GAMES AND FRAMES: A STRANGE TALE OF QOE STUDIES

UNIVERSITÄT DUISBURG ESSEN

Open-Minded

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Motivation

- Increasing research interest for video game QoS/QoE
- Past approaches treated video game QoE assessments similar to video streaming
- Networked video games have difficult-to-understand interlocked mechanics (frame and tickrates, lag, ...)
- Singular focus on network delay
- Need for a better theoretical understanding of these mechanics

Frame- and Tickrates

- Framerate and tickrate governings factor in input latency
- Independently clocked processes in networked games
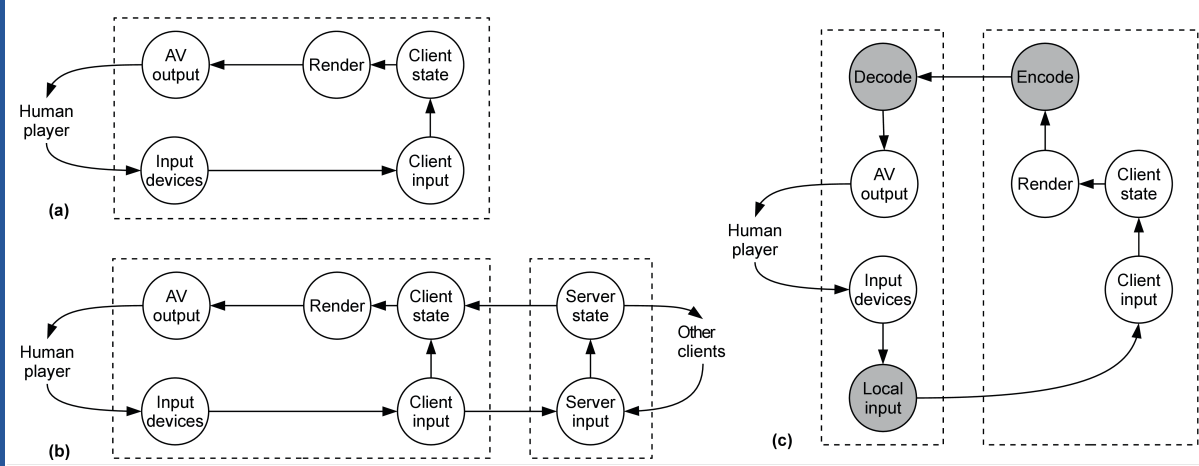
Sources Of Lag
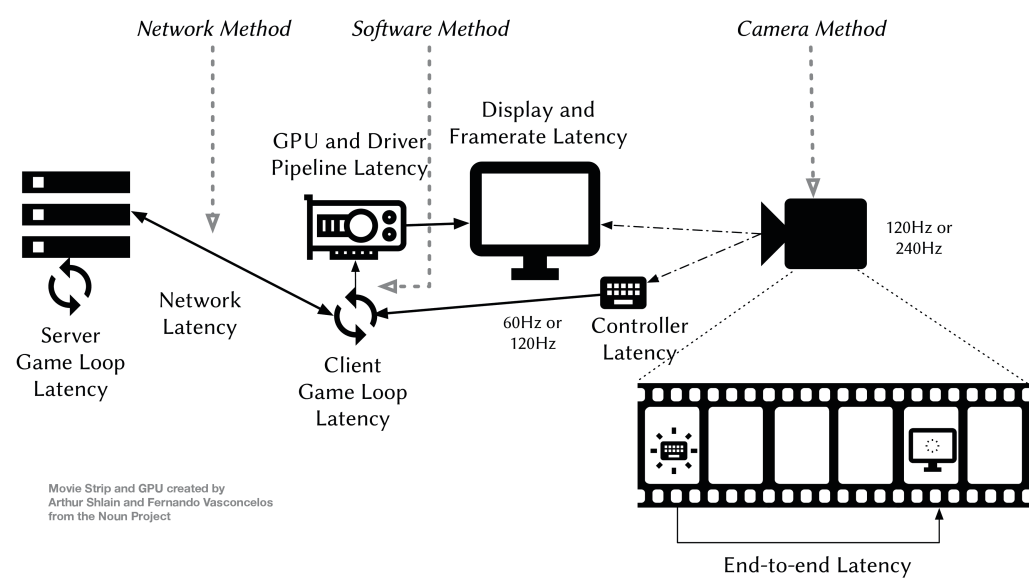
- Depending on the type of game, lag may arise in different components: Input and output devices, game client, renderer, network; codecs

Issues of Past Studies

We model the End-to-End Lag from the various messages and rates intrinsic to the game. The E2E lag, highlighted at the bottom of figure, is the time elapsed between a user input event and the display


of the event's result on screen.
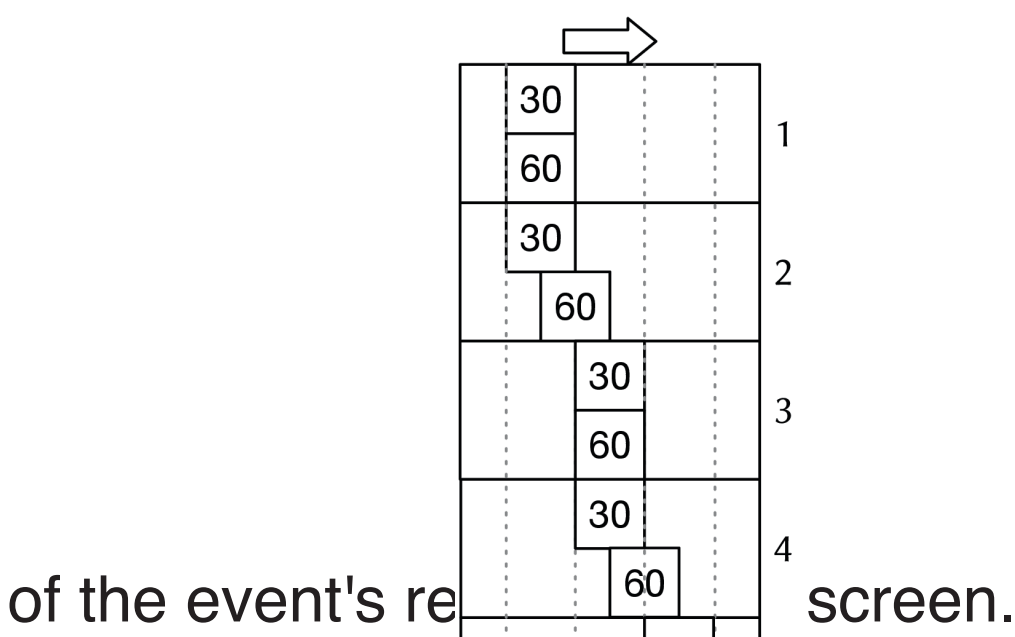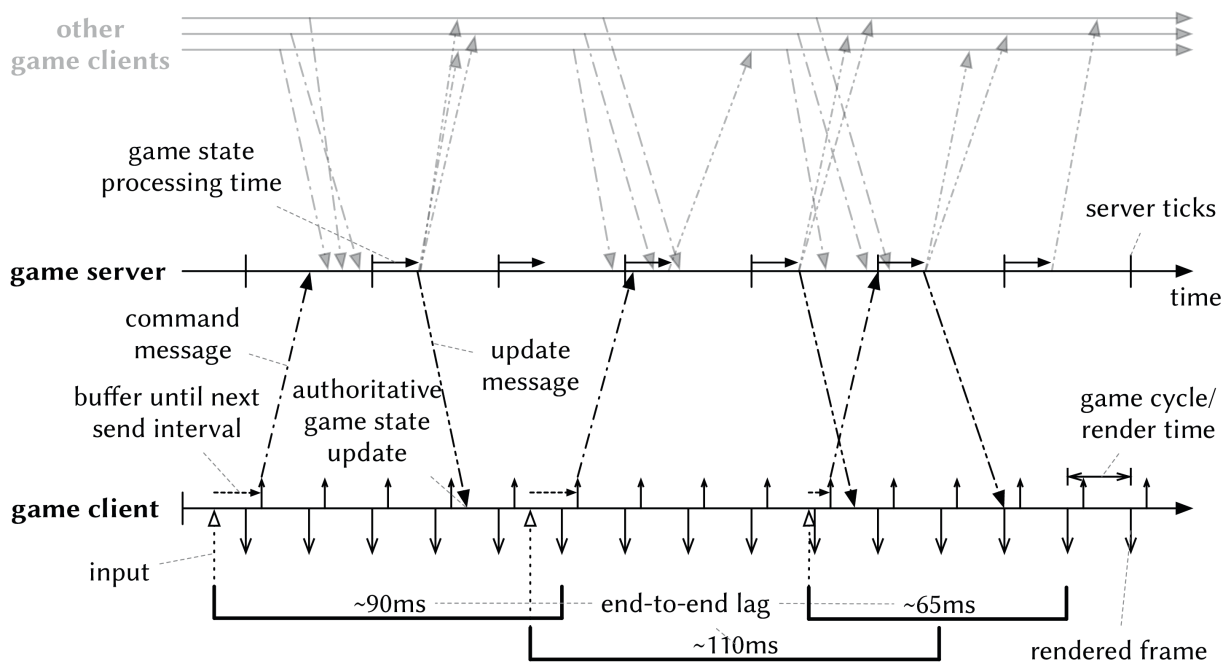
Using the online game event flow as a basis, we arrive at a queueing model for the end-to-end lag T that represents client

input events U, the command rate c, a symmetric network delay D, server processing time P, server tickrate g, and the client framerate f.

This generic model allows mapping the above game types by adding or removing delay components. For instance, a local game requires no network and server-side processing, whereas a cloud game would model encoding and decoding delays.

Modeling and Simulating Lag
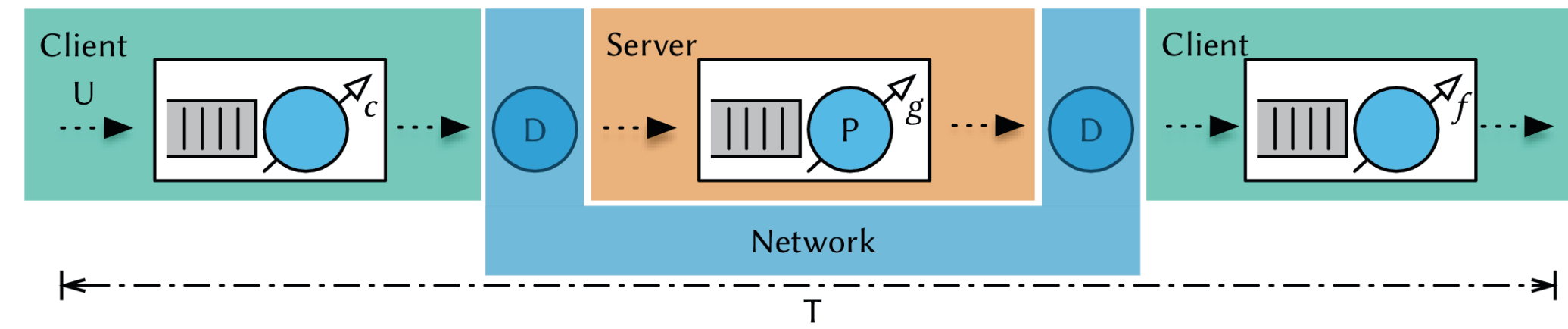
The figure above represents a locally-running game (with no NW influence etc.).
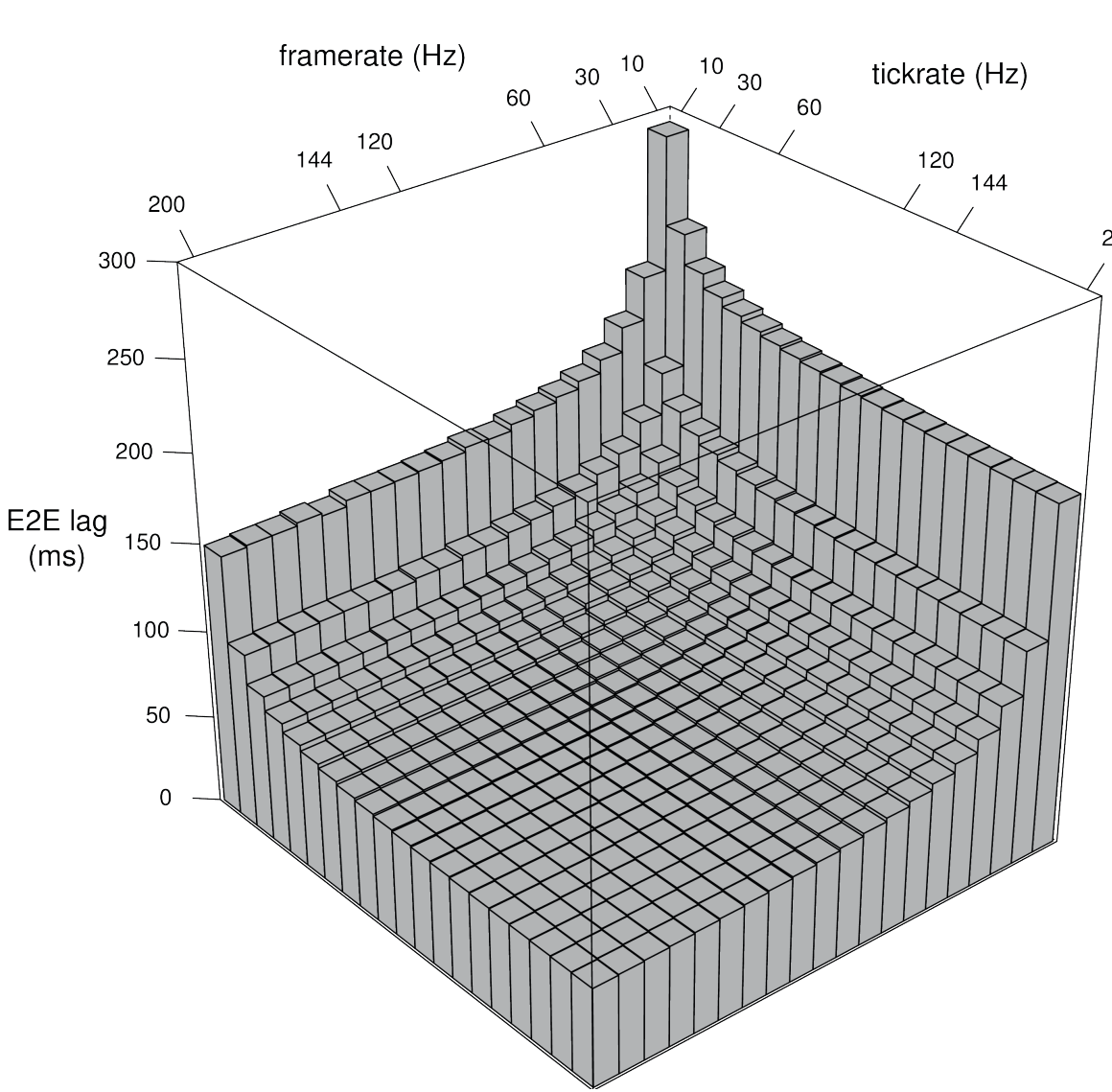
Takeaway message: Lowering the frame rate has bigger impact than lowering the tickrate. (Delta-lag as a function of FR is ~150ms in this scenario; delta-lag of TR is less than 100ms).

The other figure shows an online game with ~43ms average network+server processing delay.

Takeaway message: Similar to before; potential masking effects of low rates for NW delay; low rates clearly unsuitable to

Results & Outlook