

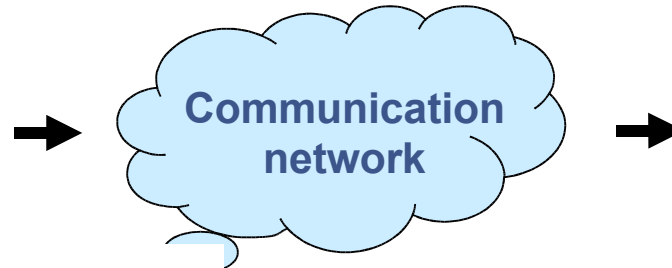
# Example Real-time Video streaming

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Gerhard Fohler  
gerhard.fohler@mdh.se

# Video stream adaptation

## Stream sources



Limited network bandwidth

Limited processing power

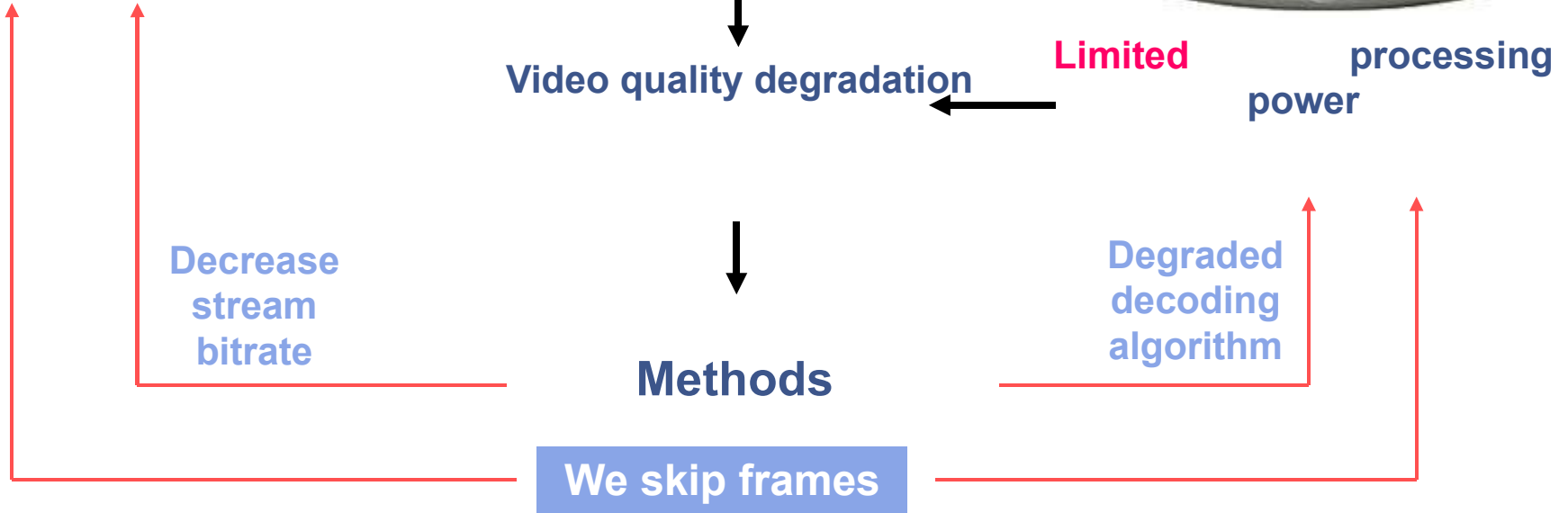
Video quality degradation

Decrease stream bitrate

Degraded decoding algorithm

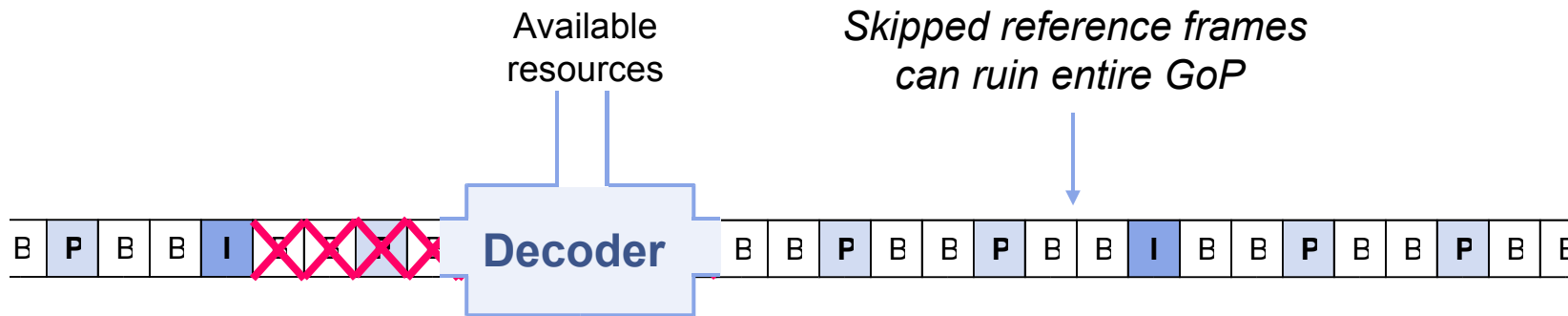
Methods

We skip frames

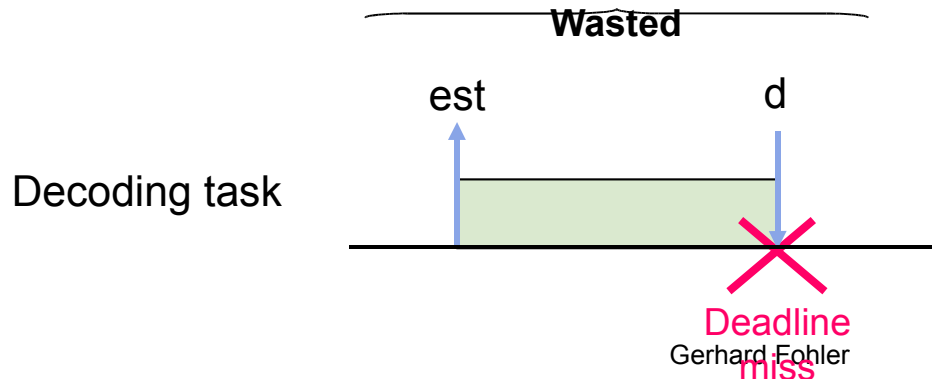


# Best-effort frame skipping

- When out of resources, **random** frames are skipped

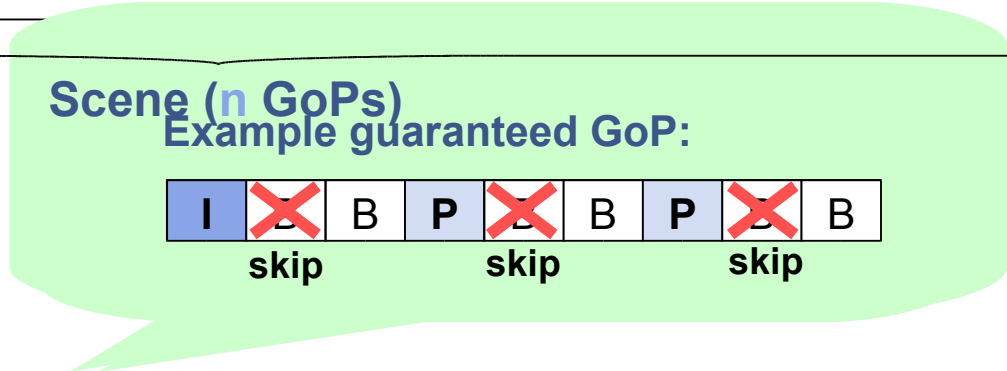
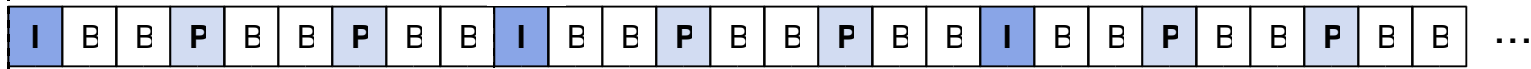


- Resources **wasted** on frames that cannot be decoded



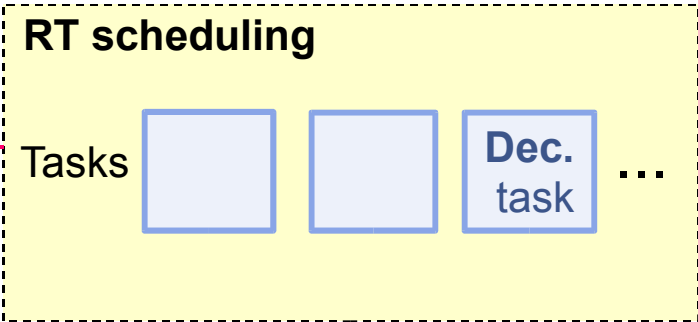
# Our frame skipping approach

MPEG-2 stream in



Frame importance assignment

Decoding guarantee algorithm



System load

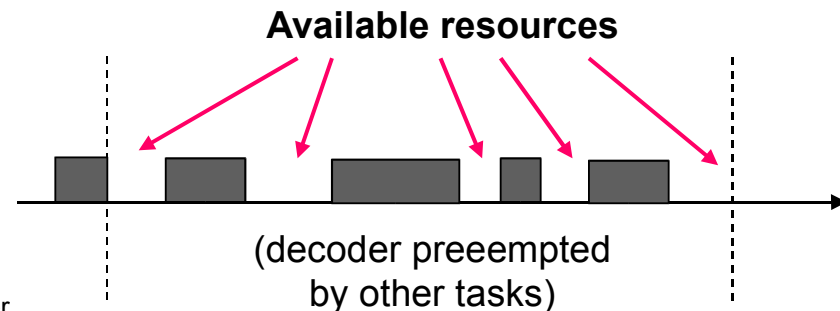
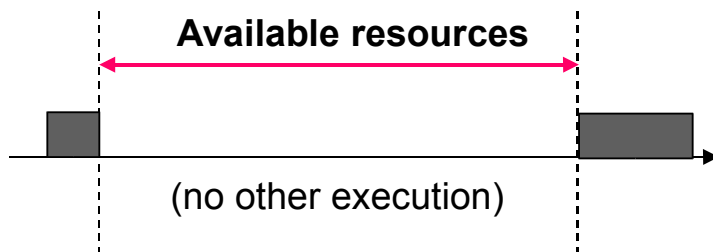


Adjusted stream out



# Decoding guarantee algorithm

- Decides how many frames can be timely decoded
- Input
  - GoP
  - Frame priorities
  - Available resources
- Output
  - Tailored GoPs (guaranteed to be decoded in time)
- Simple case
  - Uniform resource distribution
- Complex case
  - **Arbitrary** resource distribution

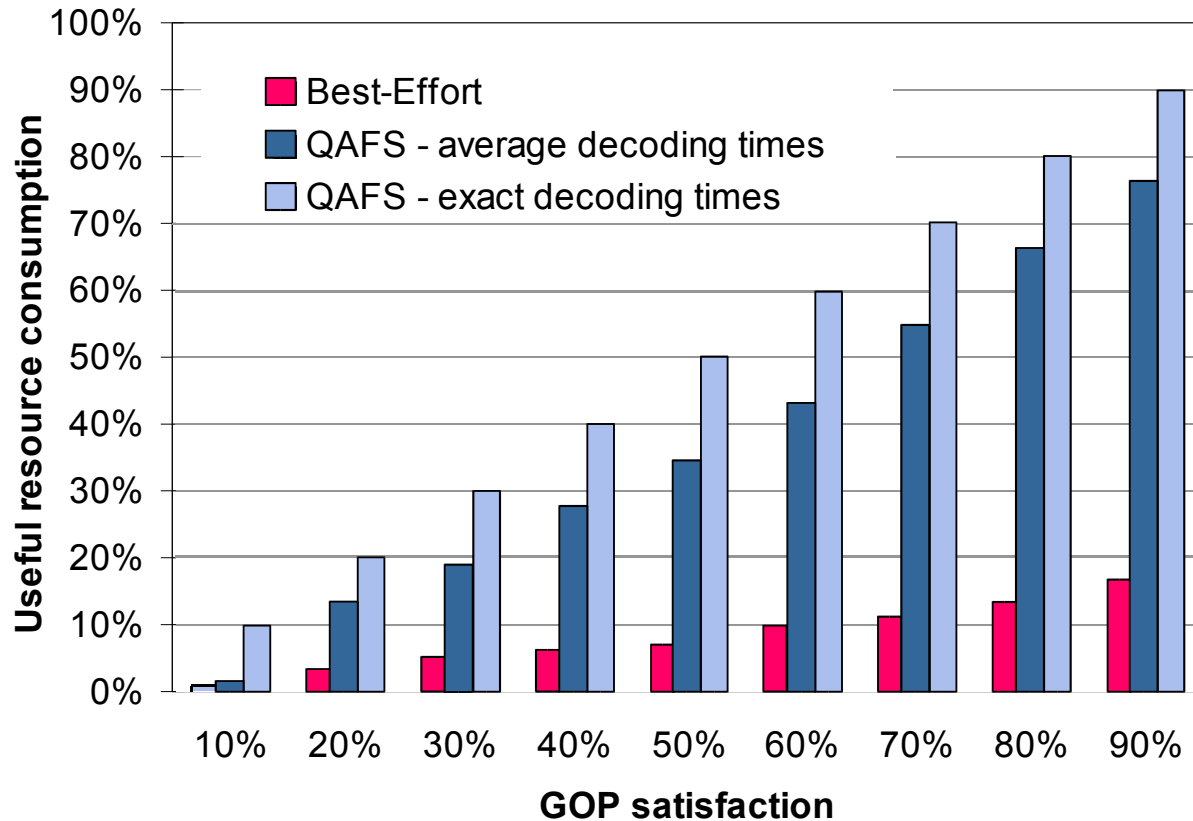


# Simulation analysis

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- We compared our method to a best-effort algorithm
  - Useful resource consumption
  - Total decoded frame
- Assumptions
  - Randomly distributed load
  - Both exact and estimated decoding execution times
- Real-time scheduling: "slot shifting" method
  - Table-driven scheduling with **offline** scheduled tasks → more challenging
  - Very suitable for **fast online access** of available system resources
  - Other methods can be used

# Simulation analysis



**QAFS =**  
*Quality Aware  
 Frame Selection*

**Useful resource consumption** = time spent on decoding frames that **contribute** to the overall picture quality

**GoP satisfaction** = 
$$\frac{\text{resources offered to a GoP}}{\text{resources needed by the GoP}}$$

Gerhard Fohler