

# Error-Resilient Live Video Multicast Using Low-Rate Visual Quality Feedback

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# Low-Rate Visual Quality Feedback

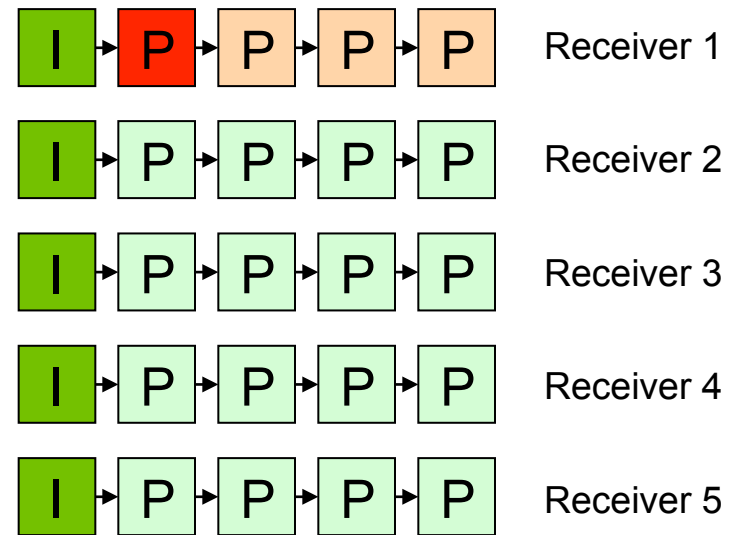
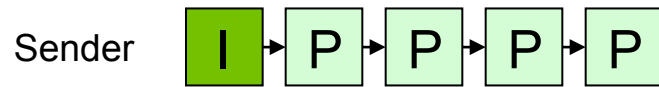


# Outline

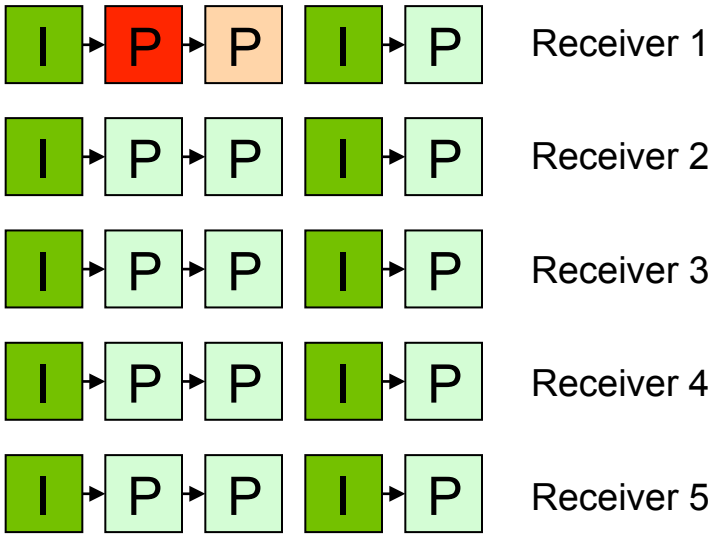
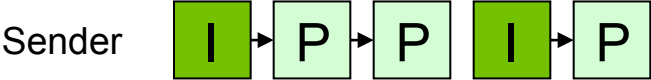
- Live video multicast and error resilience techniques
- Visual quality feedback system
- Live video multicast experiment



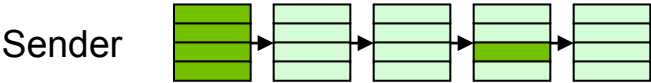
# Live Video Multicast



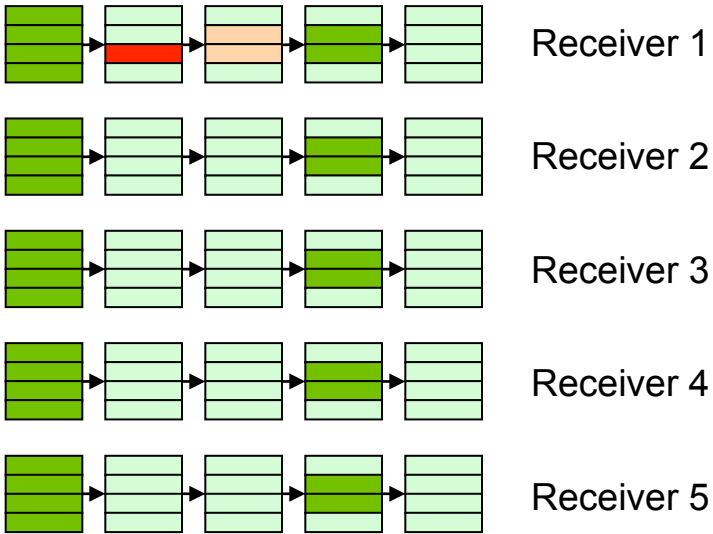
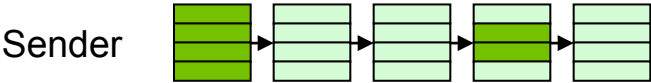
# Intra-Frame Error Resilience



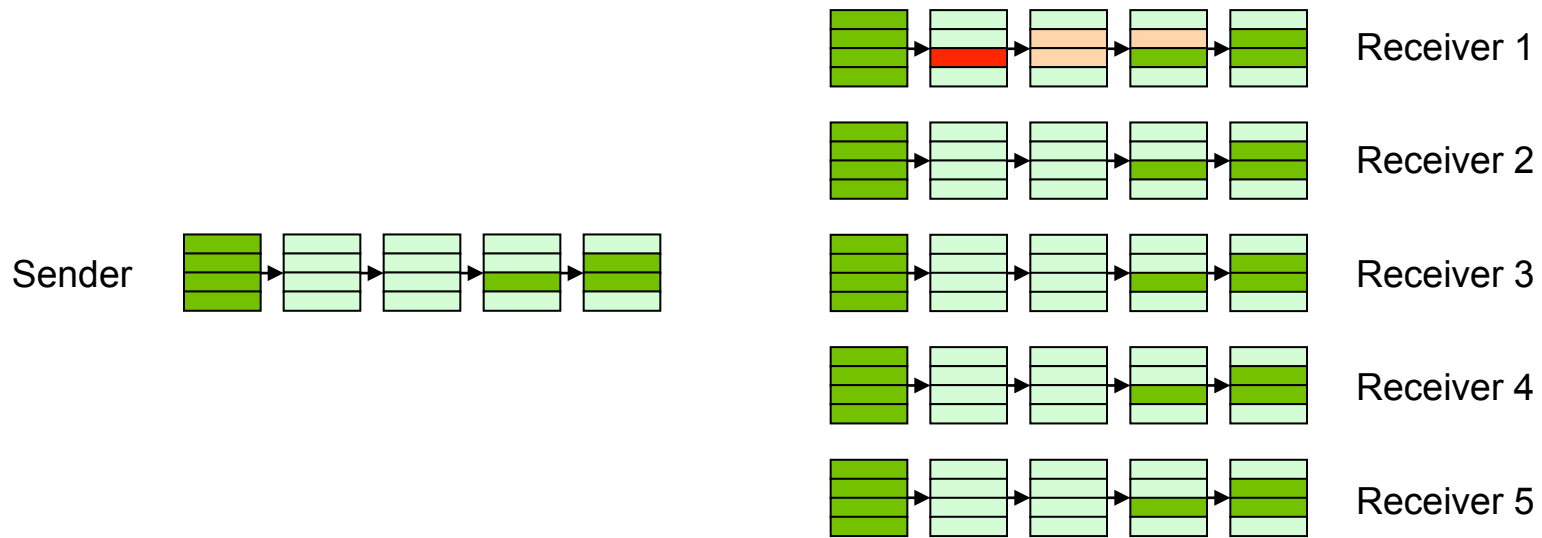
# Intra-Slice Error Resilience



# Error Tracking

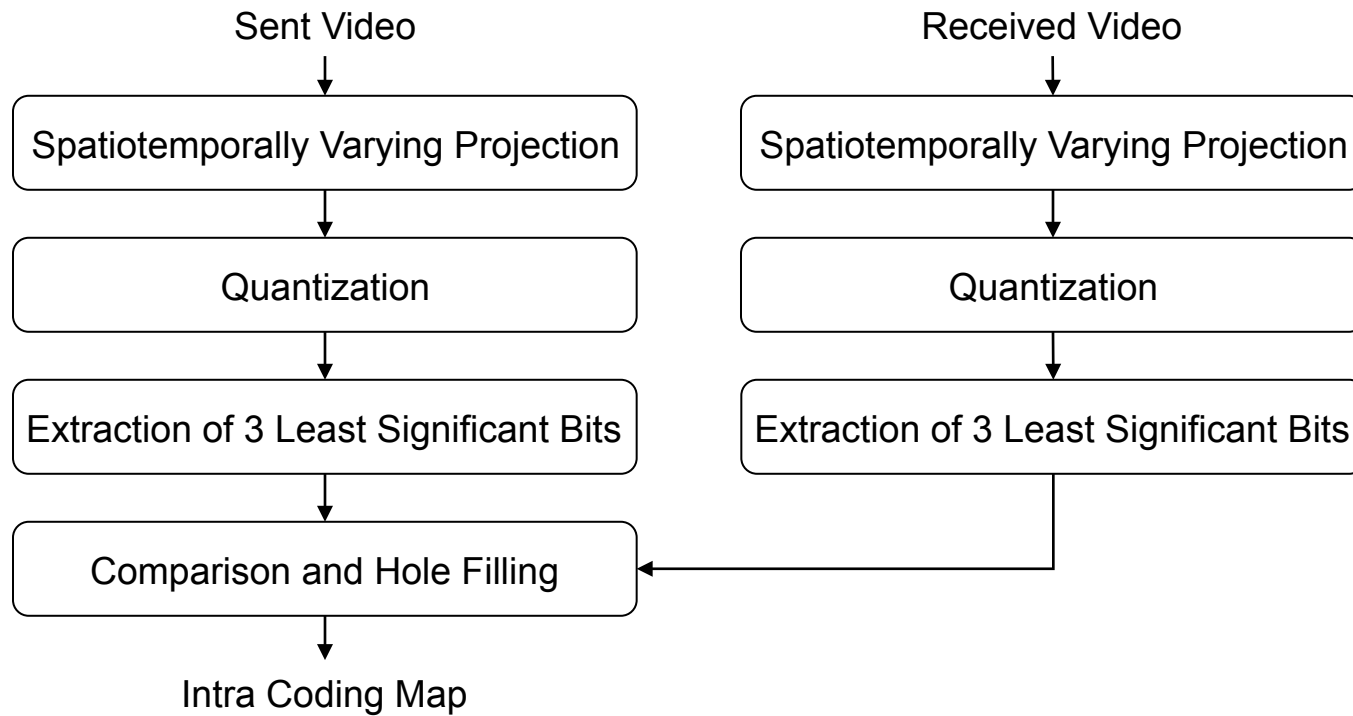


# Visual Quality Feedback Error Resilience

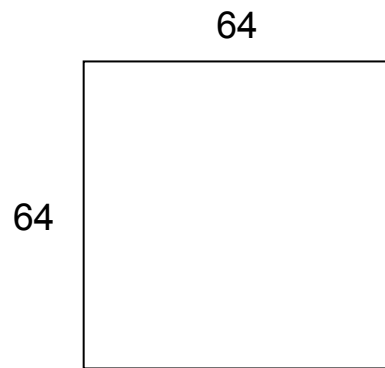




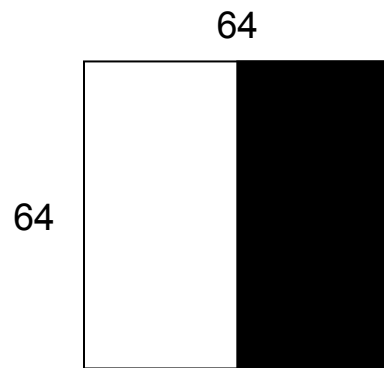
# Visual Quality Feedback System



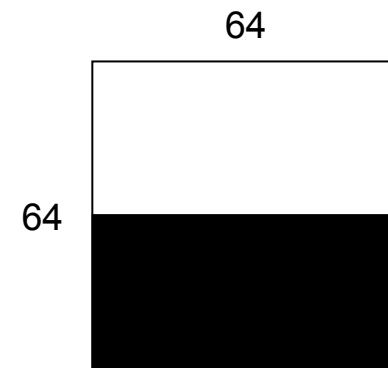
# Blockwise Projection Units



Mean



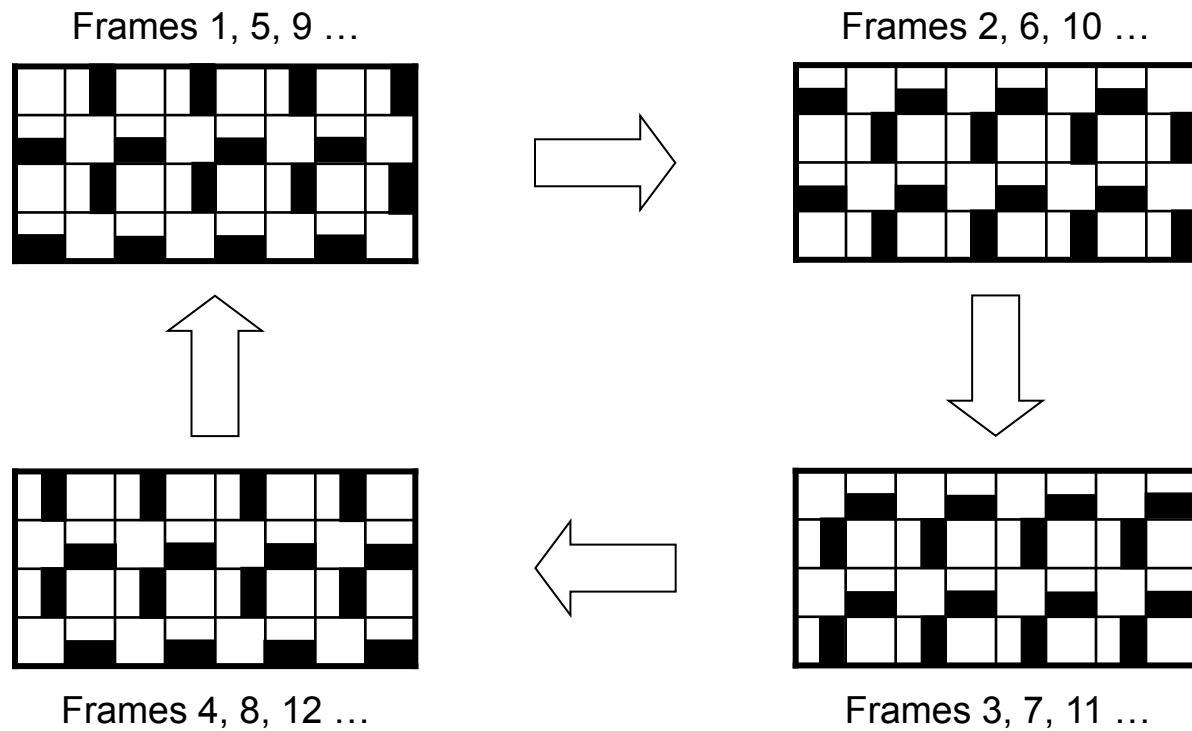
Horizontal Difference  
of Means



Vertical Difference  
of Means



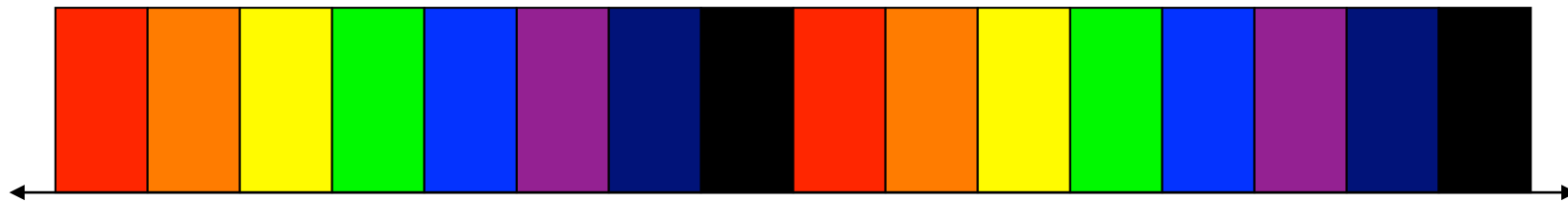
# Spatiotemporally Varying Projection



# Quantization and Extraction of 3 LSBs



Fine Quantization

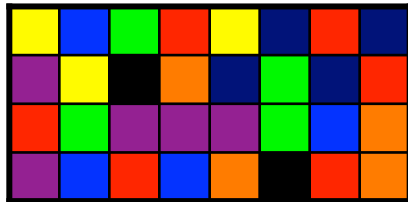


Coarse Quantization

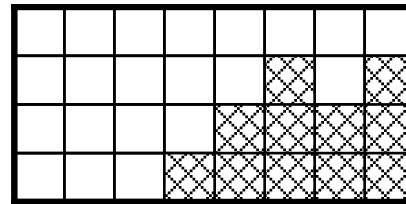
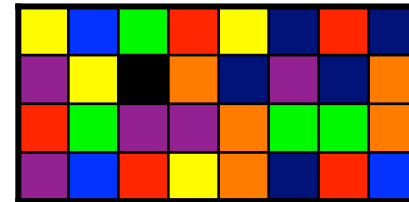


# Comparison and Hole Filling

Quantization Indices of Sent Video



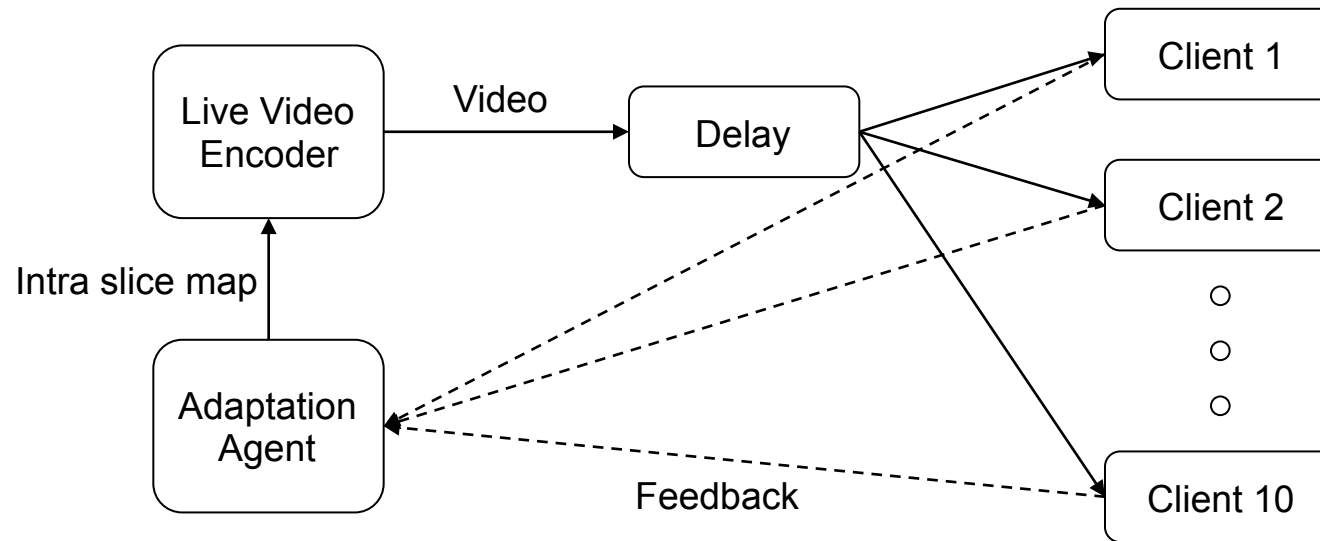
Quantization Indices of Received Video



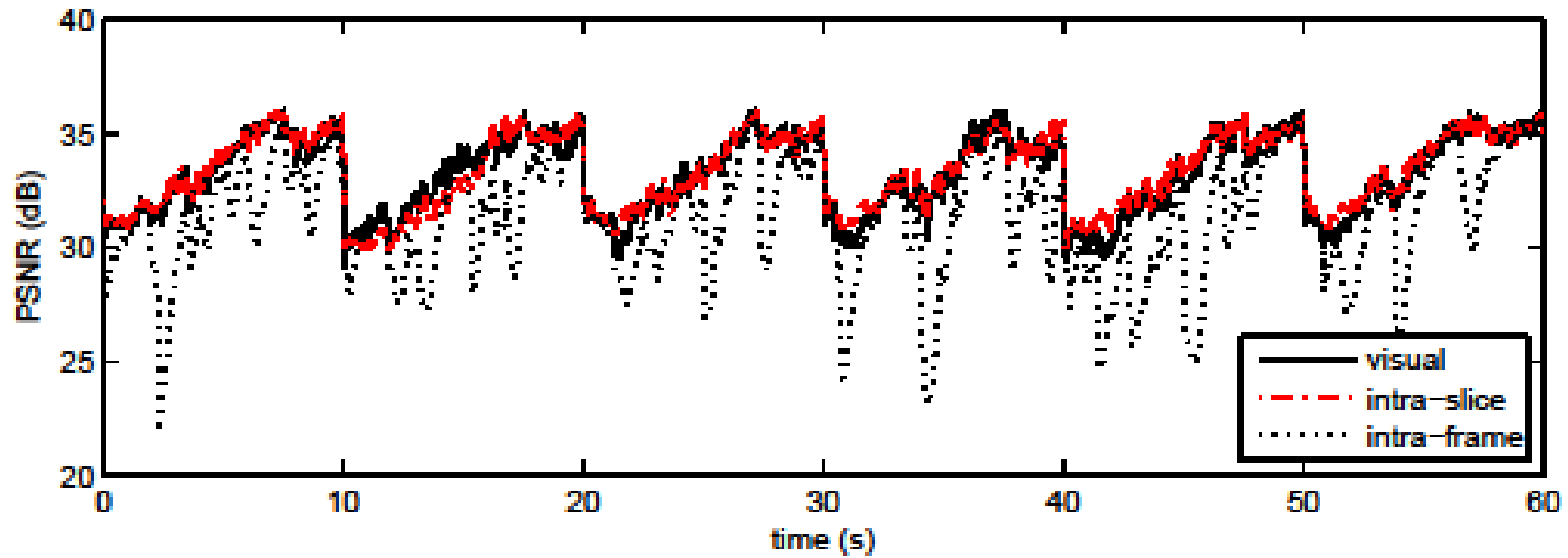
Intra Coding Map



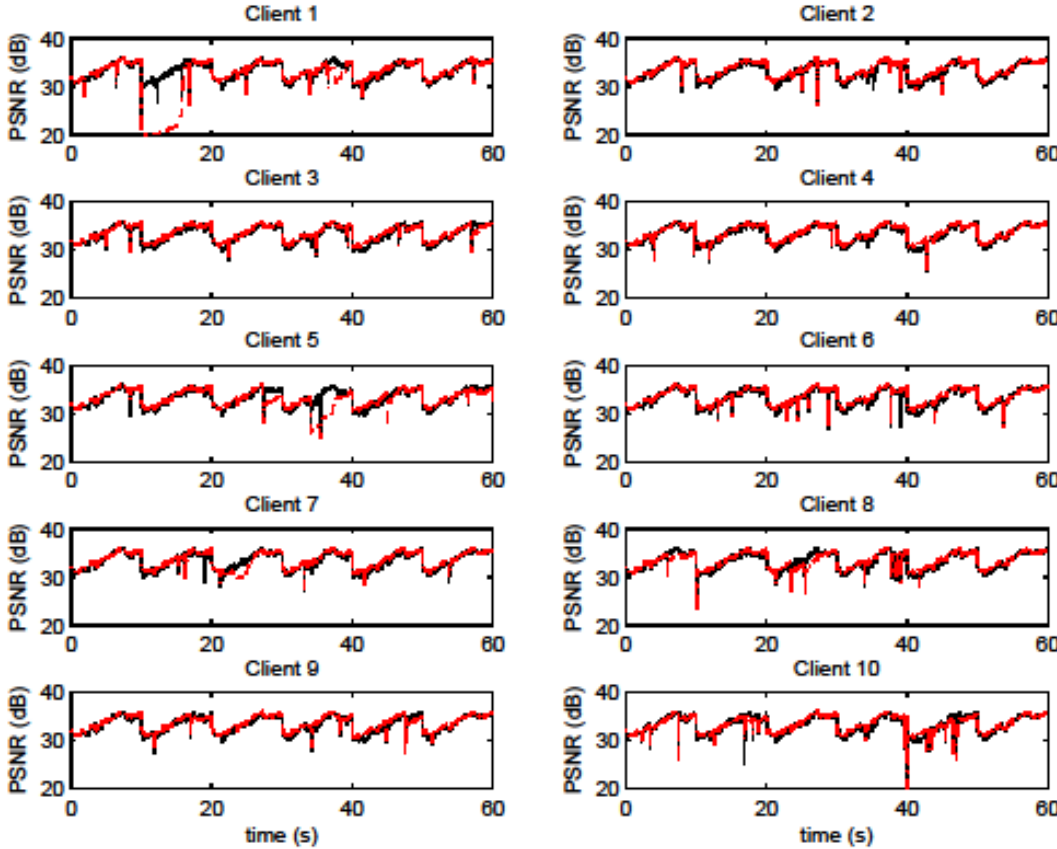
# Live Video Multicast Experiment Setup



# Average PSNR Traces



# Individual PSNR Traces





# Conclusions

- Low-rate visual quality feedback is a new error resilience tool
  - Bit rate = 3 bits per 64x64 block  $\approx$  1% of the encoded video bit rate
  - Extracts 3 least significant bits of spatiotemporally varying projection
  - Enables adaptive intra encoding on a slice or block level
- Live video multicast experiment
  - Visual quality feedback avoids the severe error events of intra-slice coding
  - Performance can be improved by adapting encoding at the block (not slice) level
- The technique may be applied in other settings, e.g. feedforward

