

Detecting Cheating in Multiplayer Online Video Games



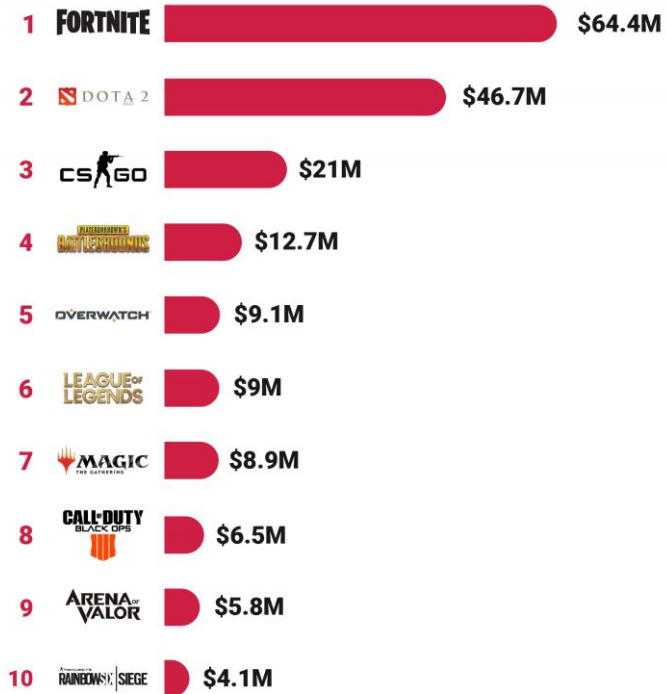
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TOP 10 ESPORTS GAMES BY TOTAL PRIZE POOL OF 2019 (IN USD)

THE ESPORTS OBSERVER



<https://archive.esportsobserver.com/biggest-esports-2019-prize-pool/>



VALORANT VANGUARD

BANNED OVER 10,000 CHEATERS

<https://www.esportznetwork.com/over-10-000-cheaters-banned-by-valorant-s-vanguard/>



<https://twitter.com/CallOfDuty/status/1473746439553617923>

Blockchain-based Real-time Cheat Prevention and Robustness for Multi-player Online Games

- Sukrit Kalra - UC Berkeley
- Rishabh Sanghi - IBM
- Mohan Dhawan - IBM Research

Goal: Explore the use of Blockchain as an anti-cheat

Outline

- Background
 - What are “Cheats”?
 - What are “Anti-Cheats”?
- Kernel-Level Anti-Cheats
- Using Blockchain as an Anti-Cheat
- Conclusions

What are “Cheats”?

Can be broken down into 4 categories:

- **Application**
 - Programs/software modify game files or memory
 - Information exposure
 - Bot/reflex enhancers
- **Infrastructure**
 - Tamper with game software, like display drivers
 - Information exposure
 - Bot/reflex enhancers

Normal



<https://wall.alphacoders.com/tag/arras-wallpapers>

Infrastructure Cheat



<https://www.youtube.com/watch?v=3tR17iM4T40>

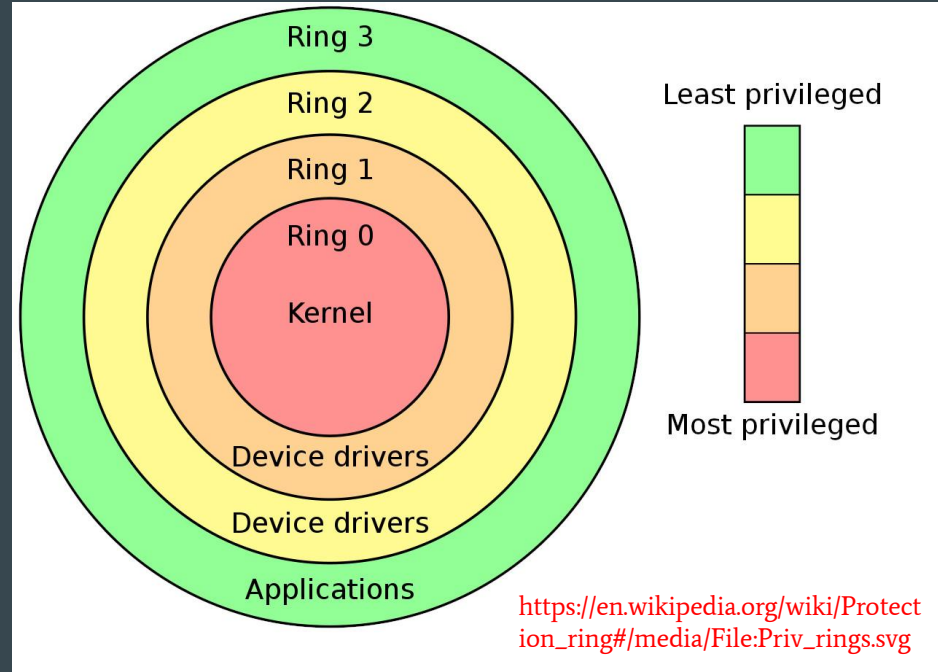
Outline

- Background
- Kernel-Level Anti-Cheats
 - What is the Kernel?
 - How do Kernel-Level Anti-Cheats work?
 - Benefits/Drawbacks
- Using Blockchain as an Anti-Cheat
- Conclusions

What is the Kernel?

- Lowest level of the operating system
- Manages resources and important processes

Key idea: The kernel can look out, but outer levels can't look in



How do Kernel-Level Anti-Cheats Work?

Key idea: The kernel can look out, but outer levels can't look in

- Scan for programs in layers above
- Installed alongside game



easyTM
ANTI-CHEAT

<https://www.easy.ac/static/img/logo-easy.png>



https://pbs.twimg.com/profile_images/1233868942017359872/y5xXE V3D_400x400.jpg

https://www.evenbalance.com/images/logo_001.png

Benefits and Drawbacks of Kernel-Level Anti-Cheats

Benefits:

- Cost-effective development-wise
- Satisfactory

Drawbacks:

- Privacy and security concerns
- Instability
- False-positives
- Kernel-level cheats

Outline

- Background
- Kernel-Level Anti-Cheats
- Using Blockchain as an Anti-Cheat
 - What is Blockchain?
 - Blockchain Anti-Cheat Approach
 - Latency Study and Effectiveness Analysis
 - Benefits and Drawbacks
- Conclusions

What is Blockchain?

Definition: A list of transactions and assets

Key Ideas:

- Peer Consensus
- Smart Contract

What is Blockchain?



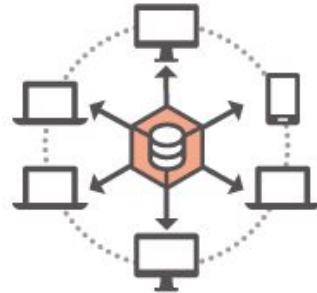
Transaction is requested



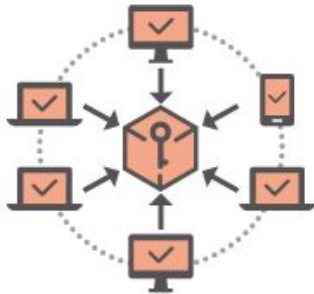
Transaction is checked against smart contract



Transaction is broadcast to all peers



Transaction is validated by all peers



Transaction is added to the blockchain



Transaction is processed



The Blockchain Anti-Cheat

Key Idea: Look at inputs/events rather than drivers/programs

- Hyperledger Fabric
 - Open smart contract model
 - Low validation latency
 - Smart contract versioning



Source: Linux Foundation (2018)

Smart Contract

Key Idea: Smart contract replaces server

Smart contract implementation for Doom

Source: Kalra (2018)

```
<Assets>
  <Asset aId="1" value="100" name="Health">
    <power pwId="0" change="+" factor="-1" />
    <power pwId="2" change="+" factor="1" />
  </Asset>
  <Asset aId="2" value="0" name="Ammunition">
    ...
  </Asset>
  ...
<Players>
  <player pId="1"> Player 1 </player>
  ...
<Events>
  <Event eId="1" name="Shoot">
    <affects pId="*" aId="1" pwId="0" />
    <affects pId="self" aId="2" pwId="0" />
  </Event>
  ...
```

Blockchain as Anti-Cheat



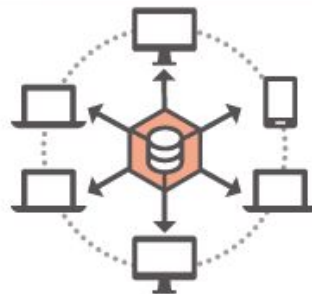
Input is requested



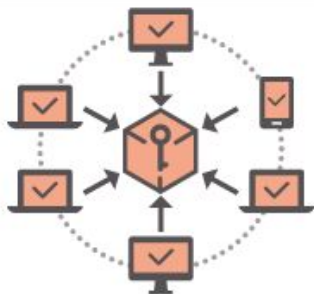
Input is checked against smart contract



Input is broadcast to all players



Input is validated by all players



Input is added to the blockchain



Input is executed



Latency Study

Goal: Measure blockchain's effect on latency

- 10 First-Person Shooter games
- Measured 3 things:
 - Player participation in a session
 - Average latency
 - Client tick rate

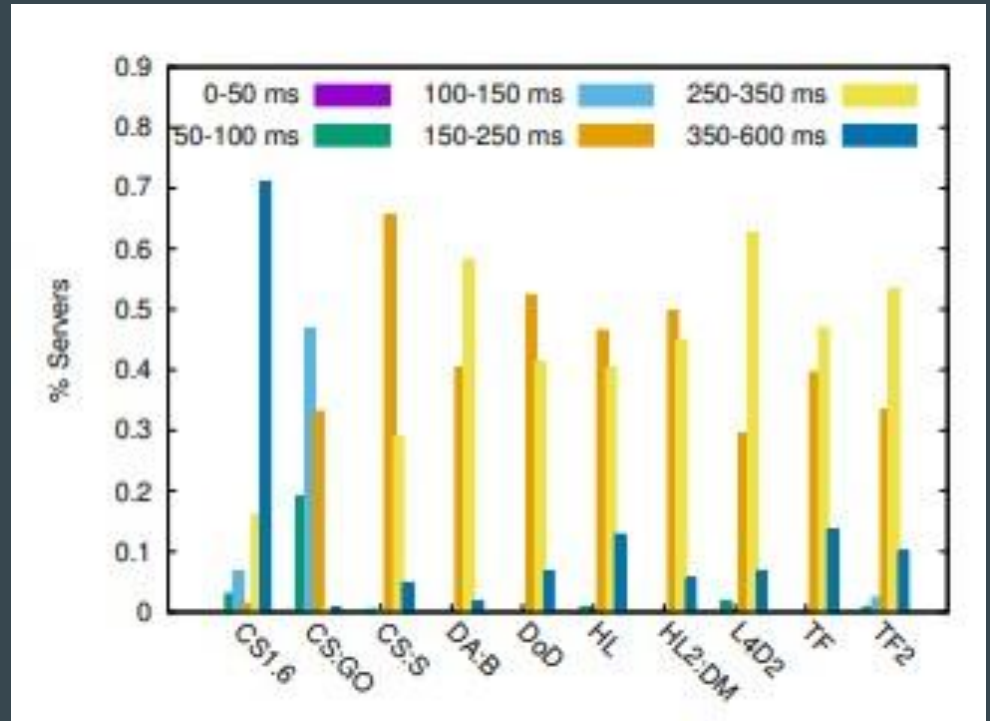
Game	# Players		Average Latency (ms)	Client Tick Rate
	Avg.	Max		
Counter-Strike 1.6	25.49	32	241	30
Counter-Strike: GO	18.93	63	240	64
Counter Strike: Source	14.84	64	234	66
Day of Defeat	4.59	30	245	30
Double Action: Boogaloo	0.42	17	288	30
Half-Life	1.75	31	258	60
Half-Life 2: Deathmatch	0.99	64	244	30
Left 4 Dead 2	2.38	24	272	30
Team Fortress Classic	0.41	15	253	30
Team Fortress 2	5.63	32	270	30

Source: Kalra (2018)

Latency Study

Goal: Measure the effect on latency using blockchain

- Server latency distribution
 - Don't state which servers were connected to



Source: Kalra (2018)

Effectiveness Analysis

Goal: Theoretically determine what kinds of cheats blockchain can detect

- Data from 25 sessions of Doom
- Generated events
- Not much information
- Blockchain would require client anti-cheat

Cheats	Blockchain	Kernel-level
Application		
Information exposure	✓	✗
Bot/reflex enhancers	✗	✓
Infrastructure		
Information exposure	✓	✓
Bot/reflex enhancers	✗	✗

Source: Kalra (2018)

Benefits and Drawbacks of a Blockchain Anti-Cheat

Benefits:

- Non-invasive
- Possibly catches cases kernel-level misses

Drawbacks:

- Complete industry change
- High network latency

Outline

- Background
- Kernel-Level Anti-Cheats
- Using Blockchain as an Anti-Cheat
- Conclusions
 - Blockchain Anti-Cheat Viability

Is a Blockchain Anti-Cheat Viable?

It depends...

- Do players accept kernel-level anti-cheats?
- Can blockchain anti-cheat have low latency?

Do players accept
kernel-level anti-cheats?

Yes

No

Can blockchain have
low latency?

Can blockchain have
low latency?

Yes

No

Yes

No

Not viable

Not viable

Viable

Not viable

Questions?

References

- Sukrit Kalra, Rishabh Sanghi, and Mohan Dhawan. Blockchain-Based Real-Time Cheat Prevention and Robustness for Multi-Player Online Games. (December 2018)
- Linux Foundation. Hyperledger Fabric. (2020)