Julius-Maximilians-
UNIVERSITÄT WÜRZBURG

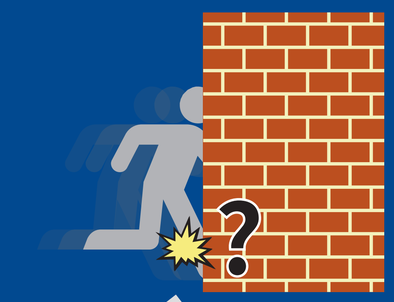
Institute of Computer Science
Chair of Communication Networks
Prof. Dr. T. Hoßfeld

Exploring the Transmission Behaviour of Overwatch:
The Source of Lag

Florian Metzger, Roman Heger

Lag in Competitive Video Games

Lag occurs at every component of gaming...

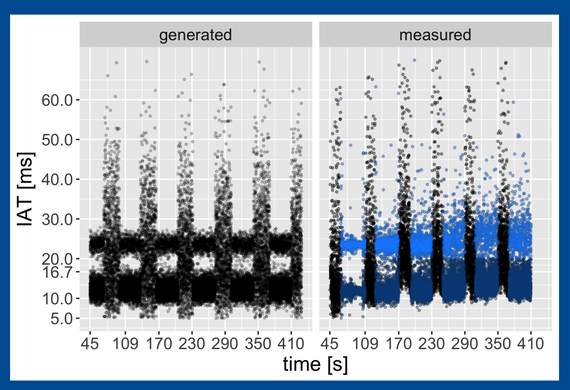


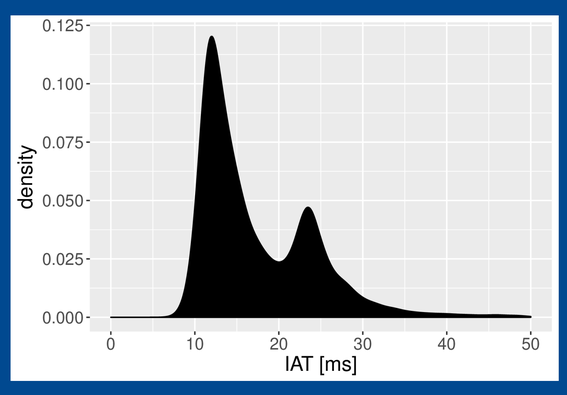
...and leads to
- **Desynchronised** behavior of clients
- Players getting hit even if they are seemingly behind an obstacle (and vice versa)
- Diminished **player experience**

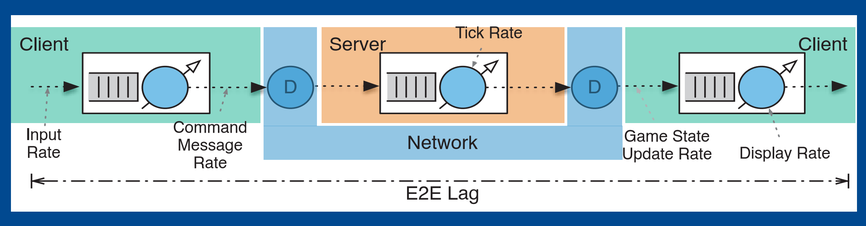
Bonus challenge: resource-constrained client computers that struggle to maintain a stable frame rate

Lag Models

Client to Server

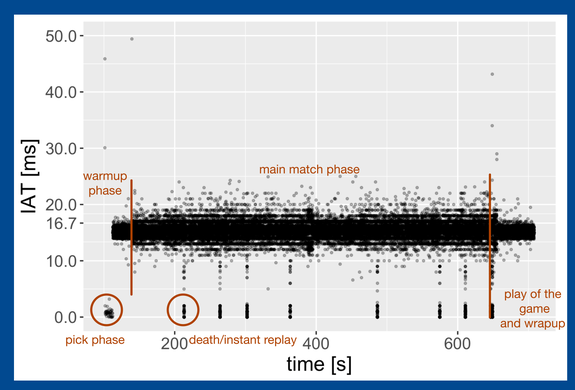


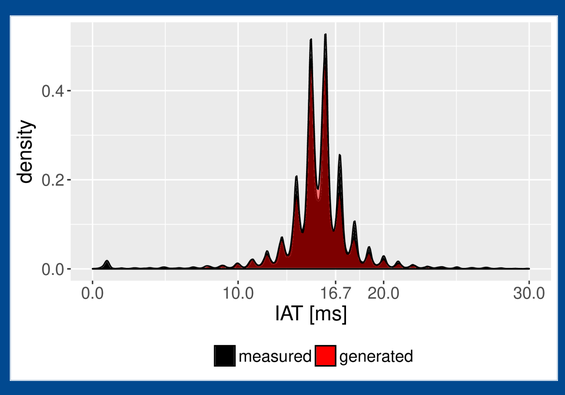




- Can describe all components leading to lag
- But modern games and engines offer **too many variables**
- Games are black boxes, public information not necessarily correct
- In-depth analysis of individual games and per-game parametrisation required
- Conducted investigation for **Overwatch**

Server to Client

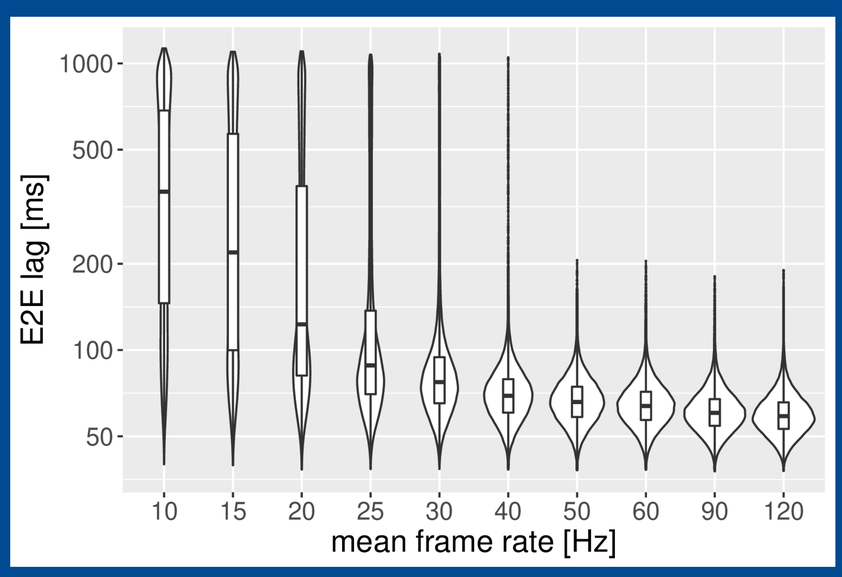




Lag Simulation

Overwatch Modelling

- **Command Messages:** Fit with two gamma distributed phases and an additional normal component
- **Update messages:** Fit with a sine-modulated Cauchy distribution
- **User input:** Exponential distribution derived from recorded input
- **Network:** Constant RTT (34ms) reflecting today's regional game hosting
- **Frame rate:** Mean as a parameter with narrow normal distribution emulating resource-constrained computers



The Results

- Overwatch's server's **tick rate** may be advertised as 60 Hz, but communication does not reflect it perfectly
- Small role of network as cause of lag
- **Frame rate of 50 Hz** and up required to achieve reasonably low, stable lag (or 60 Hz, considering even frames and no screen tearing)
- Does not consider **lag compensation** mechanics that can conceal lag and predict the outcome
- Future work in directly monitoring **game engine** behavior

Find the paper, evaluation and simulation at
https://github.com/fmetzger/overwatch-lag-model