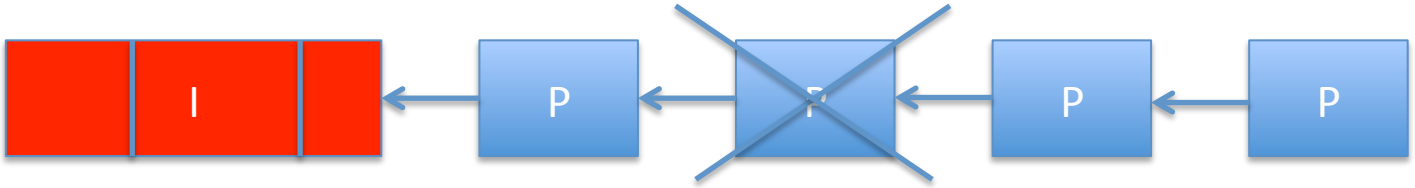
# The Case for Layered Codecs

Stephan Wenger
Alex Eleftheriadis

# Limitations to presentation

- Emphasis here on Video (similar constraints may or may not apply to other media)
- Emphasis on UDP-based media distribution, implying required error resilience *in the source coding*
  - Making the bold assumption that people here understand and agree that transport-based repair alone does not fulfill real-time requirements

# Need for Error Resilience

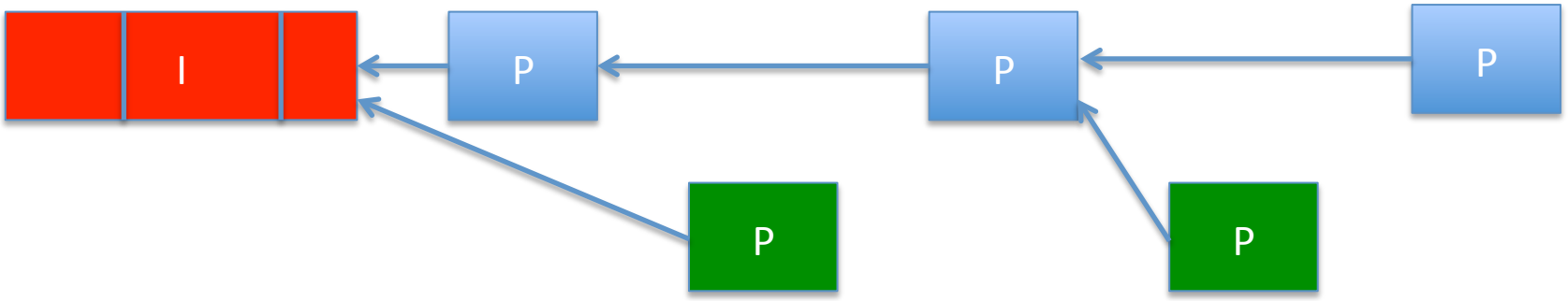



- Prediction chain between pictures
- When broken, bad things happen
- Can't easily use (naïve) re-transmission: adds too much delay
- Can't use Intra pictures
  - Too big, adds too much delay
  - Too vulnerable, because they are too big

# Video Error Resilience Tools

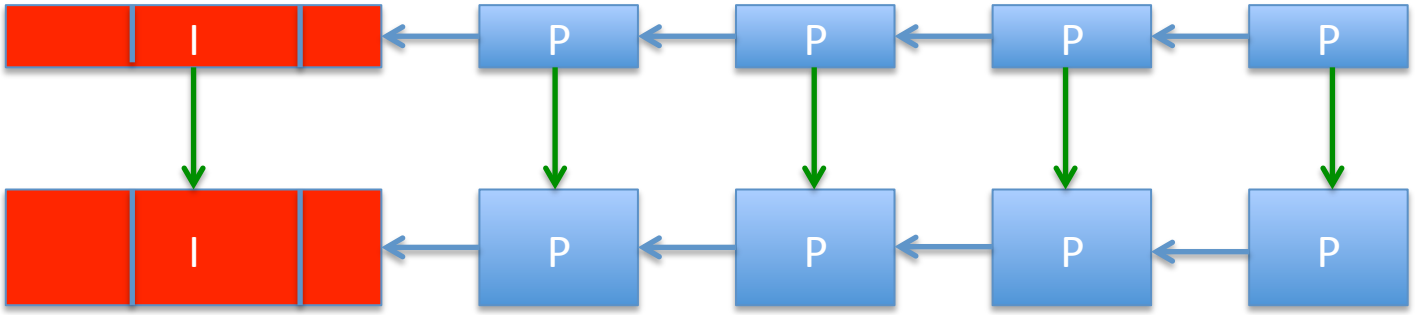
- Intra Pictures (bad)
- Intra MB walk-around (works, but bad experience and inefficient)
- Reference picture selection based on feedback (NEWPRED, or more sophisticated, periods of bad pictures, efficient, but makes complex system assumptions, non-trivial for multi-party scnearios)
- Temporal Scalability (reference picture selection, multithread, works, quite efficient especially with retransmission, avoids retransmission-delay)
- Spatial Scalability
  - Adds sophisticated technology for bandwidth adaptation
  - Allows efficient support of use case requiring multiple resolutions (picture resize, thumbnail, etc.)

# Temporal Scalability




- Inherently more error resilience than IPPP coding (green pictures can be lost without negatively affecting prediction chain)
- Allows for re-transmission of lost (blue) P pictures due to larger time intervals
- Supported by VP8 in conjunction with newest RTP payload draft

# Spatial Scalability (vs. Simulcast)




- Simulcast: send multiple resolutions of the same content
  - Can use all tools mentioned before, including temporal scalability
- Spatial Scalability: add inter-layer prediction (green arrows)
  - Neutral in terms of computational complexity
  - Layering reduces sending bitrate, can increase receiving bitrate
  - Allows bandwidth adaptation beyond QP adjustment
  - Enables *efficient* implementation of user experience (some use cases)
    - Per-user layout in multipoint without transcoding MCUs
    - Straightforward support of heterogeneous receiver population
- To support spatial scalability, one needs a modern video coddec (for example H.264 SVC)

Thank You