IETF Draft

An RTP Payload Format for Erasure-Resilient Transmission of Progressive Multimedia Streams

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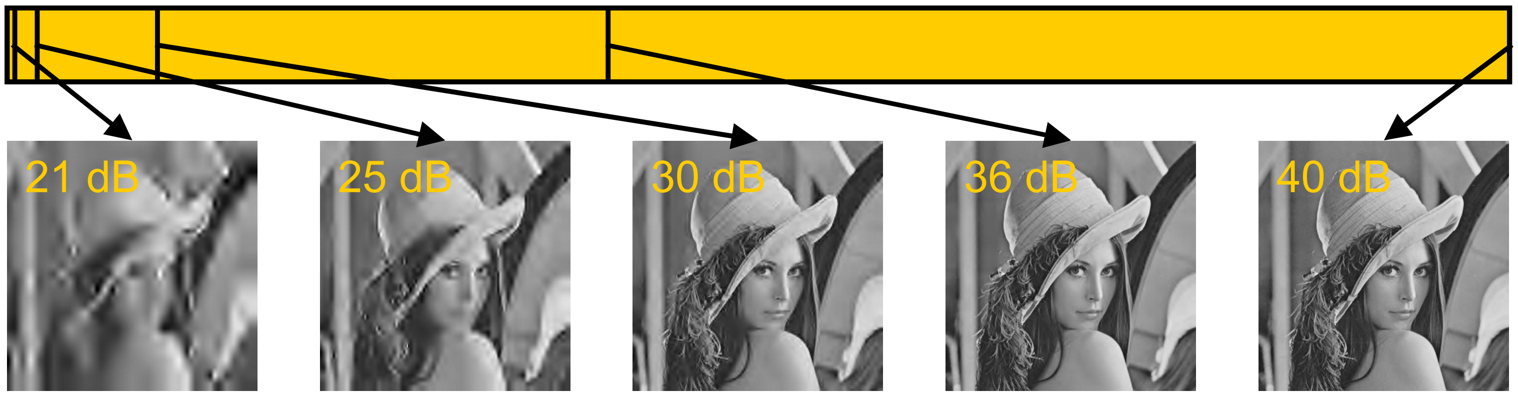
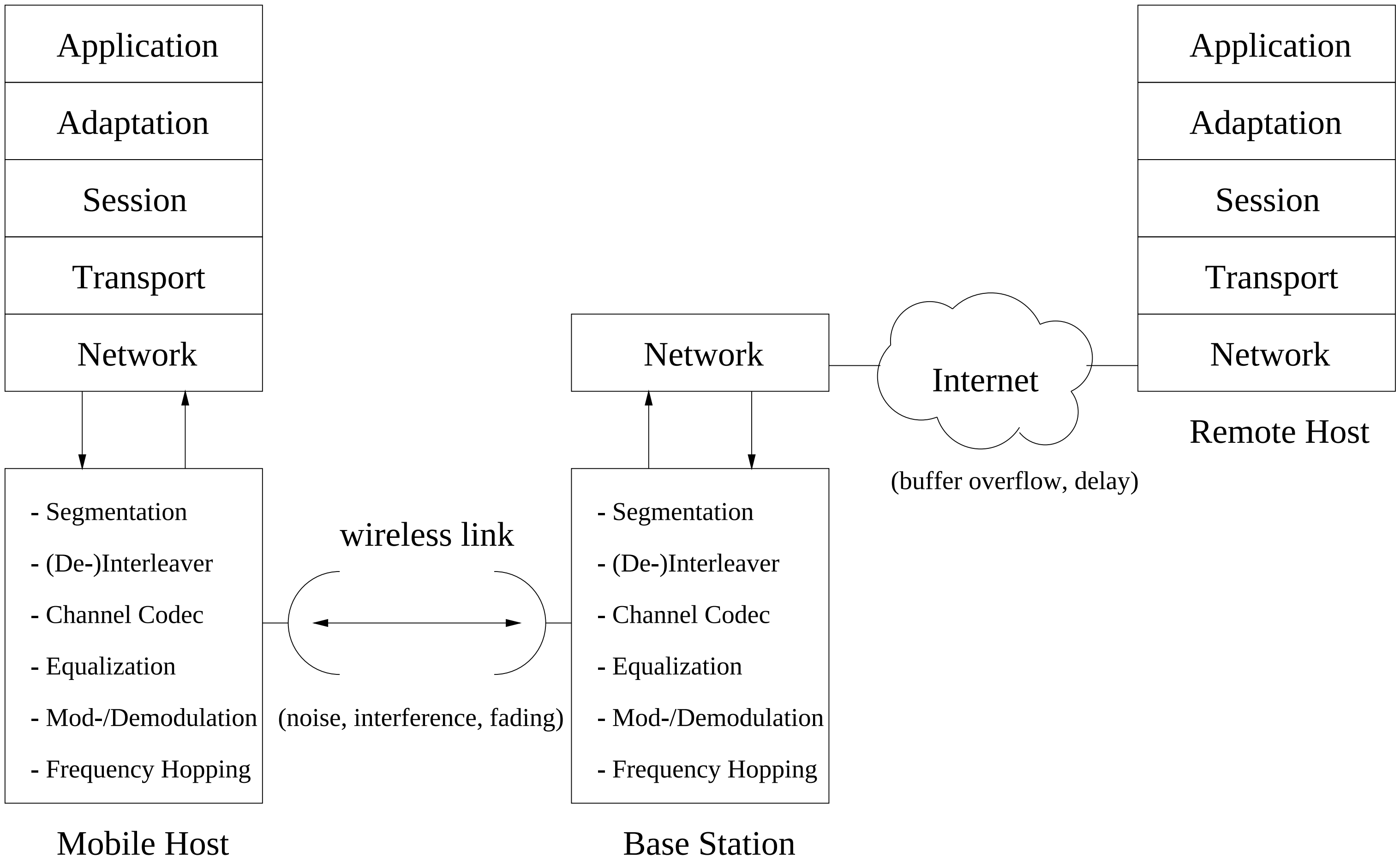
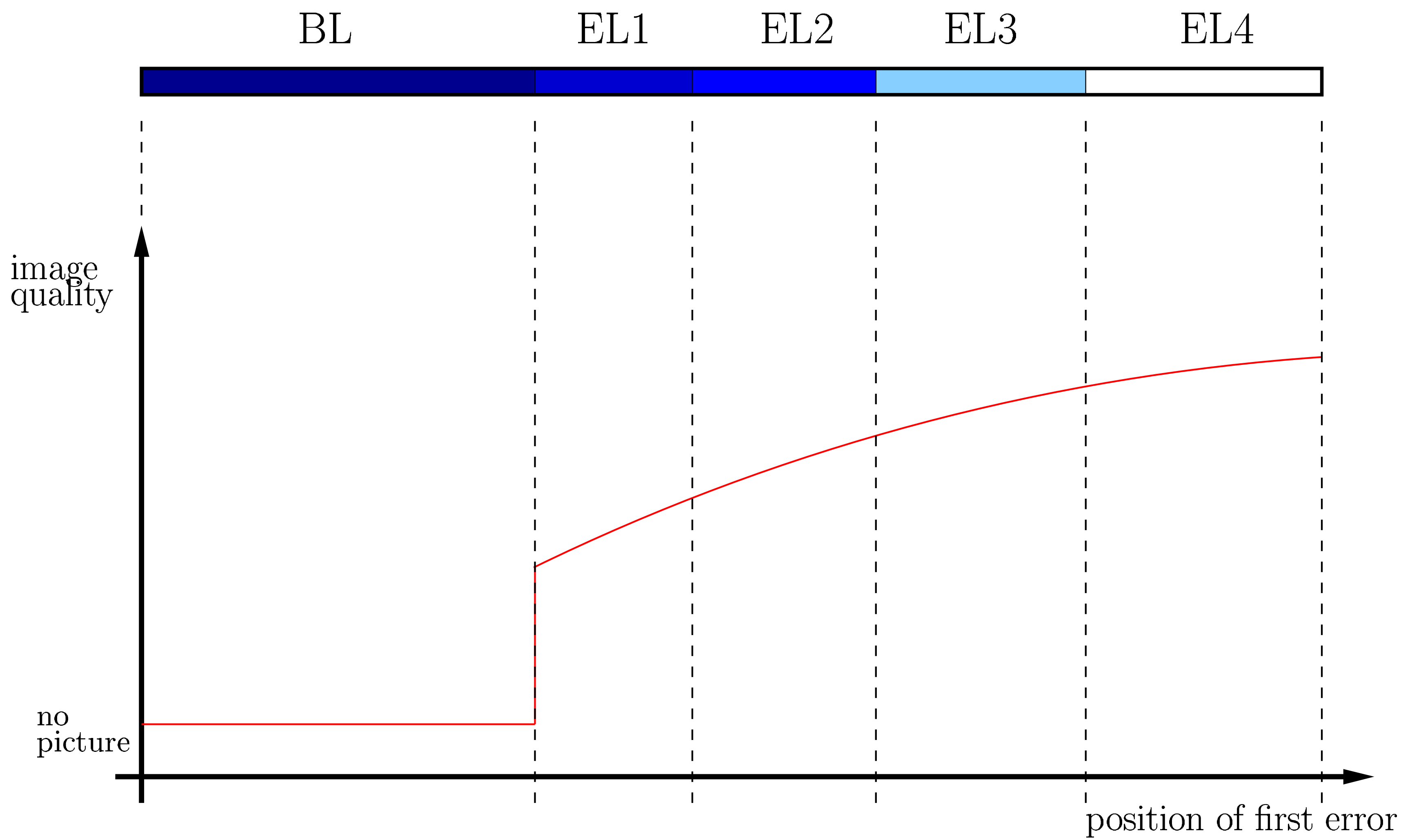
An Example for Future Source Coding Techniques



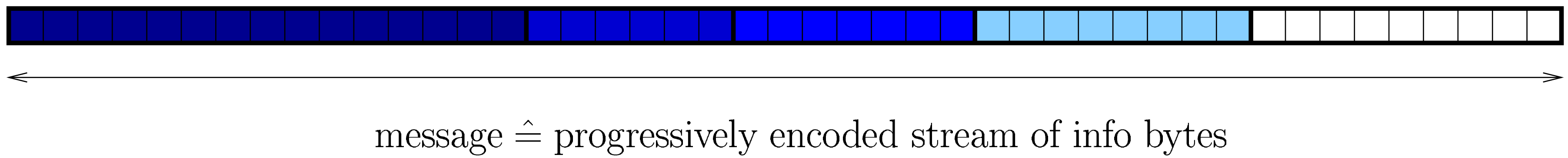
Packet Radio Networks – the Wireless Extension of the Internet

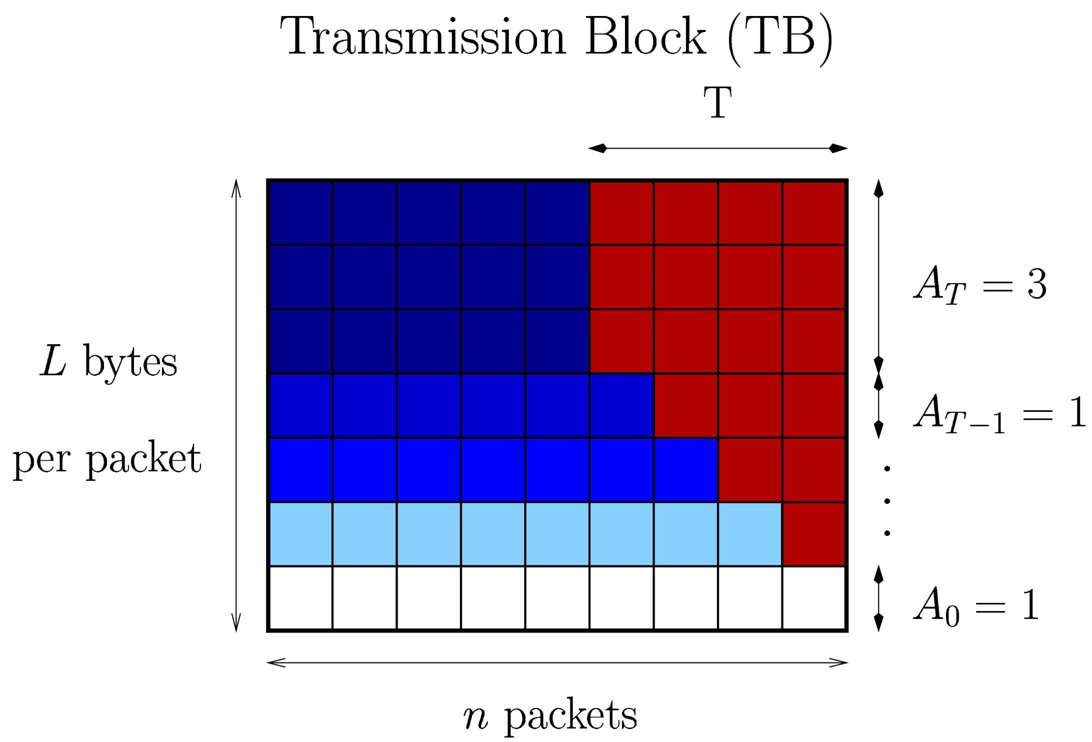


Progressive Source Coding and Image Quality



Unequal erasure protection (UXP)





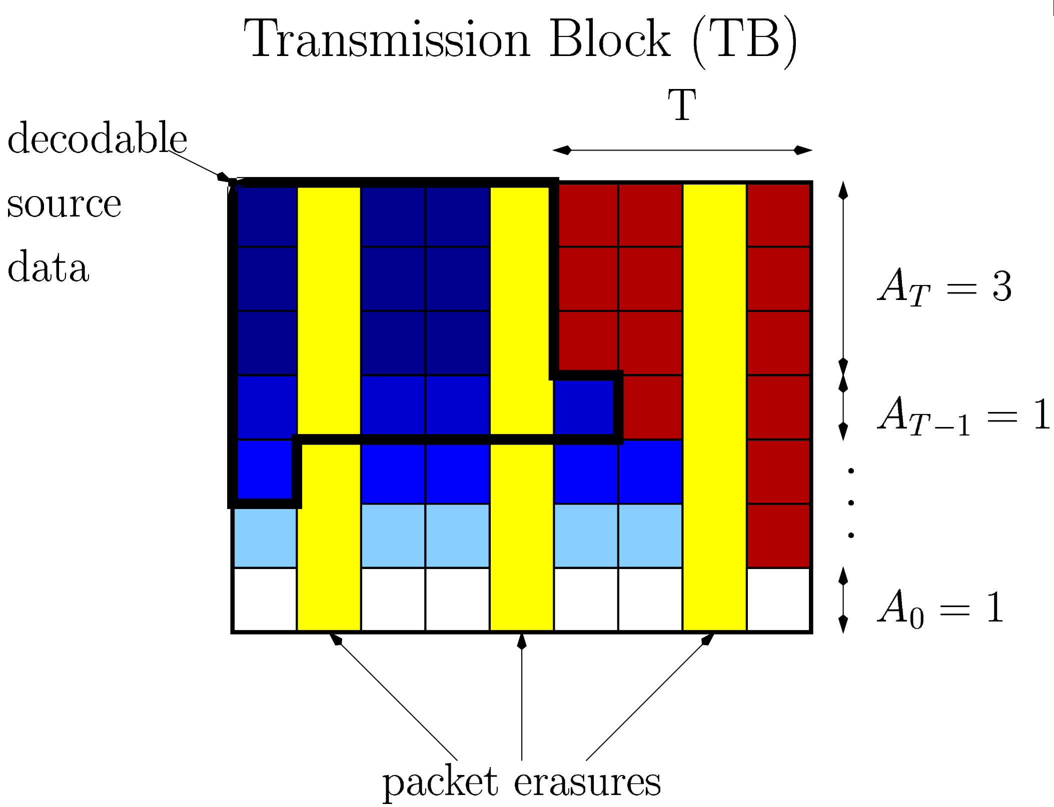
Principle:

- $T+1$ different erasure protection classes $\mathcal{A}_i$
- A_i rows per class:

$$\sum_{i=0}^{T} A_i = L.$$

- index i denotes number of parity symbols per class

Unequal erasure protection (UXP) – cont.



Decoding procedure at the receiver:

- all packets are filled column-by-column into a similar TB
- for every erased packet, the respective column is filled with erasure markers
- if less than $i + 1$ packets have been lost, the content of all erasure protection classes $\mathcal{A}_i, \mathcal{A}_{i+1}, \ldots, \mathcal{A}_T$ can be recovered by applying row-wise erasure decoding

RTP Payload Structure

RTP header (fixed RTP header):

- Timestamp: Equals the sampling instant of the first octet in the data block. All packets in a transmission block should have the same timestamp value.
- PT: Dynamic type, which is obtained through out-of-band signaling.
- All other fields are assigned as in a regular fixed RTP header.

Additional header (UXP header):

0								1							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
X	block PT							block length N							

- X (1 bit): extension bit for future enhancements; default: 0
- block PT (7 bits): regular RTP payload type to indicate primary source encoding of the media
- N (8 bits): number of packets (columns) in one TB (interleaver)

In-Band Signaling of the Erasure Protection Profile (EPP)

Adaptation of the EPP to varying source and channel characteristics requires signaling:

- out-of-band (very inefficient)
- special fields in the RTP payload header (inefficient, protection against erasures?)
- in-band signaling by means of descriptors

Conclusion

Benefits of the proposed scheme:

- constant delay independent of the number of lost packets
- constant packet length to avoid segmentation overhead due to stuffing at link level
- progressive source coding combined with regressive channel coding results in a graceful degradation of the quality of service at application level
- fast dynamic adaptation to varying link conditions through efficient inband signaling of the protection profile
- applicable to streaming and conferencing applications
- independent of the media type to be transmitted
- open for future extensions