

快节奏的多人游戏

---

**FAST-PACED MULTIPLAYER**

ENEMIES OF NETWORK GAME

网络游戏的几大坑

**ENEMY 1: CHEATING**

**作弊!**

### AUTHORITATIVE SERVER 权威服务器

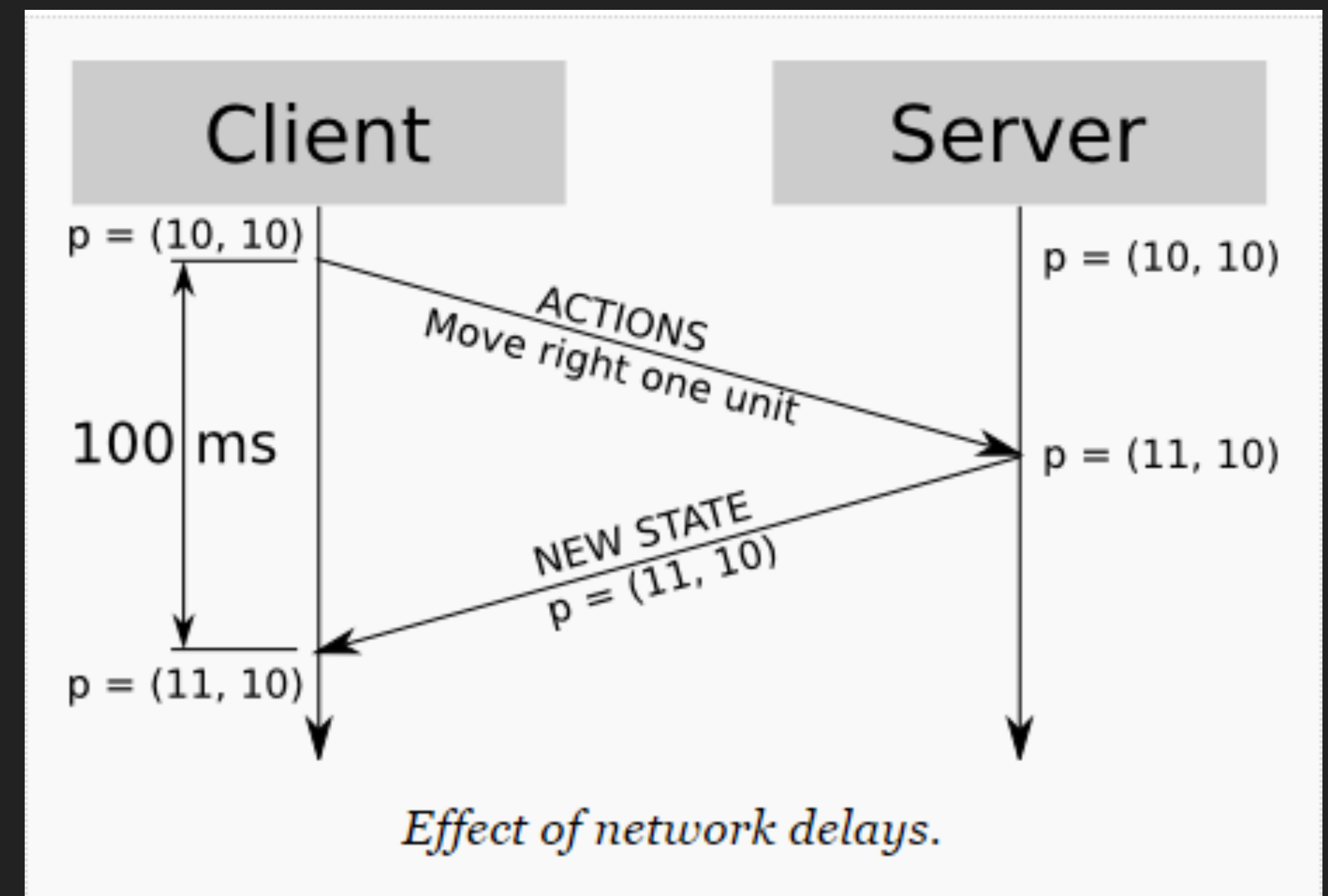
Player Server what they want to do



Server determines what happens



Server tells client players how to update



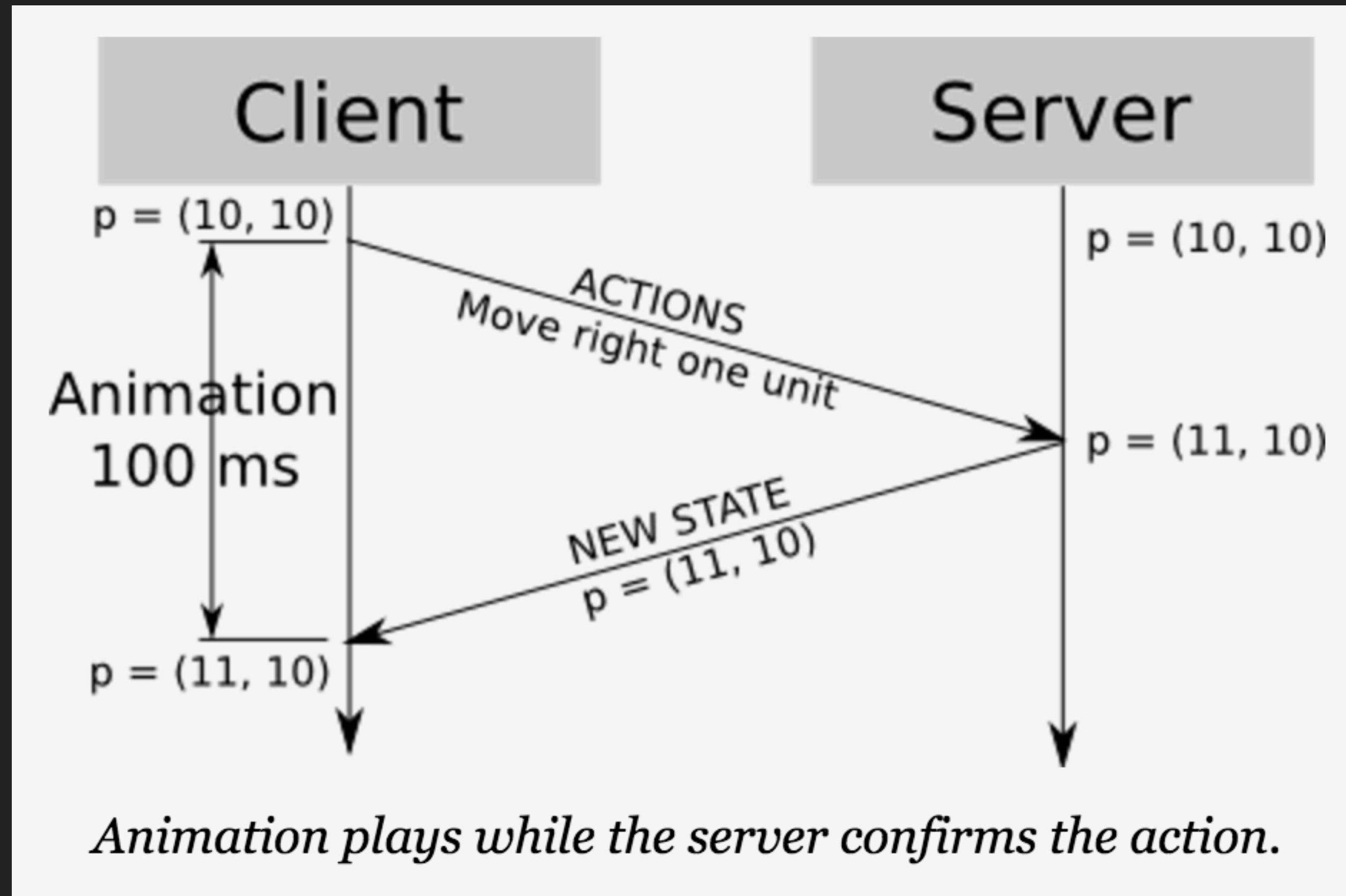
### AUTHORITATIVE & NON-AUTHORITATIVE 权威 & 非权威

- ▶ Authoritative Server needs to run PHYSICS
- ▶ Unity Server
- ▶ We use non-authoritative physics

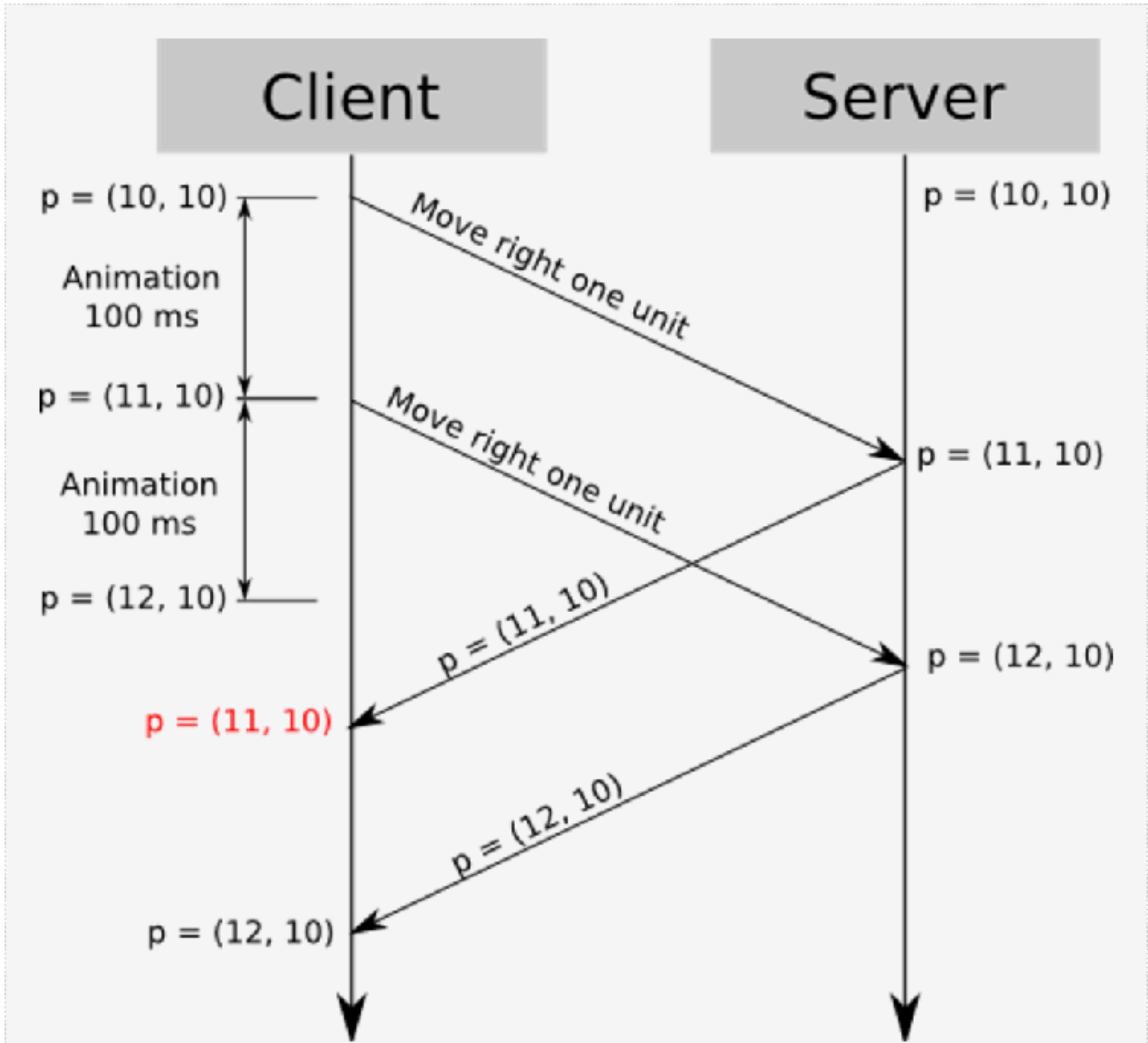
**ENEMY 2: LATENCY**

**延迟!**

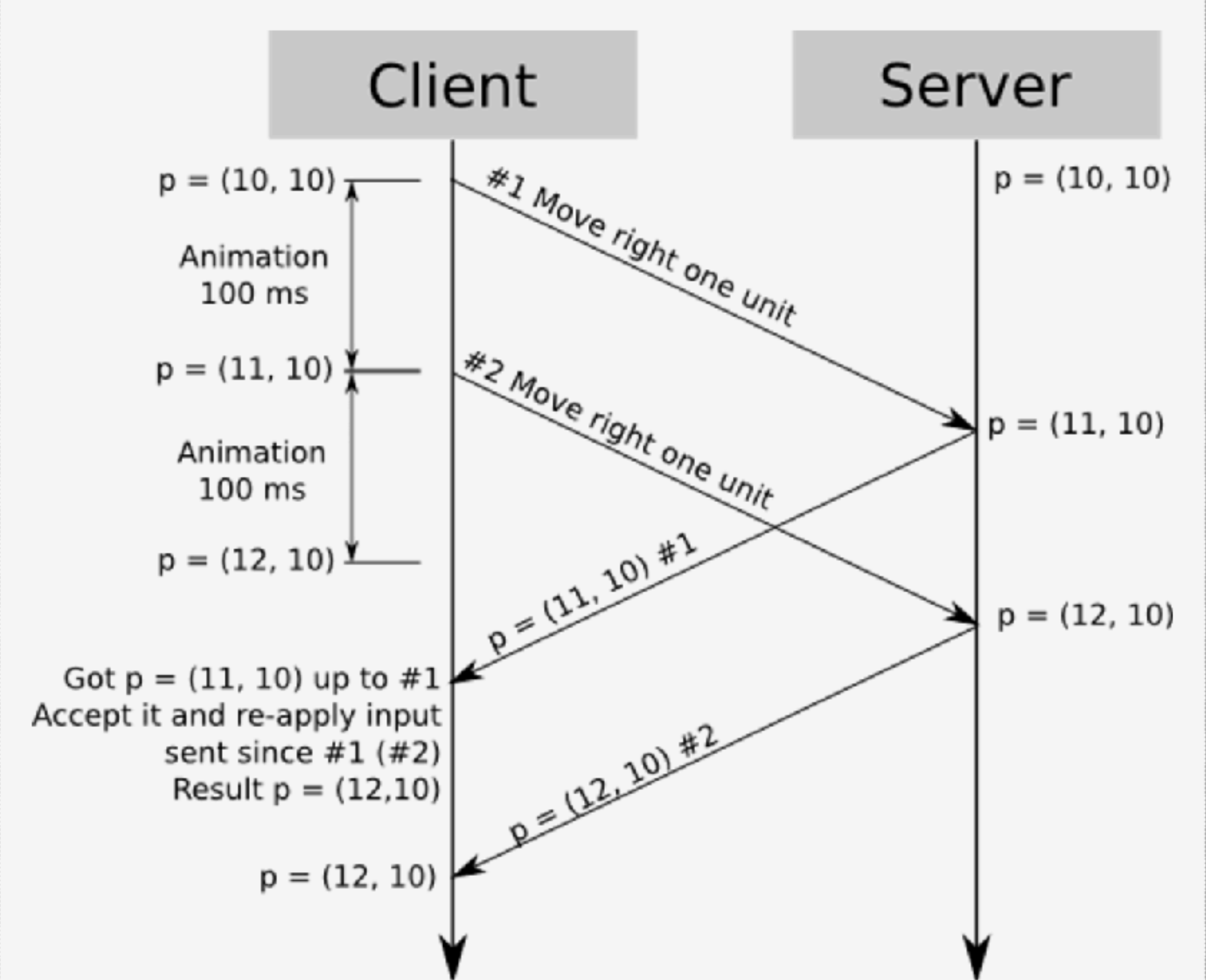
### PREDICTION 预测



SERVER RECONCILIATION 服务器调解



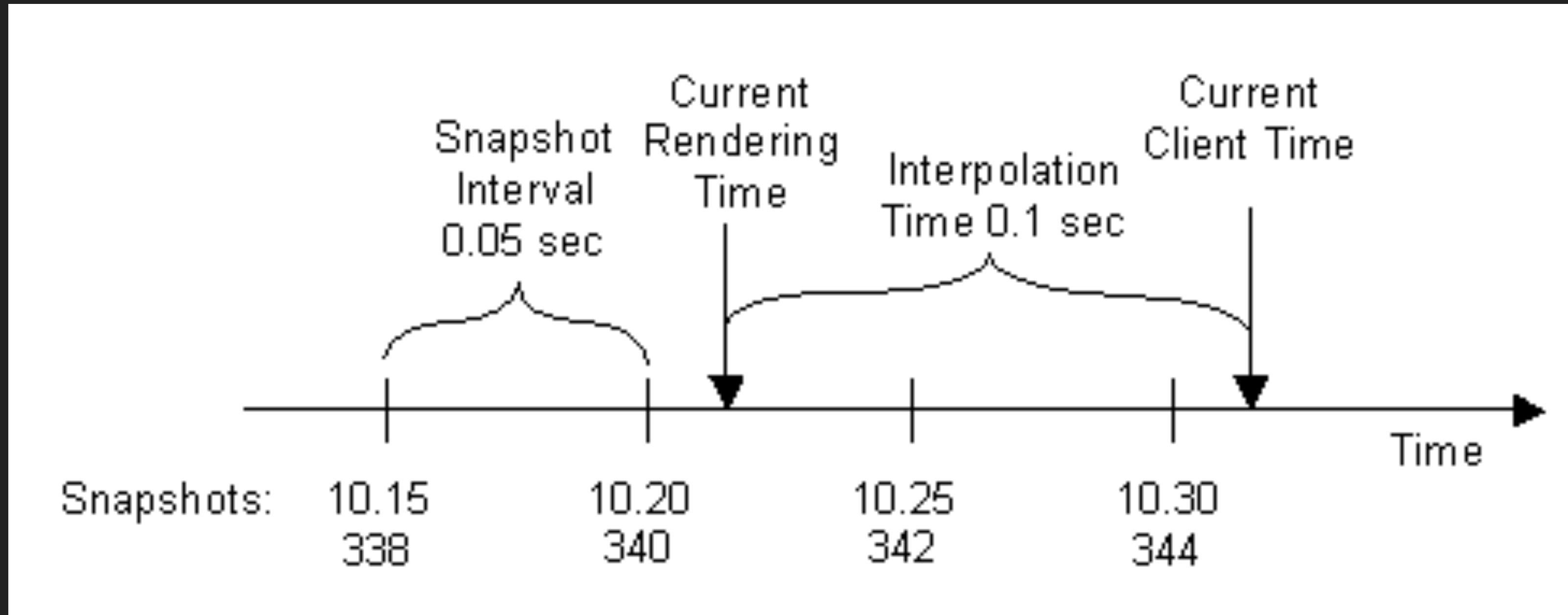
*Predicted state and authoritative state mismatch.*



*Client-side prediction + server reconciliation.*



### INTERPOLATION & EXTRAPOLATION 内插值和外插值



ENEMY 3: PACKET LOSS

丢包!

## TCP OR UDP?

- ▶ Guaranteed Data & Most-Recent State Data
- ▶ Reliable UDP

**ENEMY 4: BANDWIDTH LIMIT**

**带宽限制！**

### PHYSICS SYNC 物理同步方式

- ▶ Snapshot and Interpolation 快照同步
- ▶ Deterministic Lockstep 帧同步
- ▶ State Synchronization 状态同步

**UNITY'S PHYSICS IS NOT DETERMINISTIC!!!**

# BANDWIDTH OPTIMIZATION

- ▶ Snapshot compression
- ▶ Reliable delta compression

## OTHER TECHNIQUES

- ▶ Weapon Sync
  - ▶ 100% hit
  - ▶ hit scan
  - ▶ projectile
- ▶ Lag Compensation
- ▶ Favor the shooter

# REFERENCES

[http://gabrielgambetta.com/fast\\_paced\\_multiplayer.html](http://gabrielgambetta.com/fast_paced_multiplayer.html)

<http://gafferongames.com/networking-for-game-programmers/>

[https://developer.valvesoftware.com/wiki/Source\\_Multiplayer\\_Networking](https://developer.valvesoftware.com/wiki/Source_Multiplayer_Networking)

<https://www.youtube.com/watch?v=vTH2ZPgYujQ> Developer Update | Let's Talk  
Netcode | Overwatch