

A Transportable System for Network Adaptive Video Transmission over IP Networks

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Outline :

- **Introduction**
- **Feature of the proposed system**
 - **Live Transmission**
 - **Store and Forward**
- **Conclusion**



VistaFinder by KDDI R&D Labs.

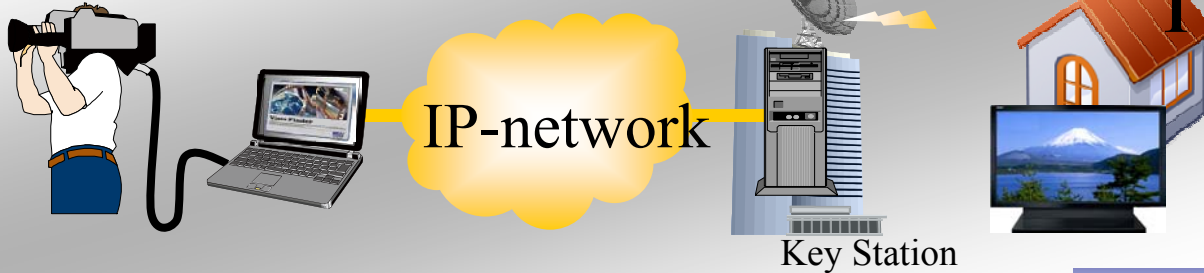
Introduction :

- **Video Transmission from anywhere is the most important feature to cover newsgathering.**
- **However, there are problems:**
 1. **Limitations on shooting equipments.**
=> Almost solved.
 2. **Limitations on encoding devices.**
=> High Compression needs heavy computation.
 3. **Limitations on network bandwidth.**
=> High quality video needs wide bandwidth.

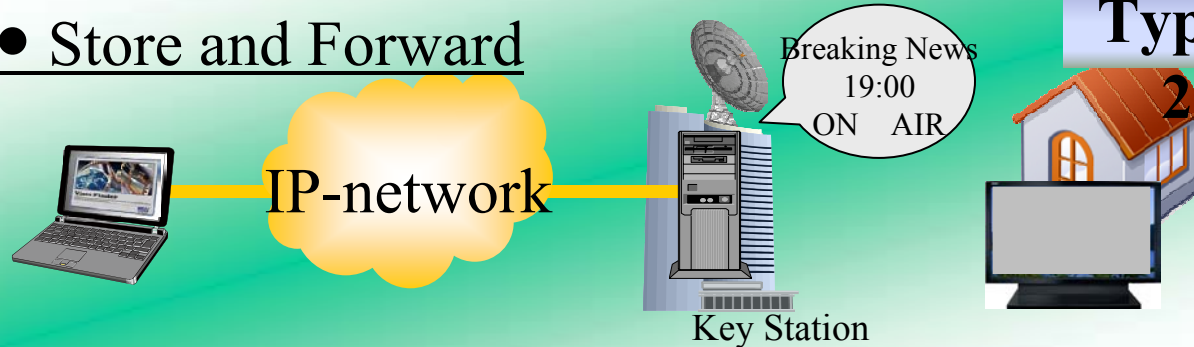
**We need to provide best balanced solution between
“High Compression Ratio” vs. “High Subjective Quality”.**

Three types of video transmission :

• Live Transmission



• Store and Forward



• Storage of Master Contents

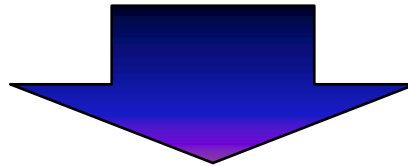


**Demand
for
Low Delay**

**Demand
for
High Quality**

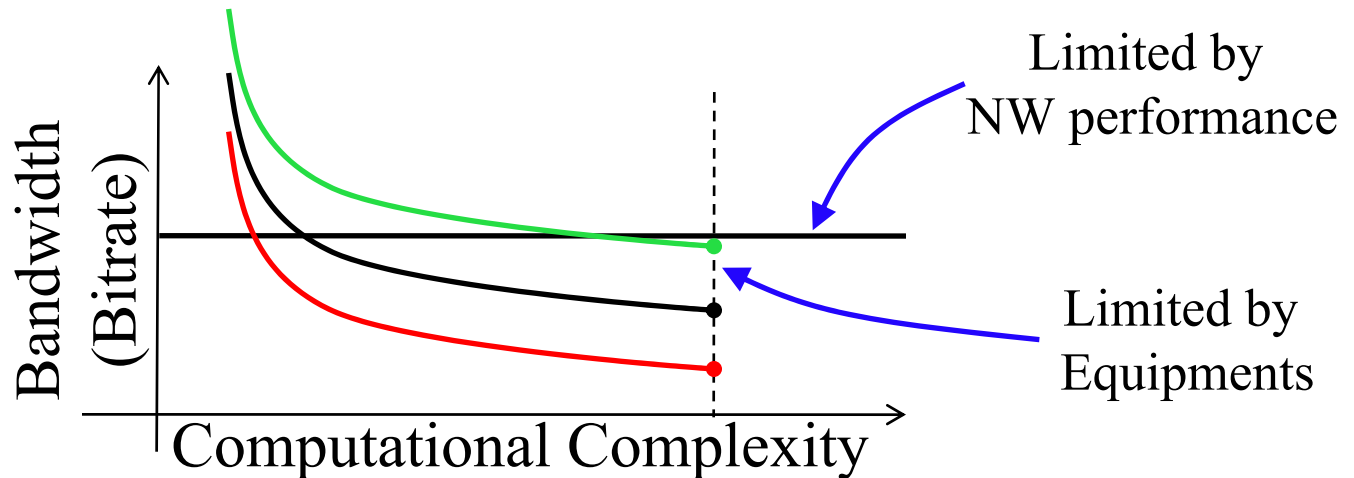
Type-1 (Live transmission) :

- **Obtain the best subjective quality video under given bandwidth and Computation resources.**



Step1. Determine video resolution.

Step2. Determine encoding parameters.



Type-1 (Live transmission) : Cont'd

Video Transmission approach :

Low delay case :

Adopt ARQ using backward channel.

High delay case :

Adopt “FEC” at the cost of bitrate overhead.

or

Adopt “Intelligent Error Concealment**” at the decoder side without any bitrate overhead.**

Visual effect caused by Packet Loss

- Blocksize is controllable



Packet Loss at a Scene



Packet Loss at a Scene Change

Proposed Error Concealment

Error Concealment Approach :

1. Spatial Concealment

- For the first picture, pictures just after scene cut.

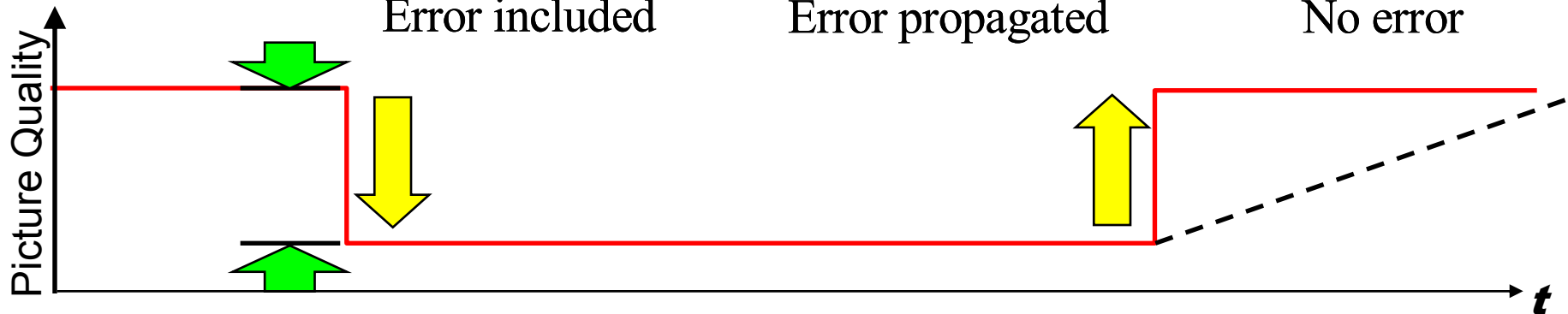
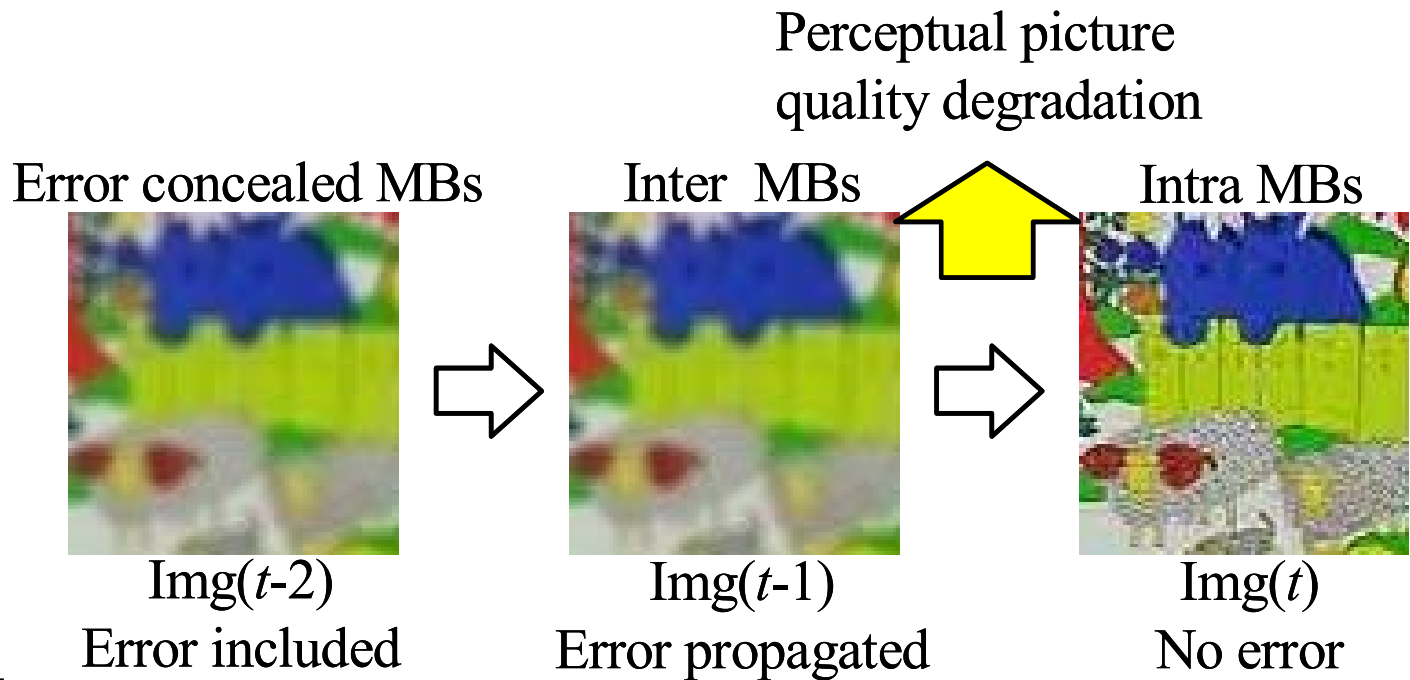
2. Temporal Concealment

- Use temporal correlation
- For pictures in a same scene.

3. Hybrid Concealment

- Spatial / Temporal concealment methods are adaptively used.

Alleviation technique against perceptual quality degradation

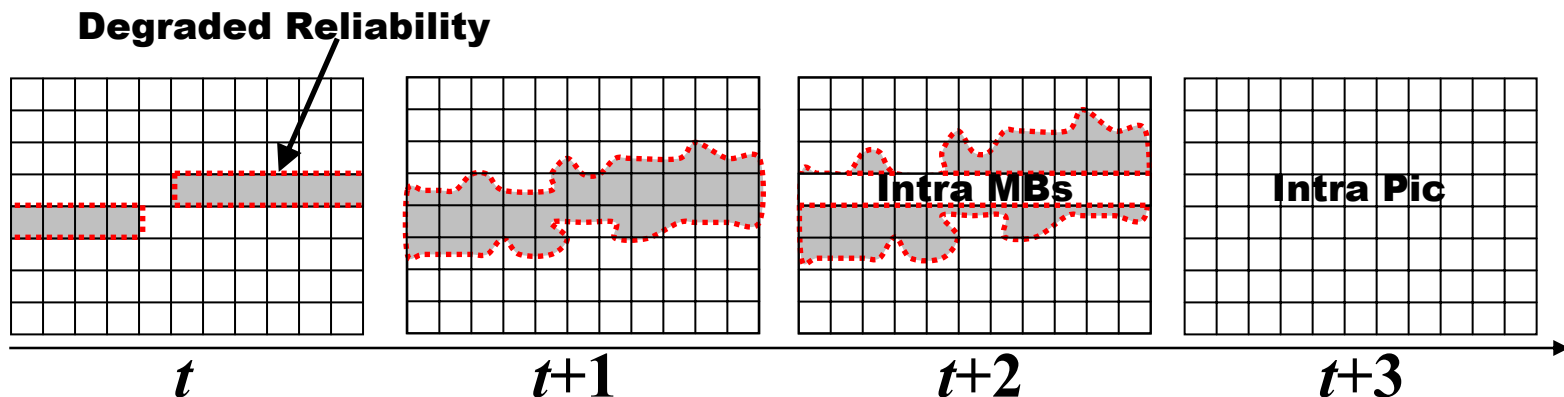


- ① Minimize Degradation
- ② Gradual Recovery

Proposed Method (Filter Strength Map) :

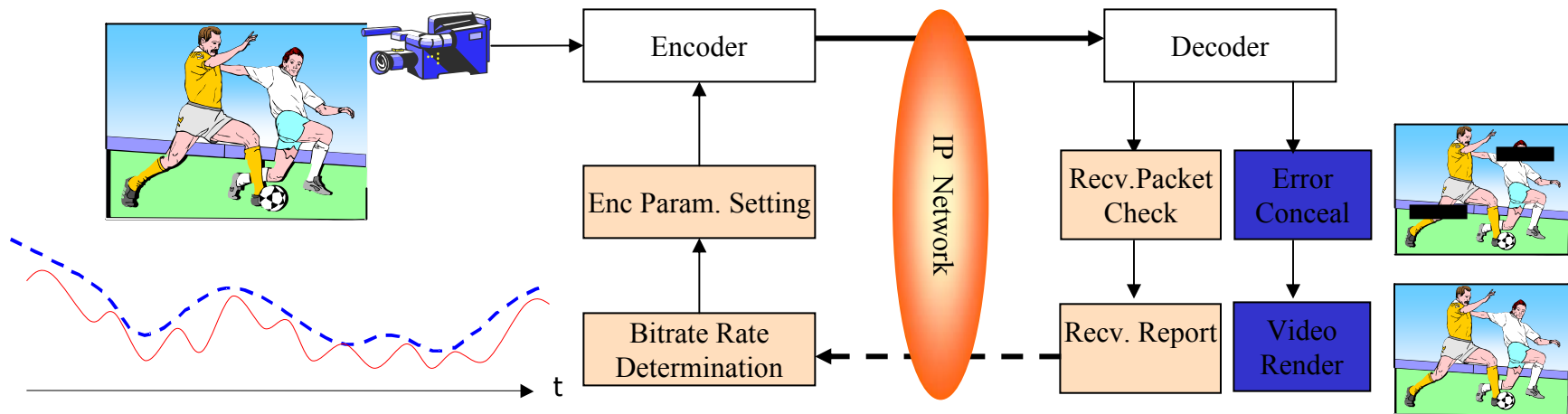
Introduction of reliability map :

- 1. Matrix which represents MB based reliability (correctness) of decoded image.**
- 2. Reliability is taken over according to Motion Vectors.**



System Flow

High quality live transmission is achieved by the combination of “Adaptive Rate Control” + “Error Concealment”



Adaptive Rate Control + Error Recovery

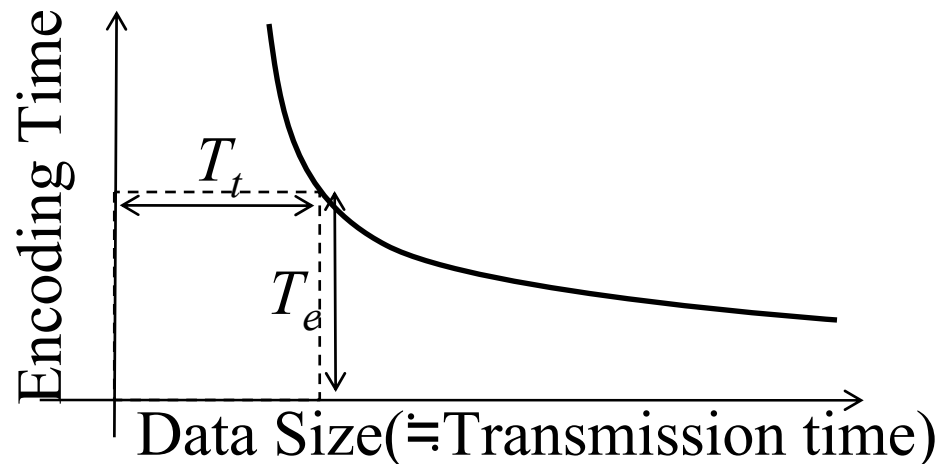
Type-2 (Store and Forward):

- **Obtain the best subjective quality video under the condition of :**
“Encoding time : T_e ” + “Transmission time : T_t ”
< “Time to broadcast in the TV program”



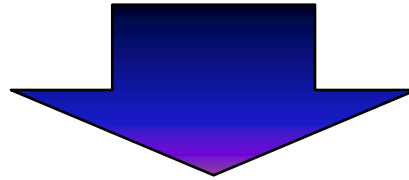
Step1. Determine video resolution

Step2. Determine encoding parameters

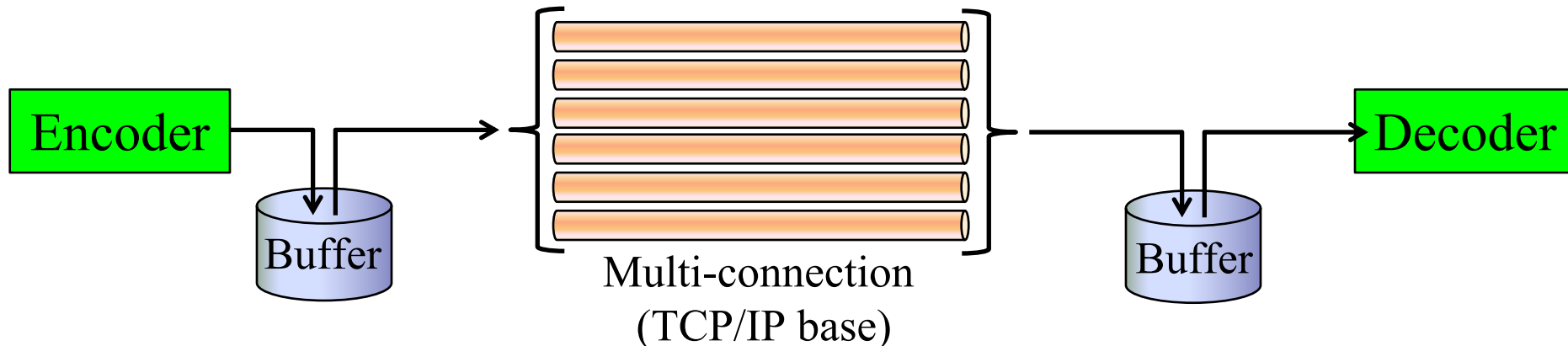


Type-2 (Store and Forward): Cont'd

- **To make the most of IP network, we propose a new transmission protocol which controls multiple TCP sessions at a same time.**



- **The proposed method is effective especially under the condition of high round trip time.**



Spec. Information

Items	Live Transmission Mode	Store and Forward Mode
Video Format	H.264/AVC (up to 30fps)	H.264/AVC (up to 30fps)
Audio Format	HE-AAC	HE-AAC
System Format	–	MPEG-2 TS
Transmission Protocol	Proprietary (Multiple-TCP/IP)	RTP
Adaptive Rate Control	○	–
Error Concealment	○	–
Bulk Transmission	○	○

Conclusion :

- **Transportable Video Transmission System**

Type-1 : Live Transmission:

- **Adaptive Rate Control**
- **Intelligent Error Concealment
at the decoder side**

Type-2 : Store and Forward:

- **Multiple TCP/IP connection control**

Type-3 : Storage

H.264/AVC + HE-AAC