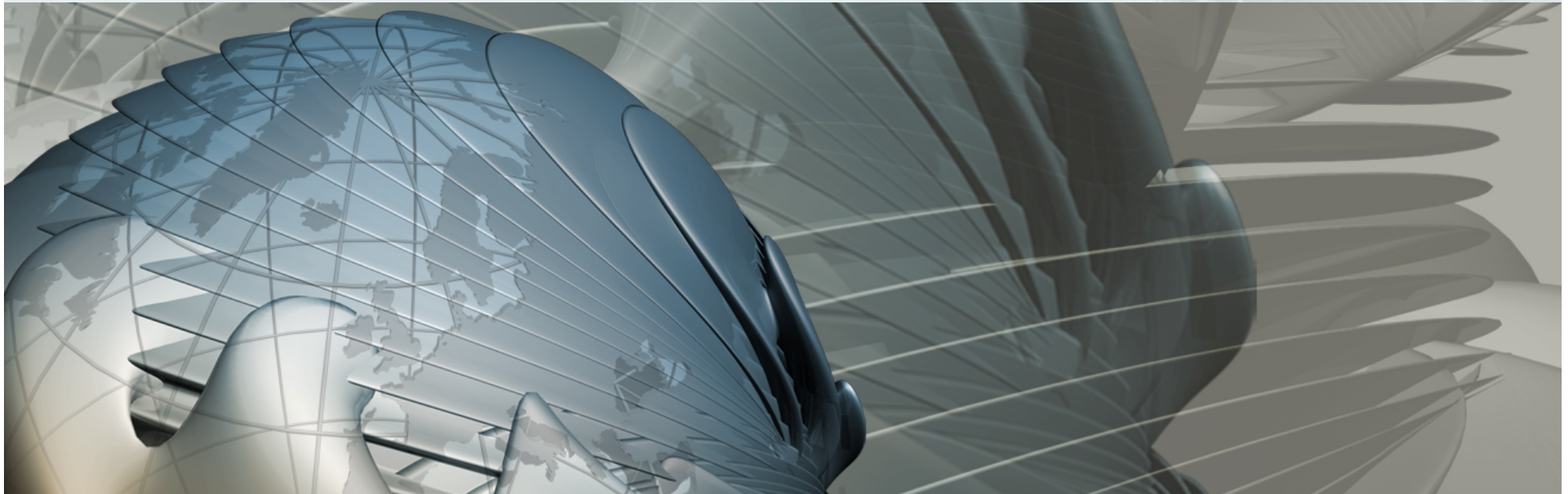




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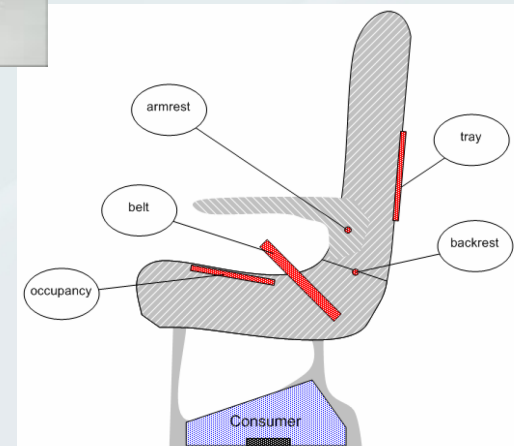
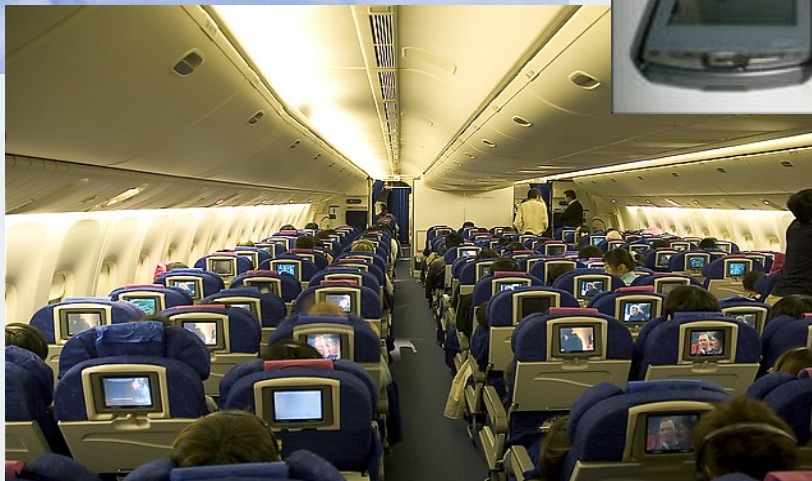
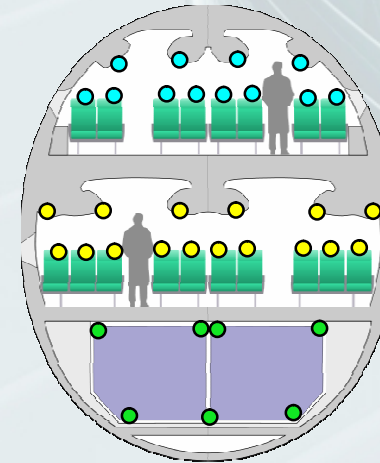
Performance Study of Applications for In-Flight Entertainment over IEEE 802.11 Ad Hoc Networks with Statistic-Based-Routing



Agenda

- ◆ Application
- ◆ Statistic-Based Routing
- ◆ Implementation
- ◆ Evaluation
- ◆ Results
- ◆ Future Work

Application



Statistic-Based Routing

Motivation

- ◆ Support of frequent topology changes
- ◆ Minimization of routing overhead
- ◆ Minimization of complexity

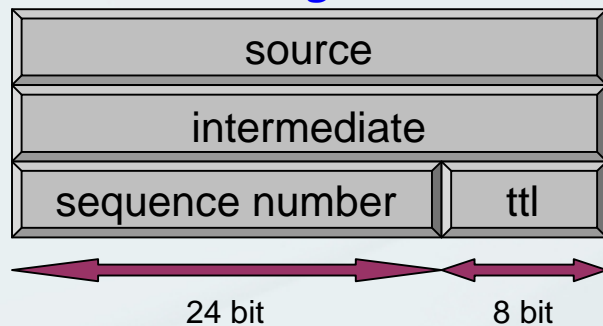
Characteristics

- ◆ Continuous routing metrics
- ◆ Adaptive route selection
- ◆ Usage of previously gathered information



Statistic-Based Routing

Hello Message:



- originator of the message
- address of the forwarder node
- identifier of the message

- ◆ Hello Messages are periodically transmitted by every node
- ◆ Sequence number is increased each time a node transmits a new Hello Message
- ◆ Hello Messages are only forwarded if they are received by the best neighbor and the time-to-live is higher than zero

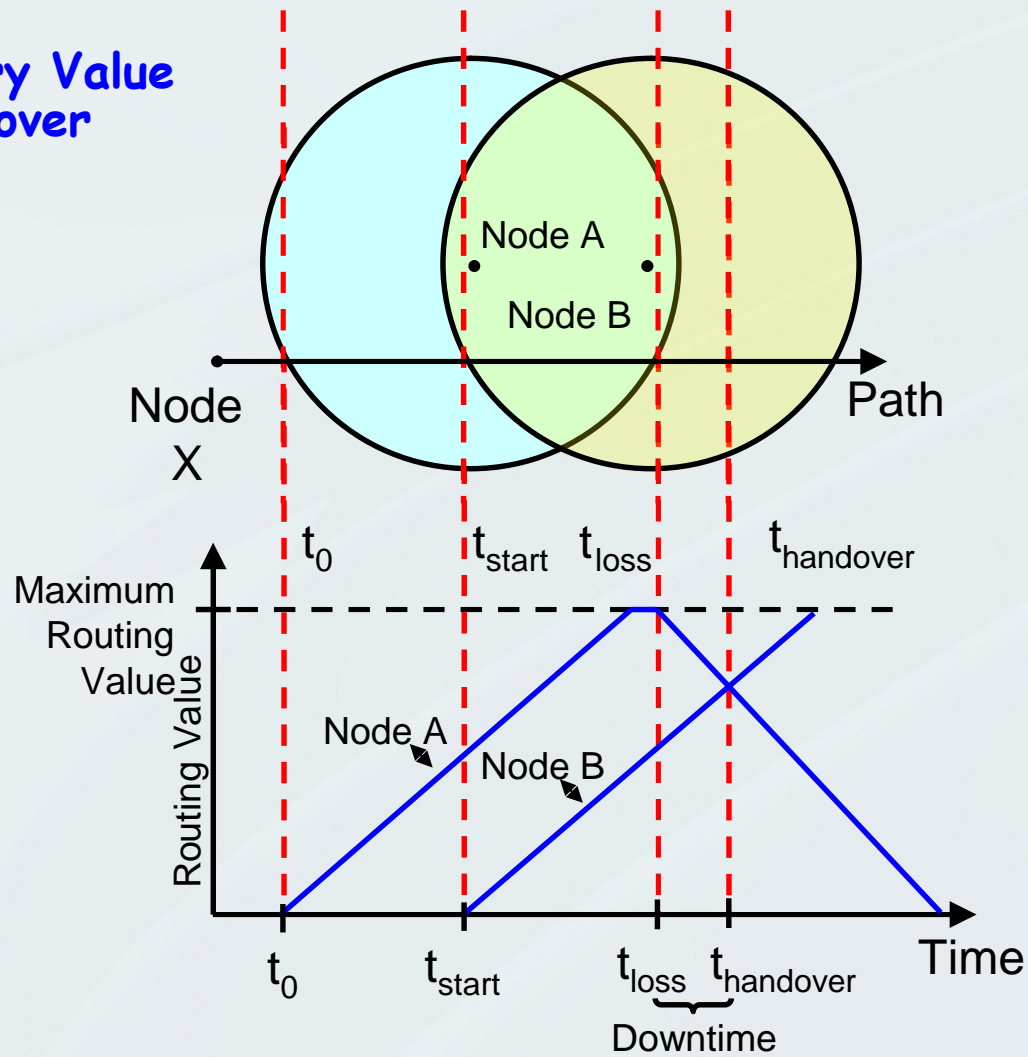
Statistic-Based Routing

Idea:

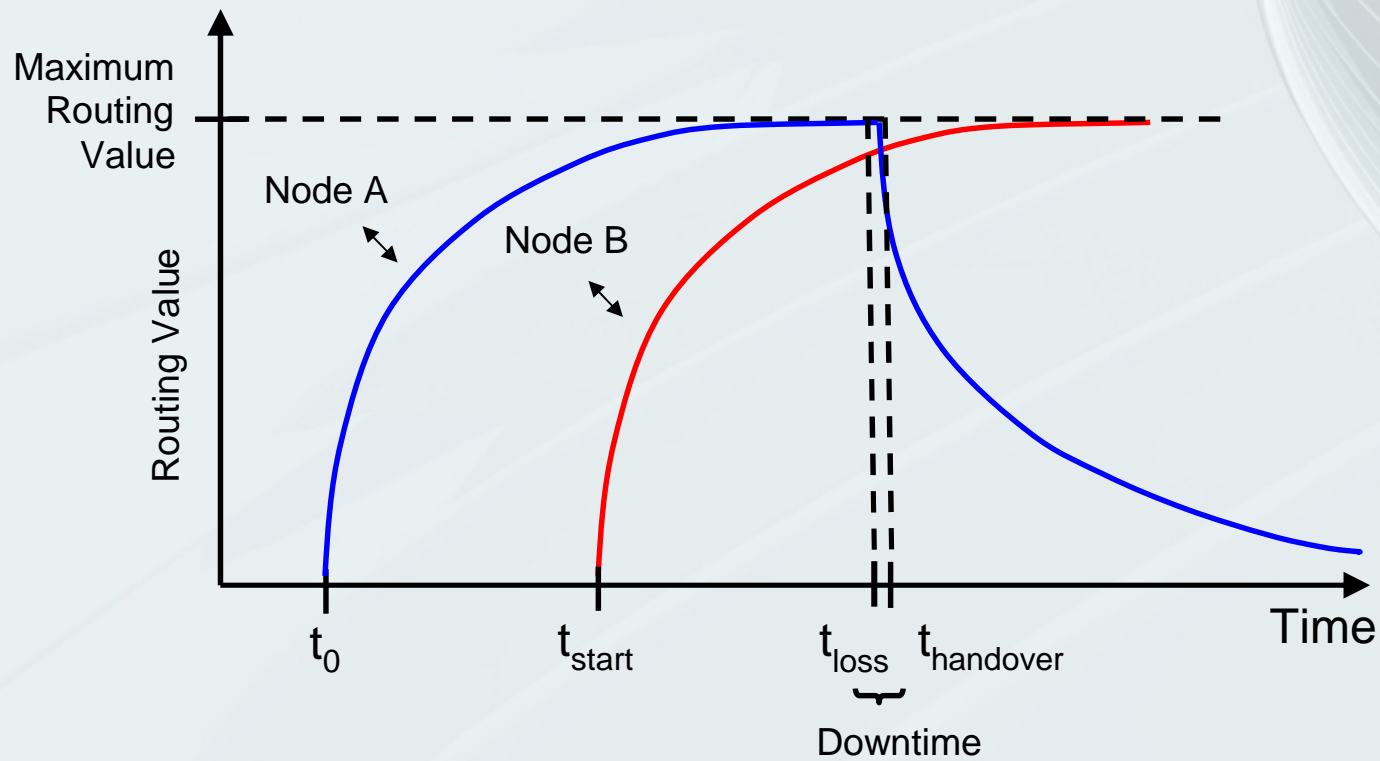
- ◆ New hello messages are **rated by a cumulative function** that considers previously gathered information
- ◆ The values are stored in a routing table
- ◆ The values are **decreased at constant time** intervals
- ◆ The entry with the highest value is chosen as next hop

Statistic-Based Routing

Routing Entry Value during Handover



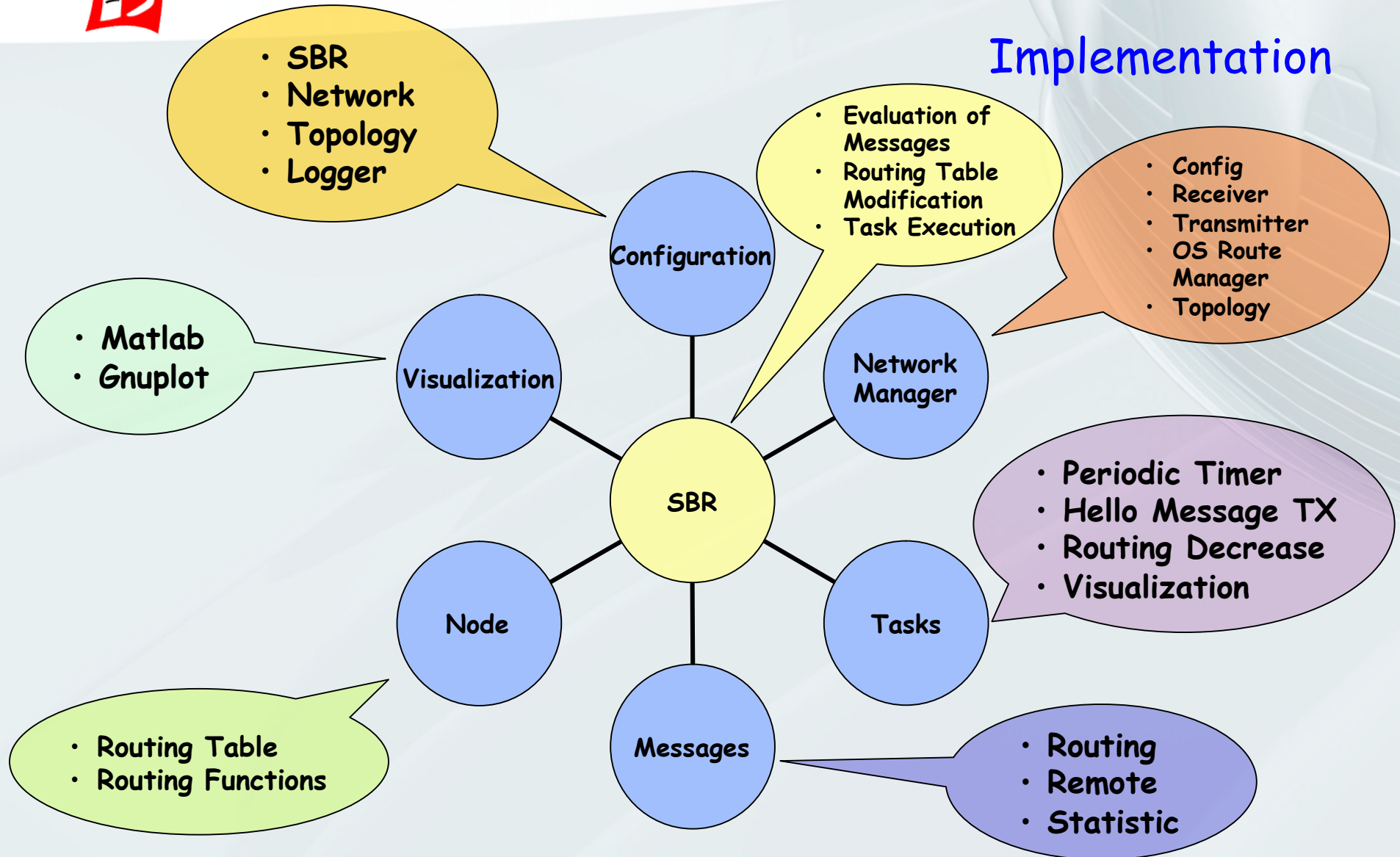
Statistic-Based Routing



Downtime can be reduced to
 $\max(\text{Hello Message Interval, Decrease Routing Value Interval})$



Implementation



Evaluation

Video Profile

- ◆ Resolution: CIF (352 × 288)
- ◆ Frame Rate: 30 Hz
- ◆ I Frame Rate: 1 Hz
- ◆ Duration: 300 Frames
- ◆ Encoder: H.264 (x264)
- ◆ Bitrate: 128 kbit/s
- ◆ Repetition: 6

PSNR [dB]

- ◆ > 37
- ◆ 31 - 37
- ◆ 25 - 31
- ◆ 20 - 25
- ◆ < 20

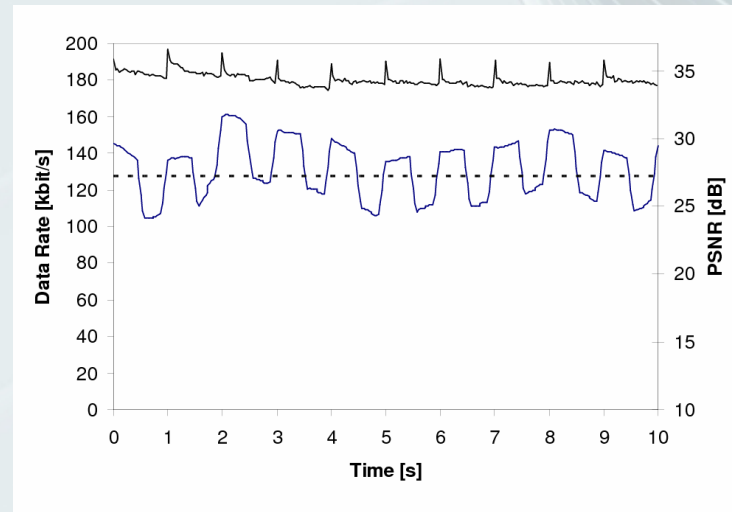
↔ MOS

- ↔ 5 (Excellent)
- ↔ 4 (Good)
- ↔ 3 (Fair)
- ↔ 2 (Poor)
- ↔ 1 (Bad)

Evaluation



Sample Image from Hall Monitor Video



Video Profile and Quality

Evaluation Steps:

1. EvalVid:

- ◆ Video Trace File (Packet Size, Packet Type)

2. Wireshark:

- ◆ IP Trace at the source and the destination

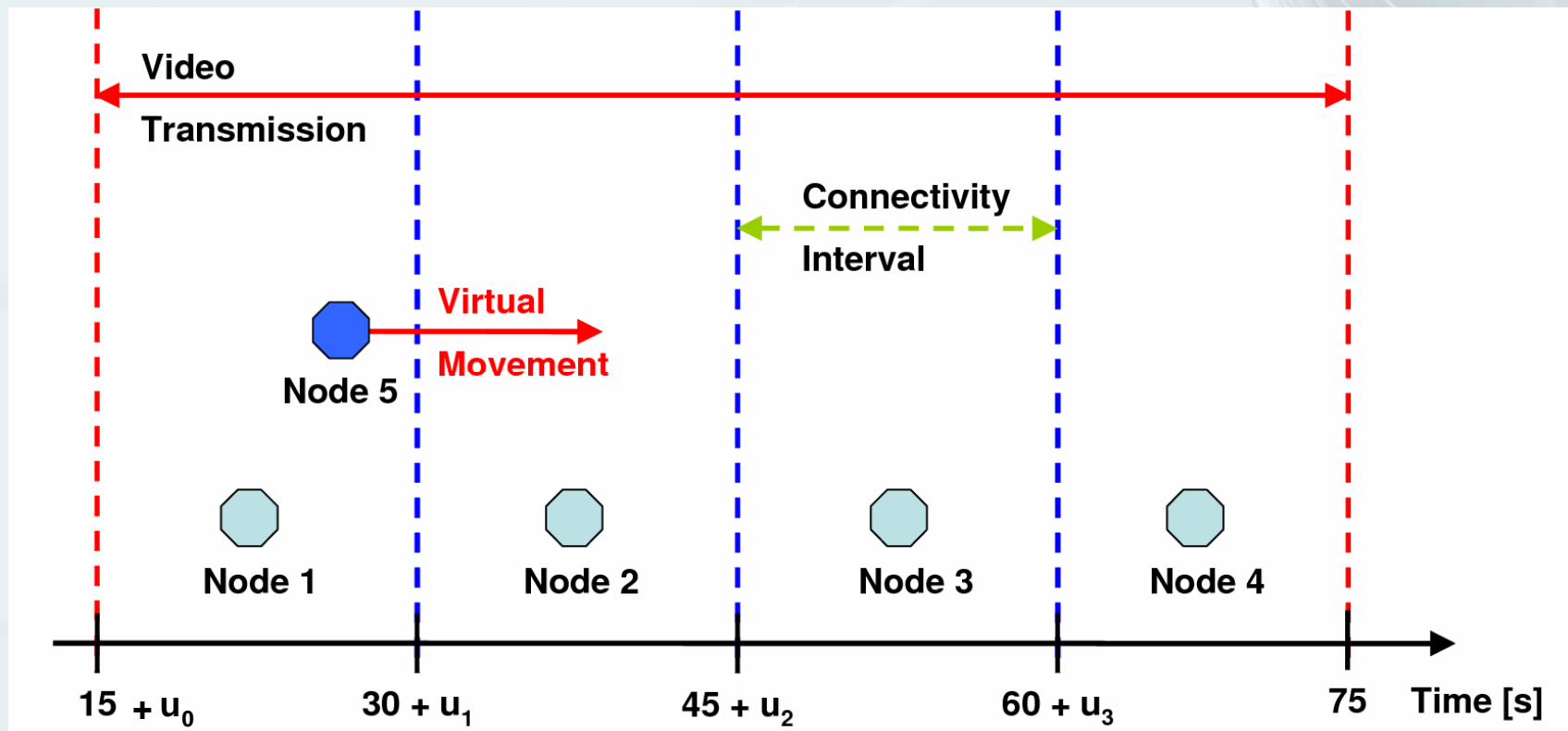
3. FFmpeg:

- ◆ Decoding of the received video

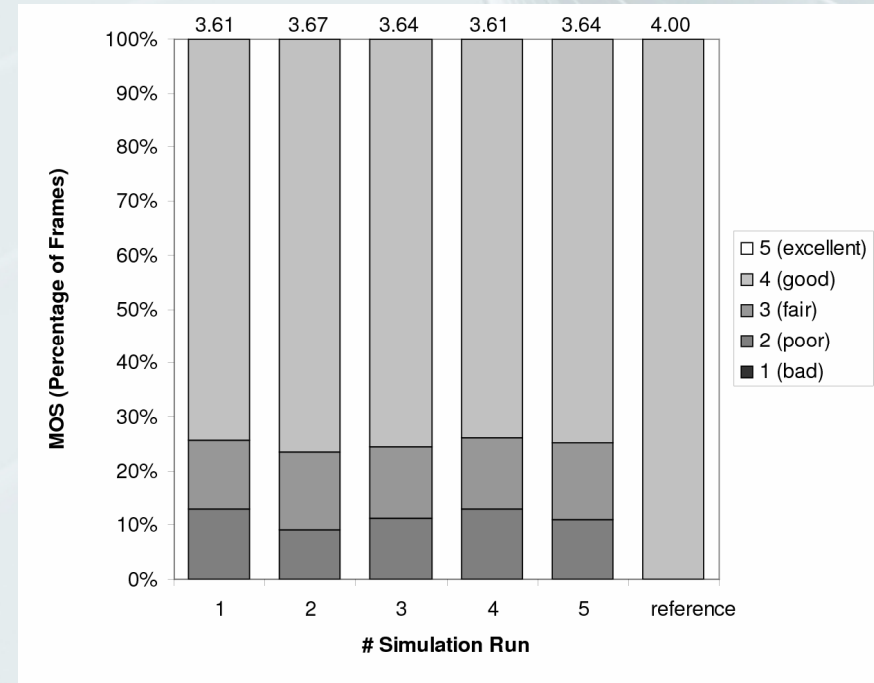
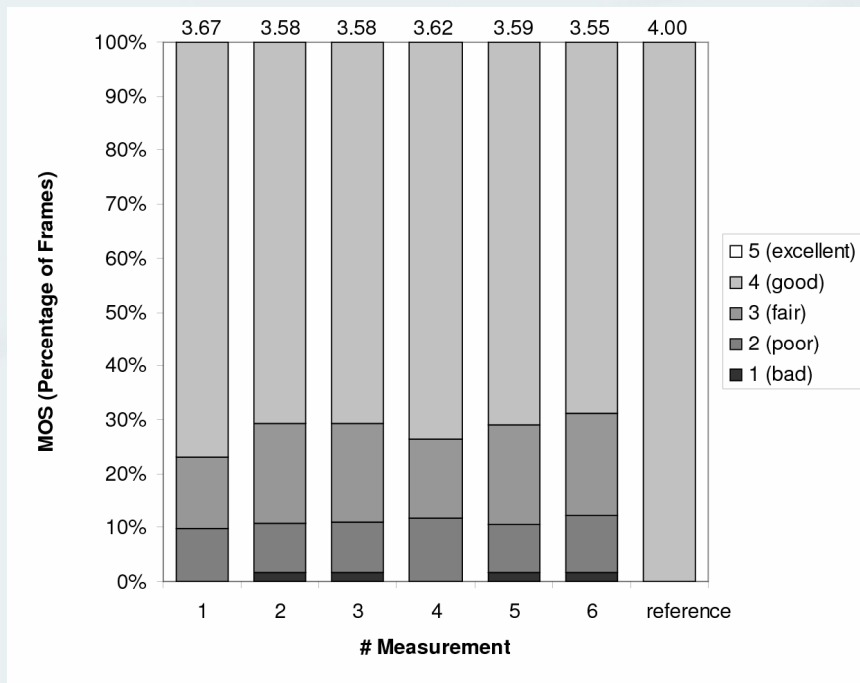
4. EvalVid:

- ◆ PSNR and MOS calculation

Calibration Scenario

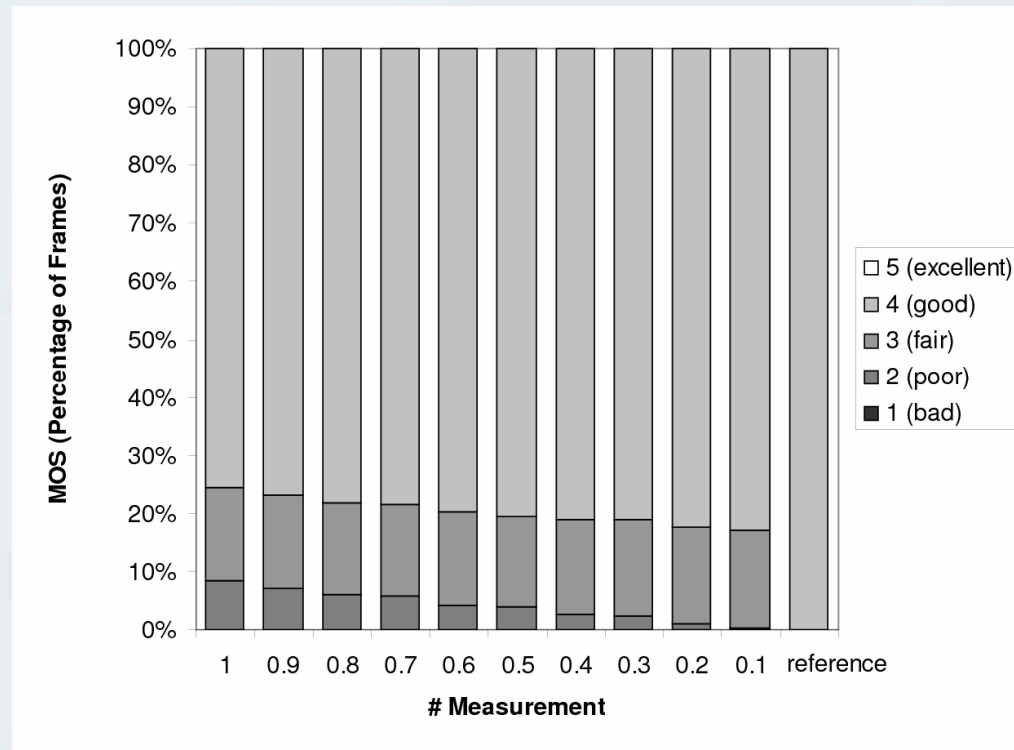


Results



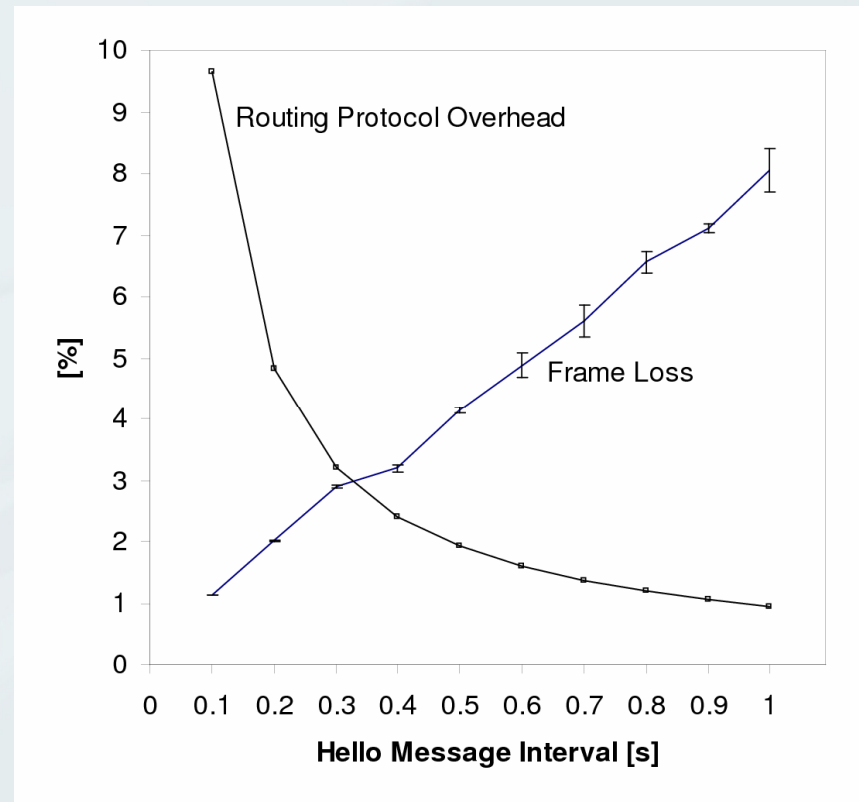
Comparison of the Mean Opinion Score (MOS) (HMI 1.0)

Results



Mean Opinion Score depending on the HMI

Results



Routing Overhead and Frame Loss depending on the HMI



Future Work

- ◆ Increase the testbed to ~ 30 Nodes
- ◆ In-Cabin and indoor performance measurement
- ◆ Mobile scenarios
- ◆ Impact of heterogeneous nodes

Questions

