

Influence of network awareness on perceived video quality

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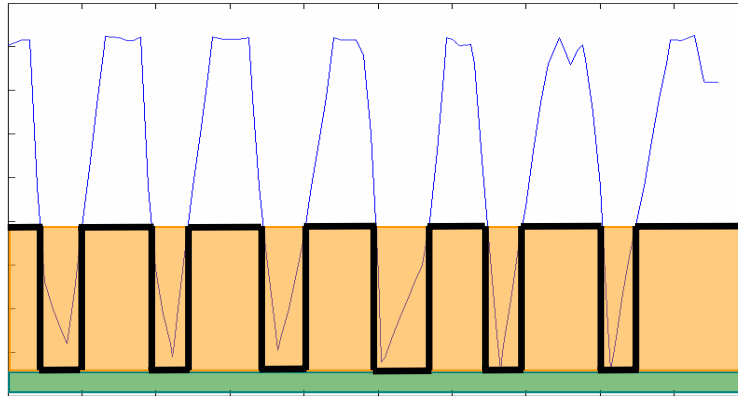
Networked terminal



- Resource-constrained terminal : CPU
- Resource-constrained network : bandwidth
- Wireless network has fluctuations

Scalable video

Bandwidth

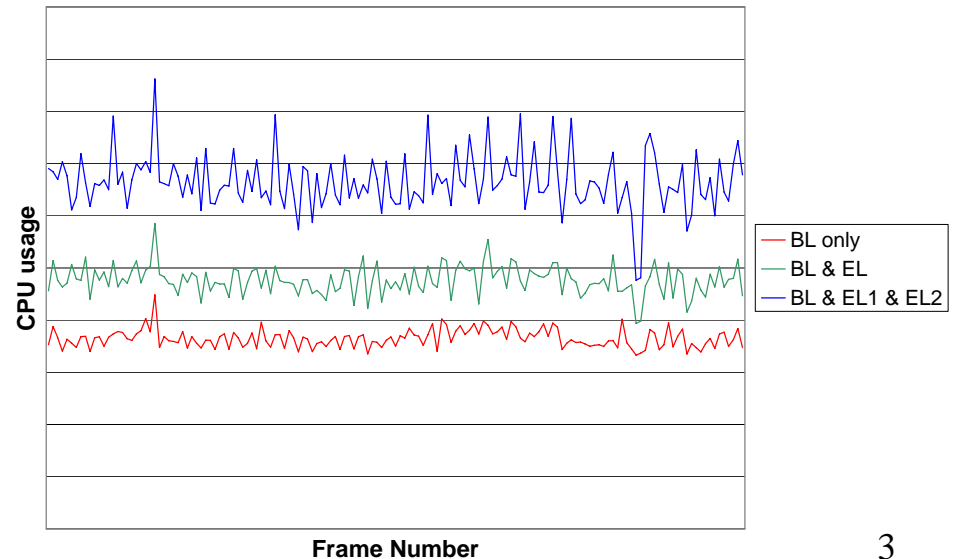


Time

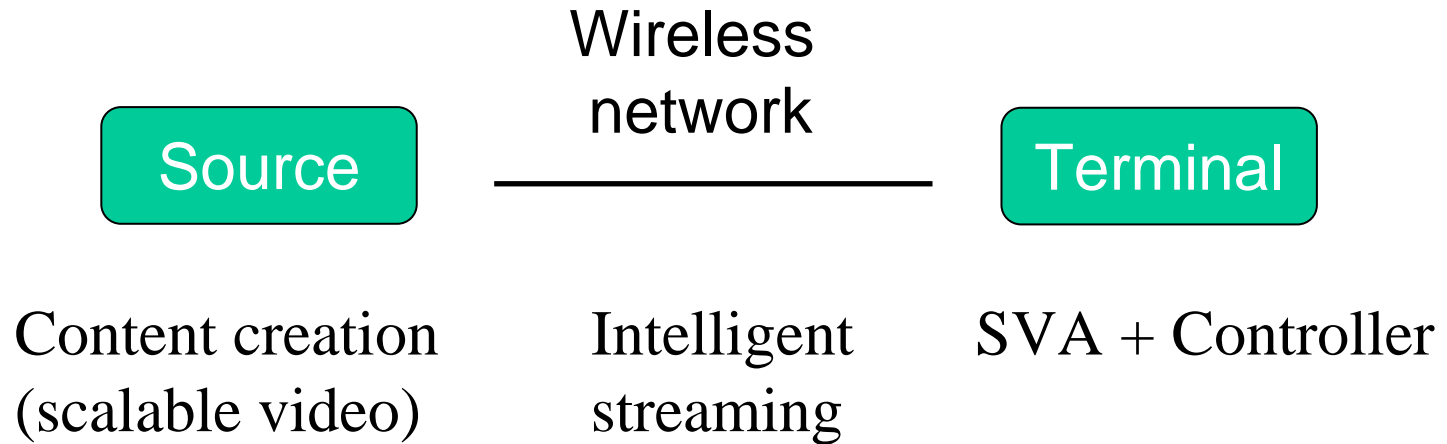
Choose size of base layer such, that we can almost guarantee the transmission

The enhancement layer is transmitted if there is available bandwidth

The number of layers to be decoded can be chosen for every frame



Multimedia streaming

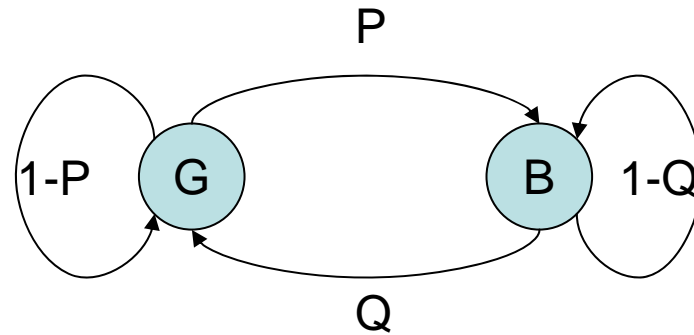


Video + Network = ?

? + Network = excellence

Network behavior model

Uses a network simulation based on Gilbert-Elliot channel model



Calculates probabilities of frames being missed for the given layer configuration based on network conditions (error rate and burstiness)

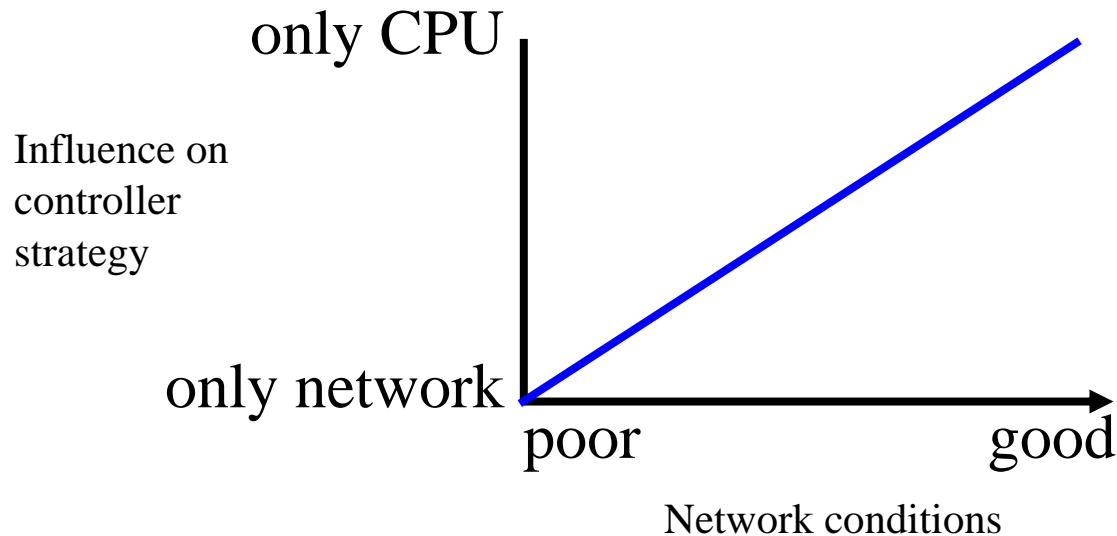
Controller strategy

- Chooses how much video data (e.g. layers) should be processed. Takes into account:
 - amount of available resources (CPU)
 - amount of video data available (e.g. how many layers have we received)Maximizes number of processed layers, minimizes number of changes in the number of processed layers.
- An optimal strategy is created offline by means of a MDP
 - State: progress, number of layers decoded, maximal number of layers for the next frame
 - Revenue: reward for number of layers, penalty for deadline misses, penalty for quality change

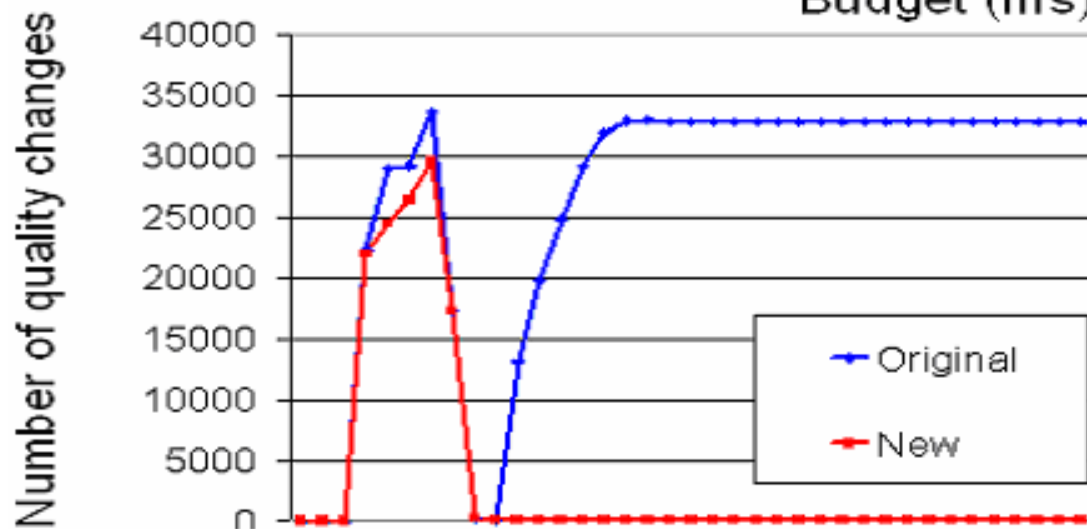
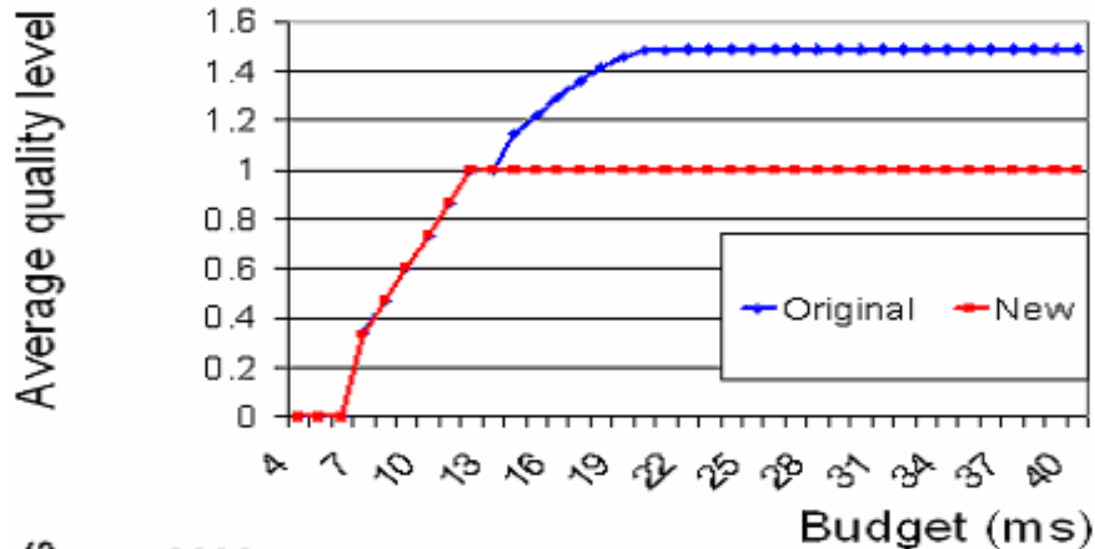
Results

Network conditions with respect to a layer configuration are:

- **poor**
Behavior of the controller is determined mostly by network
- **good**
Behavior of the controller is determined by availability of CPU resources
- **average**
Behavior of the controller is determined by network and CPU resources



Results: Network- aware vs. –unaware solution



Conclusions

- The network-aware solution allows decrease of unnecessary changes in the number of processed layers, thus delivering a video with higher objective quality.
- There is no significant difference in behavior of the original and new approaches if network conditions are very poor or very good
- New solution requires one strategy per each combination of Layer Configuration / Network Conditions.

