IPTV (*and Digital Cable TV*) Performance Management

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Outline

- IPTV/ Digital Cable service architectures
- What do service providers need to know?
- The myriad aspects of IPTV performance
- IPTV performance monitoring architecture

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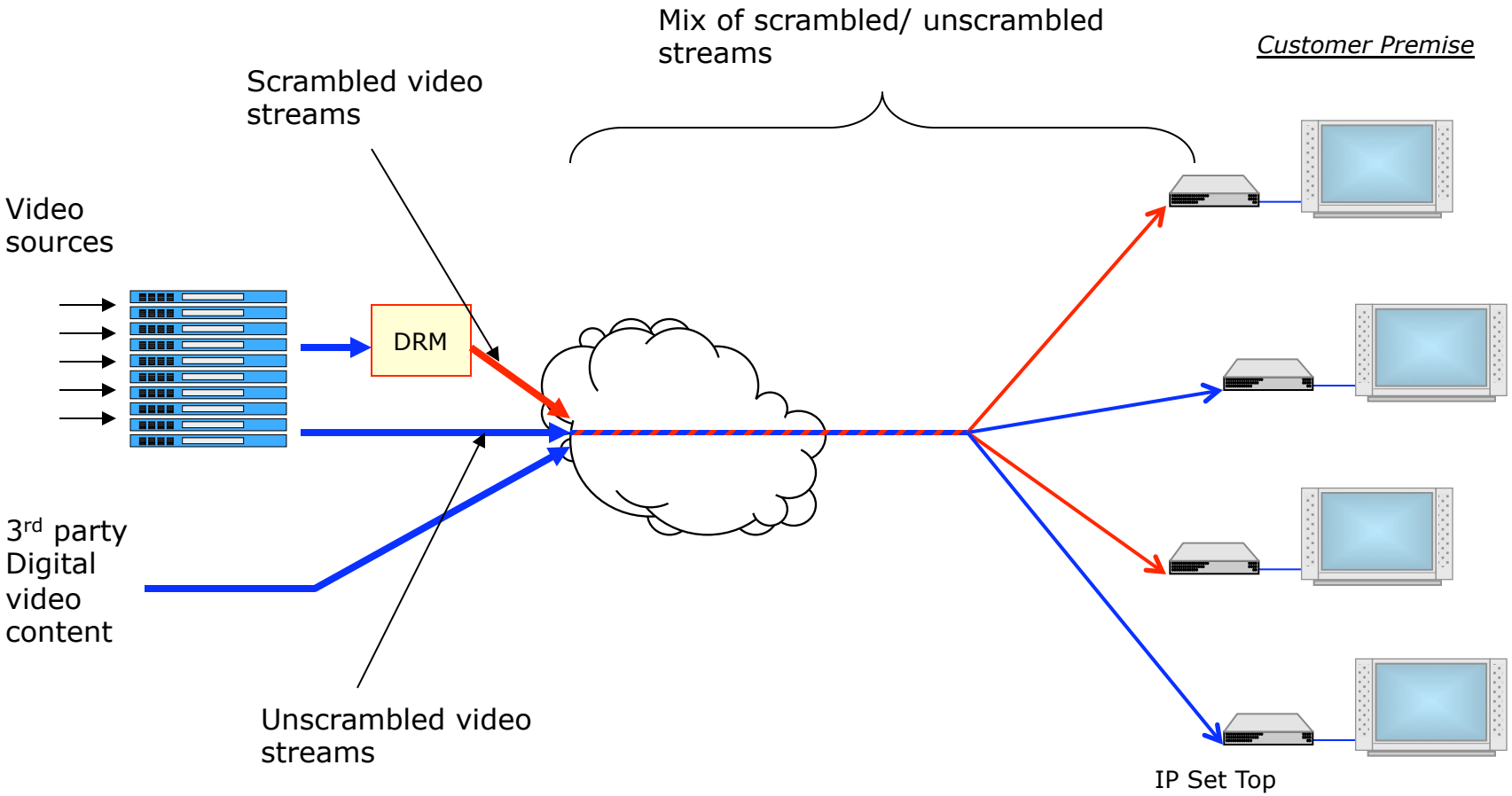
IPTV/ Digital Cable service



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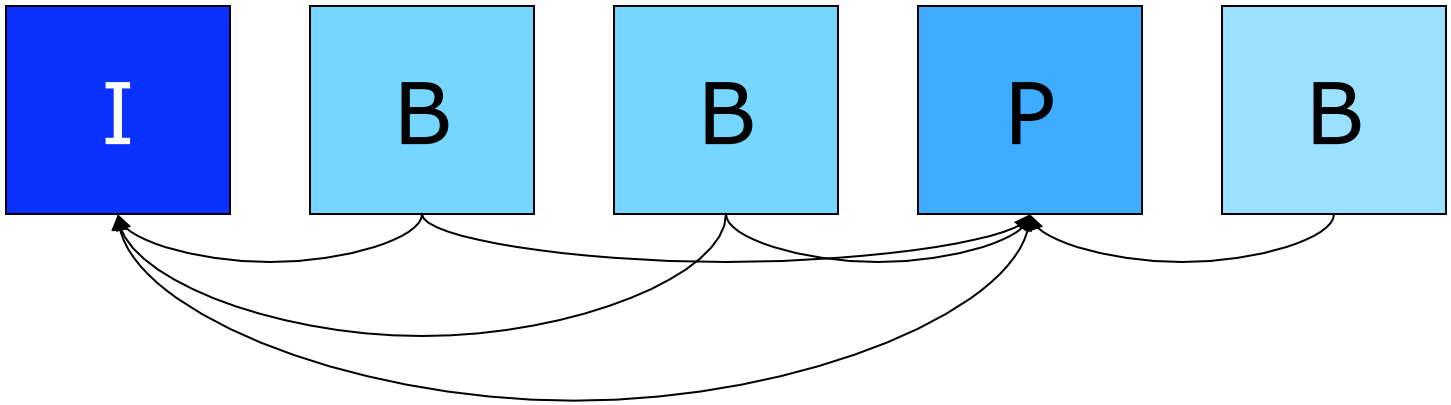
Video Frame Structure



Typical assumptions:
- GoP length of 15 or 30 (have seen 250, can be variable)
- I frame bandwidth ~ 40% of total bandwidth
- P/B frame bandwidth ~ 3-5% of total bandwidth per frame

Impact of high motion?
- VBR - leads to bandwidth spikes
- CBR - can lead to motion related blockiness

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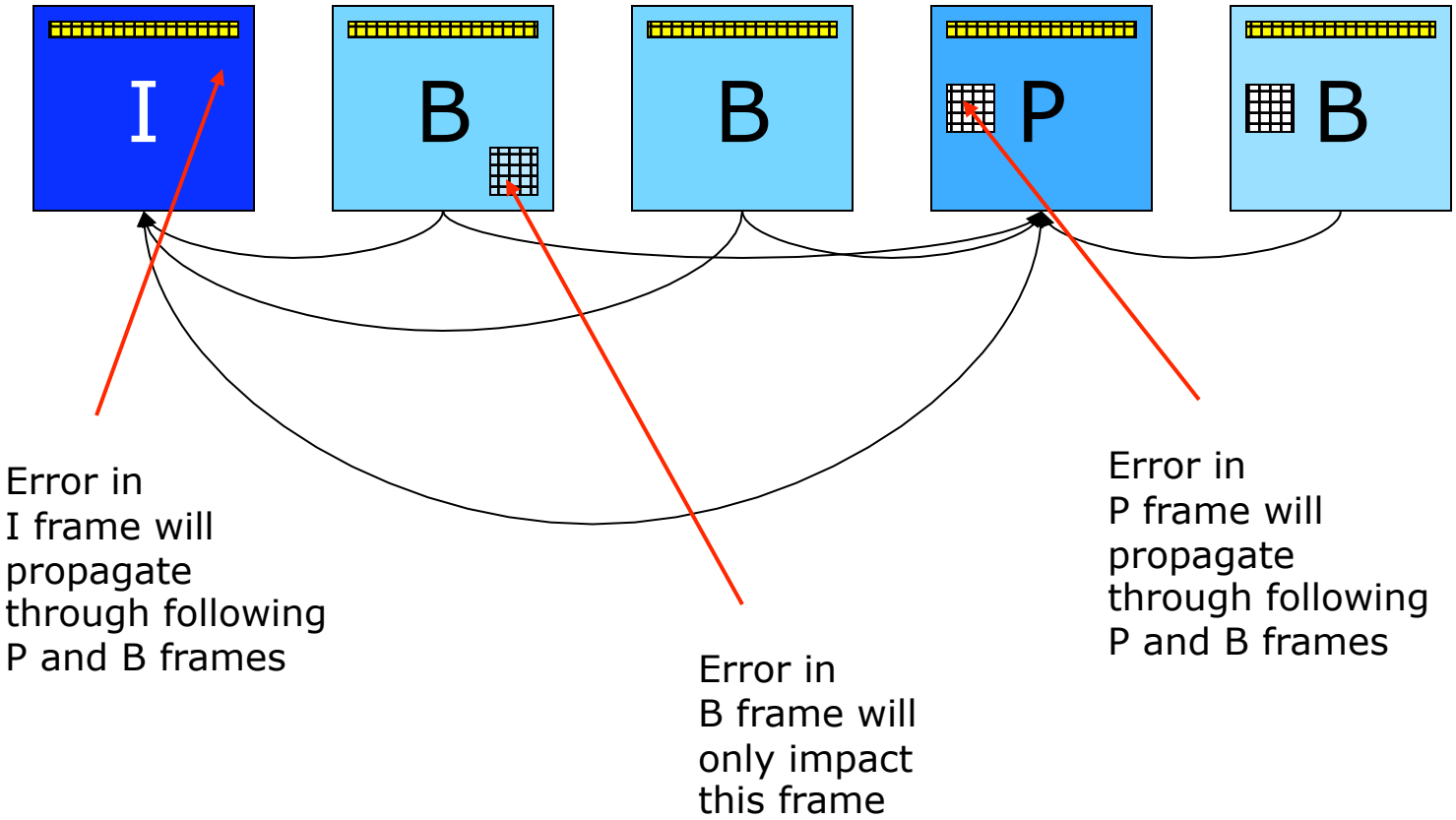
Video Frame Structure and Packet Loss



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The myriad aspects of IPTV performance

- Transmission performance
  - Equipment faults, limited bandwidth, unexpected traffic patterns, subscriber access or LAN problems
- Configuration or equipment errors
  - Mismatch between encoder settings and decoder capabilities
  - Equipment fault or unwanted behavior
- Non-optimal encoder configuration
  - GoP too long or short
  - Bandwidth consumption too high or variable
  - Unexpected content
- Video loss - blank, frozen, noisy video
  - Loss of video feed
  - Excessive error rates on video feed
  - Software bug in video encoder

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What do service providers need to know?

- Head-end perspective
  - Are all streams conforming to specification?
  - Do streams have active content?
  - How is bandwidth being used?
  - Impact of bandwidth limitation * content on quality?

- Subscriber perspective
  - Network problems (loss, bandwidth…) affecting individual/multiple subscribers?
  - Impact of codec configuration * transmission problems on quality?
  - Overall user view of service provider?
  - Overall user view of individual channels?

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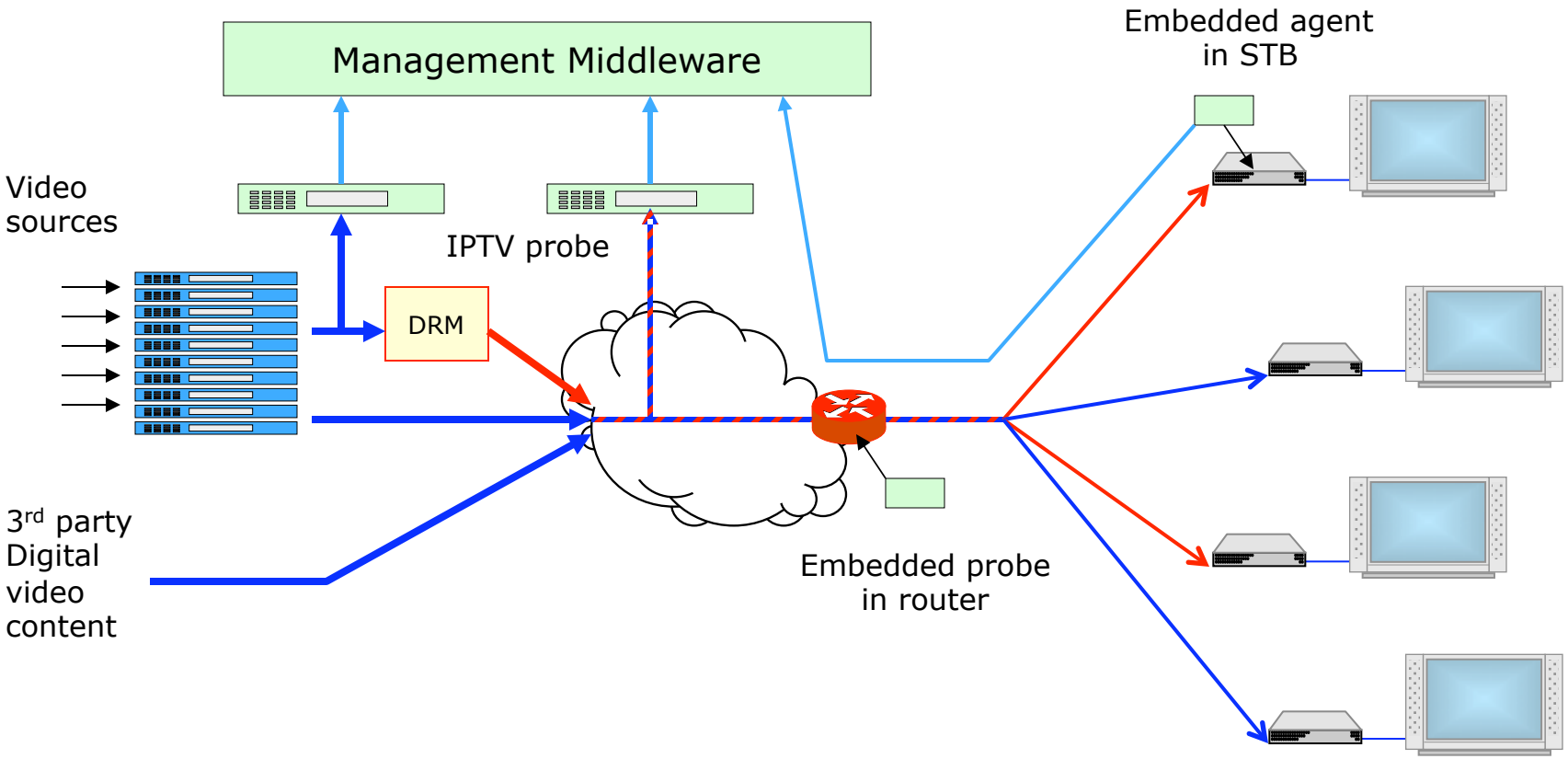
IPTV performance monitoring



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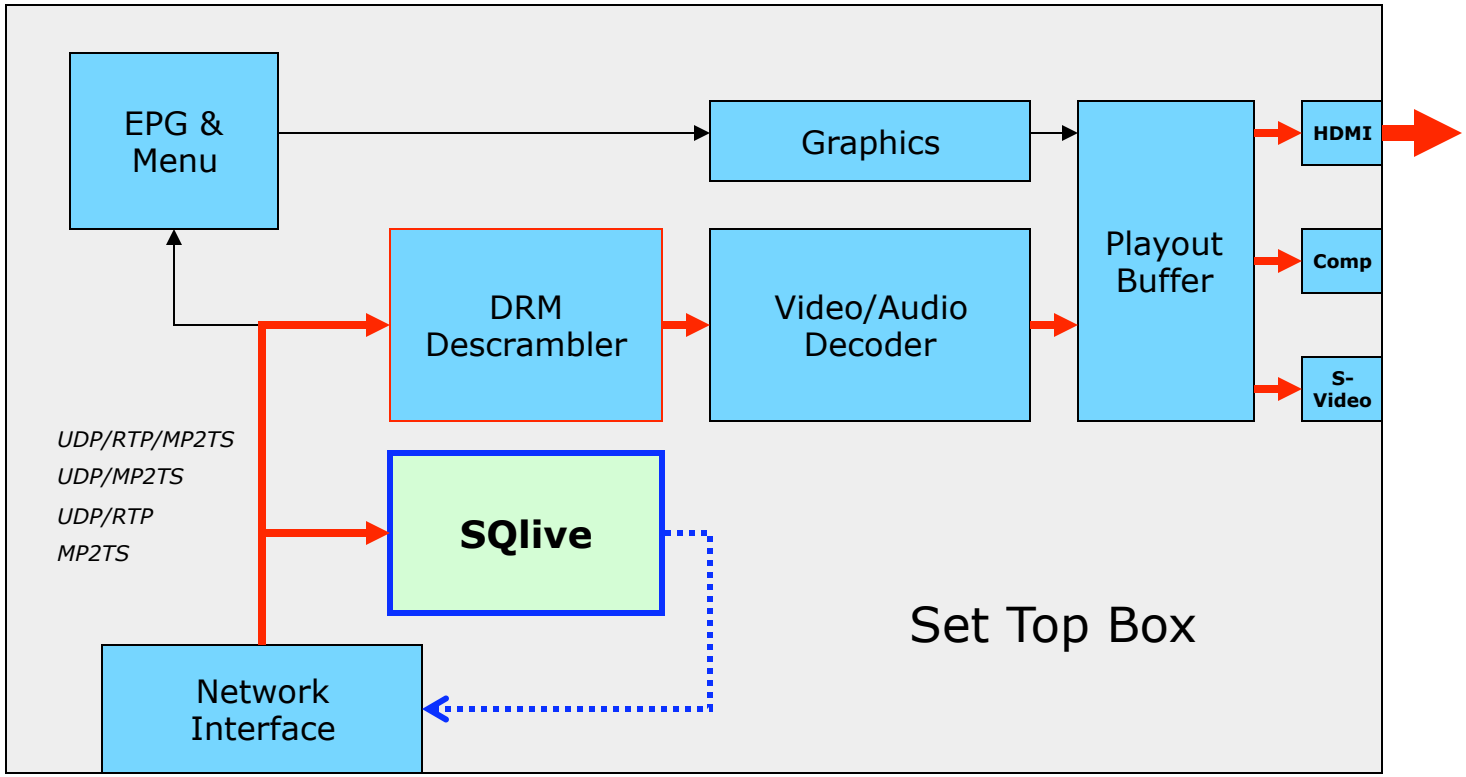
IP Set Top/ Agent Architecture



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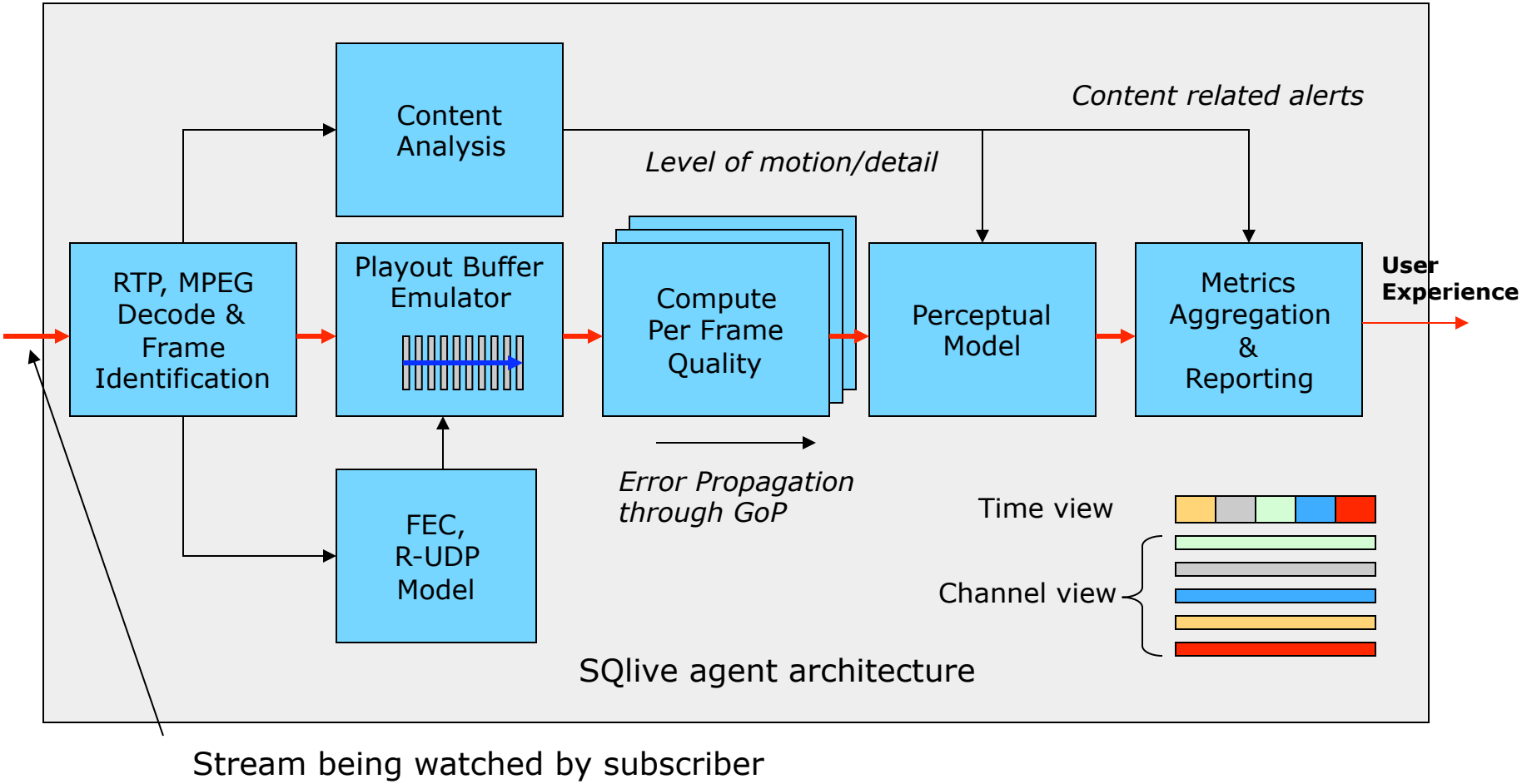
IP Set Top Agent Architecture



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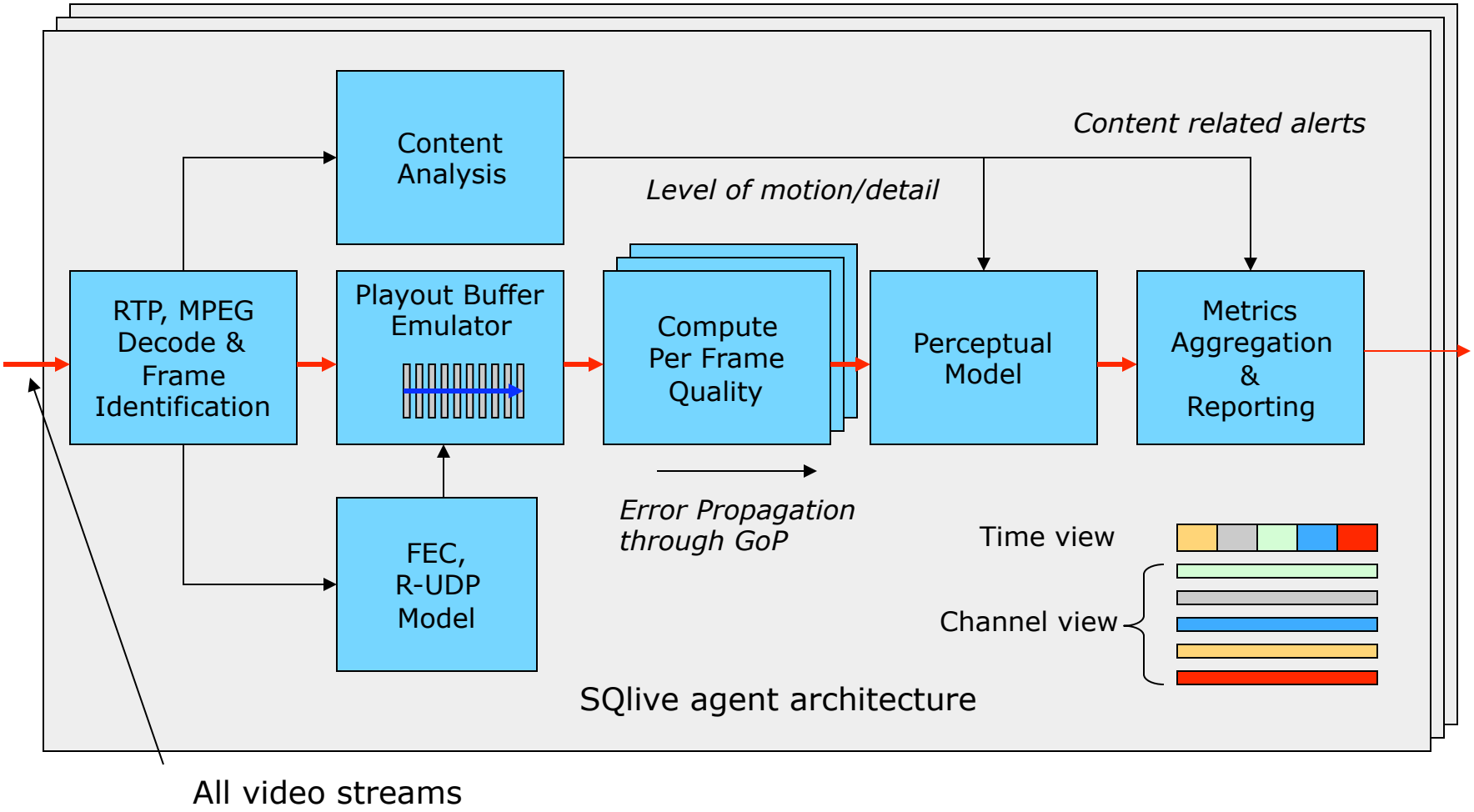
Head-end Probe Architecture



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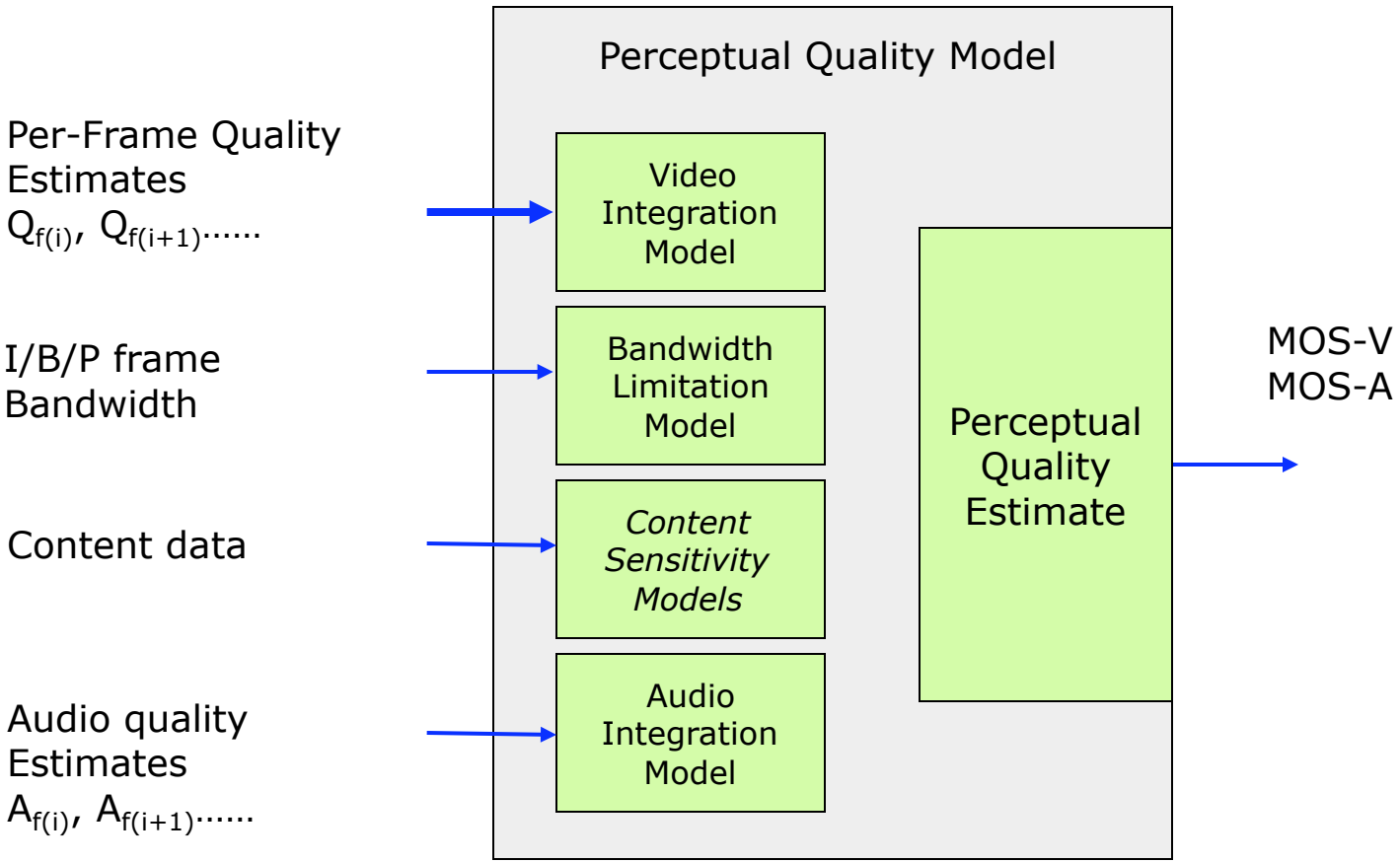
Perceptual Quality Model



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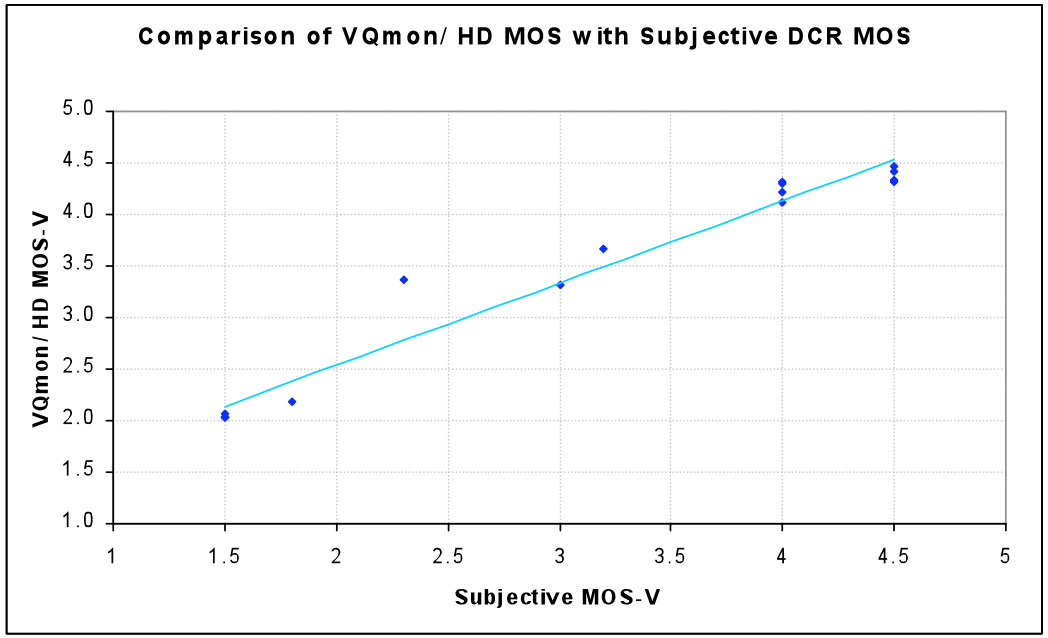
Performance verification

- Main focus on subjective testing
  - Expert panels of 16-20 viewers
  - SD (480i) and HD (720p, 1080i and 1080p) tests
  - Mix of DCR and ACR tests



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Scrambled vs Unscrambled Video

- Unscrambled
  - MOS-V = 3.1
  - EPSNR = 27.5
  - I frame packets
    - Received 6225
    - Lost 42
  - P/B frame packets
    - Received 20779
    - Lost 40
  - IP Statistics
    - Loss rate = 0.23%
- Scrambled
  - MOS-V = 3.0
  - EPSNR = 27.0
  - I frame packets
    - Received 6367
    - Lost 42
  - P/B frame packets
    - Received 20637
    - Lost 21
  - IP Statistics
    - Loss rate = 0.23%

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Summary

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