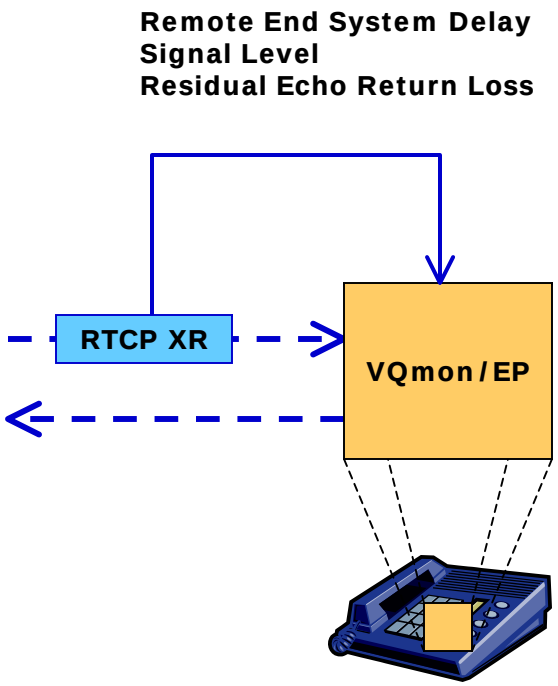
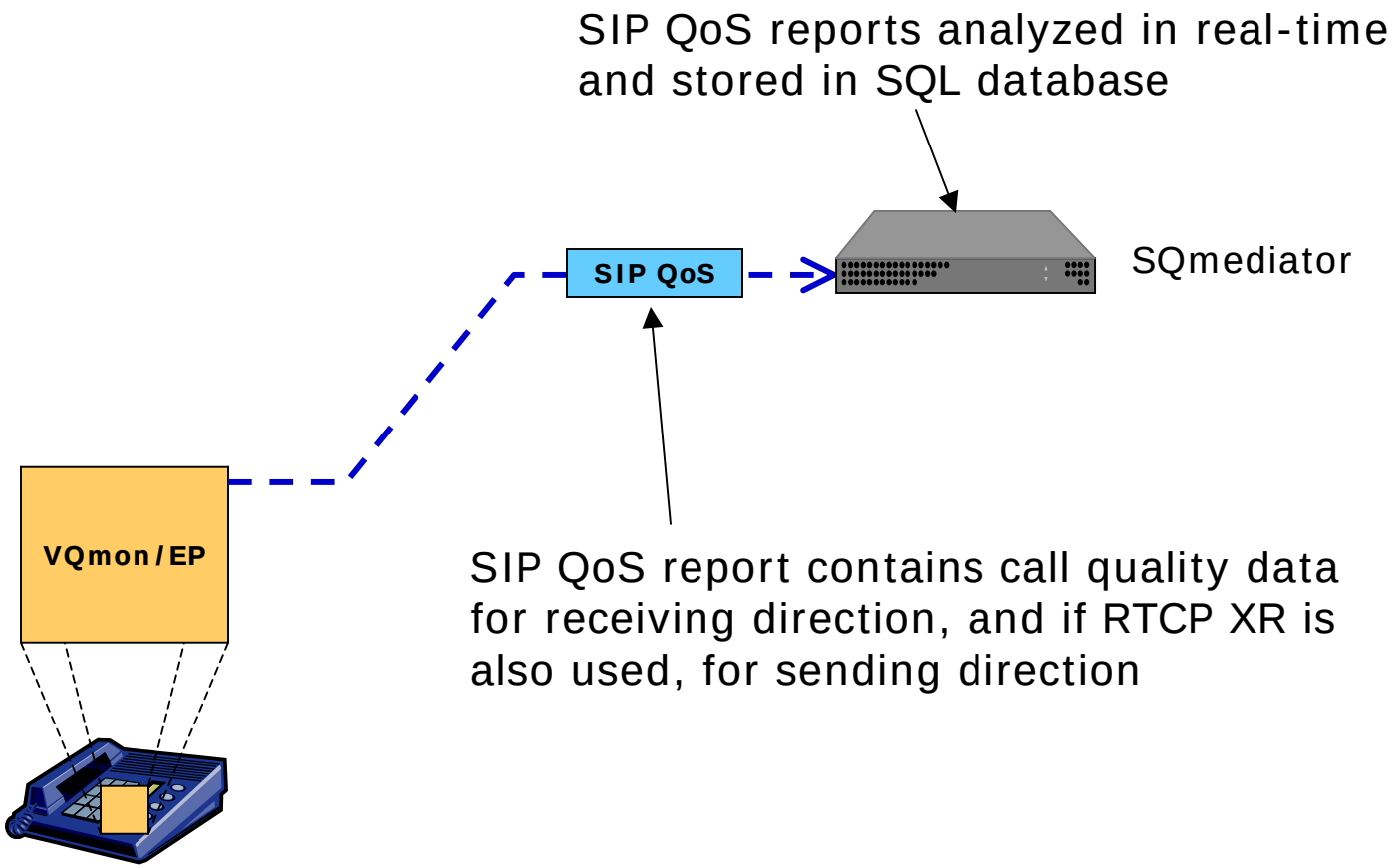
# VQmon/EP generation of RTCP XR messages



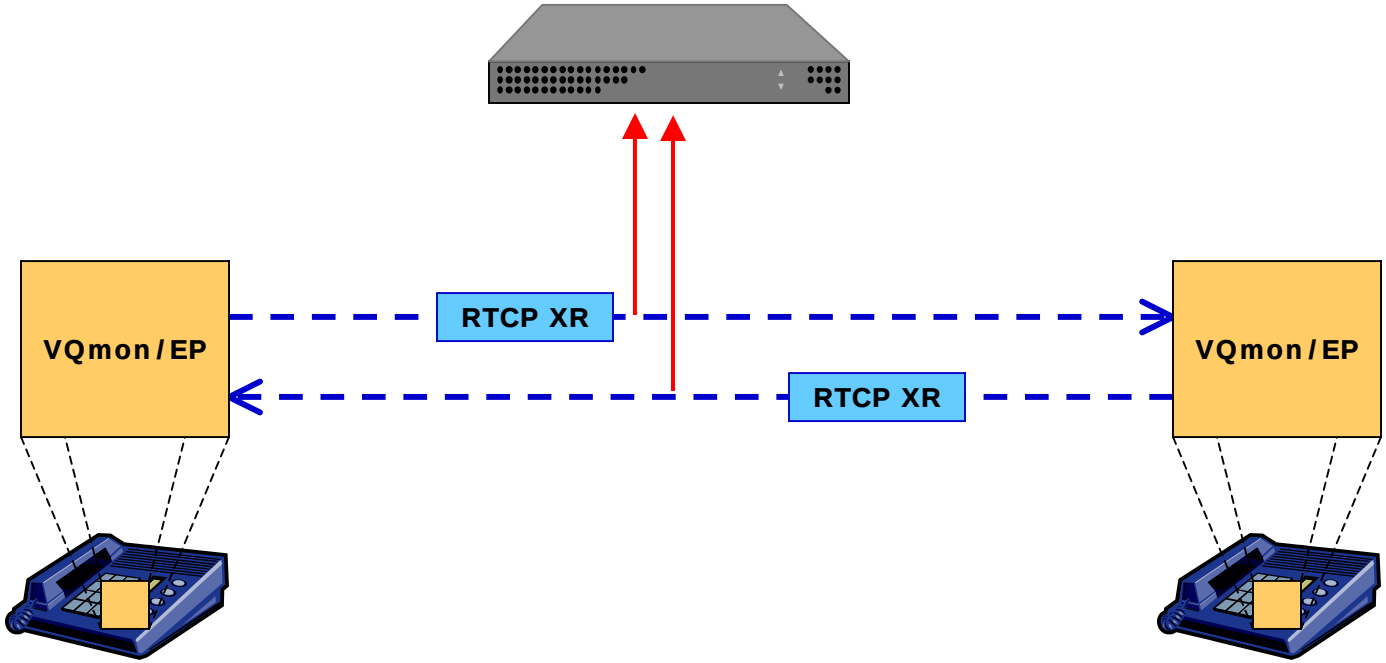

VQmon/EP incorporates some data from remote endpoint into call quality calculations made at “this” endpoint

# SQmediator for call quality reporting



# SQprobe for mid-stream analysis/collection

SQprobe - analyzes RTP streams directly, collects RTCP XR messages and integrates local measurements with endpoint reported data

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# Summary

- VQmon – most widely used VoIP performance monitoring agent technology
- IP impairments are time varying
  - Bursty loss
    - Interferes with modem/ fax retrain process – leads to low reliability & low throughput
    - Causes transient voice quality problems
- VQmon + SQmediator provides
  - Accurate voice quality metrics
  - Modem/Fax performance and reliability metrics
  - Scaleable data collection system

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# Telchemy Overview

- Leading provider of technology for Voice and Video Fault/ Performance Management

- VQmon technology
  - economically measures call quality and captures diagnostic data at both endpoint and midstream on every voice or video over IP call/session
  - used by 80 equipment vendors, 100+ different product lines, over 8 million units licensed, deployed in Carrier/Enterprise networks for 5 years

- Leading technical contributor for 9 key VoIP and IPTV management protocols in IETF, ITU, PacketCable, participant in ATIS IIF

- Close working relationships with many carriers and major enterprise, providing guidance on management architecture, SLA definition…..

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