Regional Twitch Network Performance and User Experience: Server Allocation Patterns

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Introduction

Twitch play a key role in connecting content creators with a global audience.

- Understanding the correlation between geographic distance and the Twitch performance.
- Exploring Twitch server allocation and the effects of VPN and location from the streamer and viewer perspective.

Approach & Methodology

1. Figure out locations of twitch servers

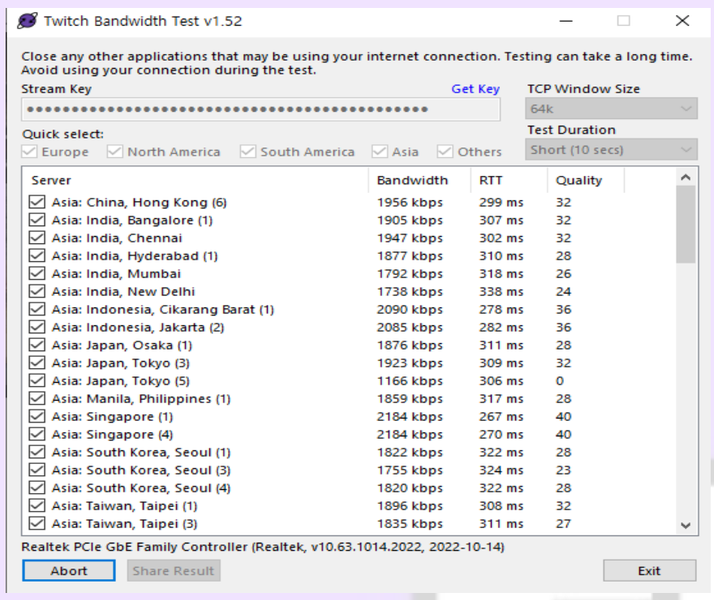

Figure 1: Twitch Bandwidth Test

- look at what servers are available for each location.

2. Check which server provides optimal performance for each continent

Figure 2: Test locations via VPN

- Find the best server location in AUS, US, KOR, UK.

3. Measure performance differences between viewers in different locations.

Video Resolution	1280×720
Display Resolution	1144×538
FPS	57
Skipped Frames	6
Buffer Size	4.29 sec.
Latency To Broadcaster	7.51 sec.
Latency Mode	Normal Latency
Playback Bitrate	2746 Kbps
Backend Version	1.23.0-rc.3.2

Figure 3: Video stats showing real-time network performance

- Make a python program that automatically measures video stats.
- Calculate the average FPS, bitrate, delay for 1 min.

Problem Statement

Table 1: Traffic distribution of Twitch clusters globally from [1].

Fraction(%)	NA cluster	EU cluster	AS cluster
North America	99.4	0.6	0
South America	96	4	0.01
Europe	17	82	1
Africa	21.8	78.2	0
Asia	34.4	20	45.6

Twitch assigns a server from the nearest continent:

- 99.4% of the requests in North America
- 96% of requests are handled by servers in NA
- 82% of the requests in Europe are served by EU servers
- Asian servers handle only 45.6% of requests from Asian clients; more than one third of the requests are handled by NA servers.
- Most regions are assigned adjacent Twitch servers.

Q1. Will the broadcast quality actually show good performance on adjacent servers?
Hypothesis:

- As the distance between current location and the server increases, the streaming quality is expected to degrade.
- When changing locations using VPN, the performance is likely to be lower compared to being physically present in that region.

Q2. Are there differences in network quality for viewers across regions?
Hypothesis:

- Viewers who are closer to the streamer will have faster and higher fps, RTT, and delay than viewers who are farther away.

Results & Discussion

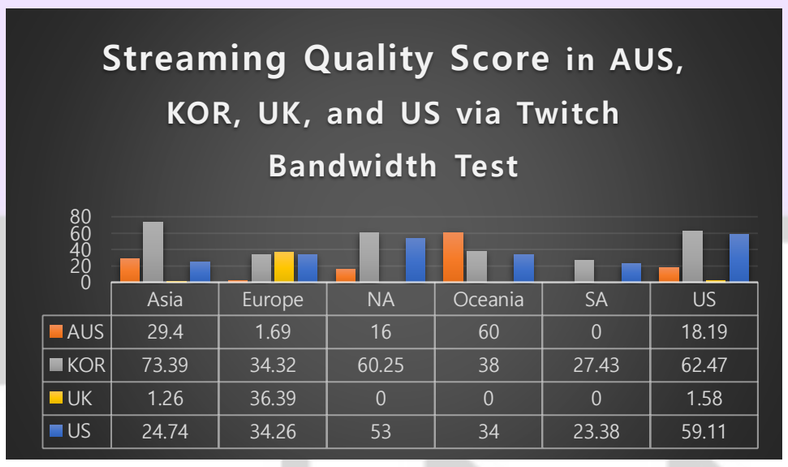

Figure 4: Streaming quality scores in AUS, KOR, UK, and US

The found distribution of servers was as follows:

- Asia have 20 servers; Europe 26; North America 4; Oceania 2; South America 8; and the United States 35.

1. Streaming Performance

- The closer the server is to the current location, the higher the broadcast quality score.
- Because you set a virtual location through VPN, the actual location is different, so there is a difference between the highest score and the actual value.
- For example, the UK had the highest quality score on the European server, but the actual value was low at 36.39.

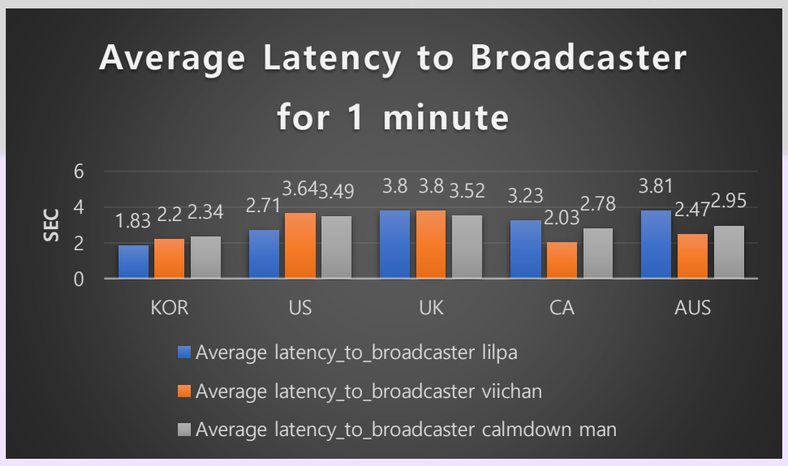

Figure 5: Average latency to broadcaster for 1 minute

2. Viewing Performance

- The average FPS consistently ranged from 59 to 61 across all regions.
- The average bitrate showed almost no regional variation, with values from 2900 to 3100 Kbps.
- In the case of the average broadcast delay, there is only a difference of about 1.1 seconds at most
- Twitch viewers can receive uniform service regardless of location

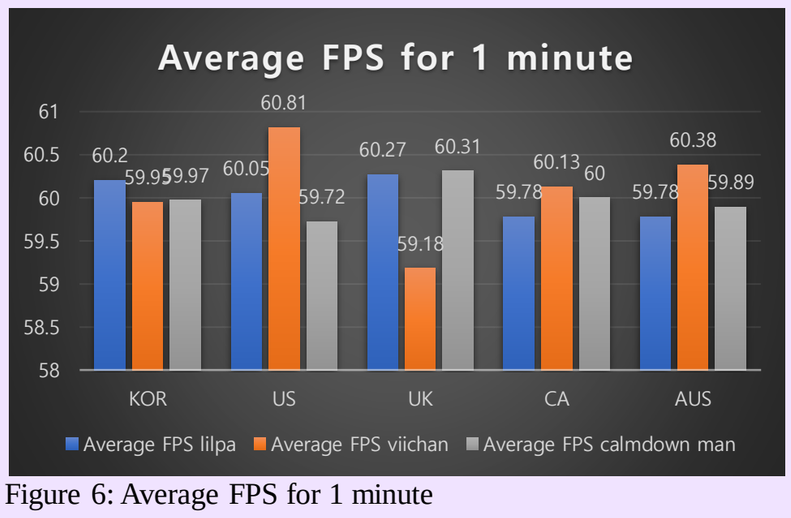

Figure 6: Average FPS for 1 minute

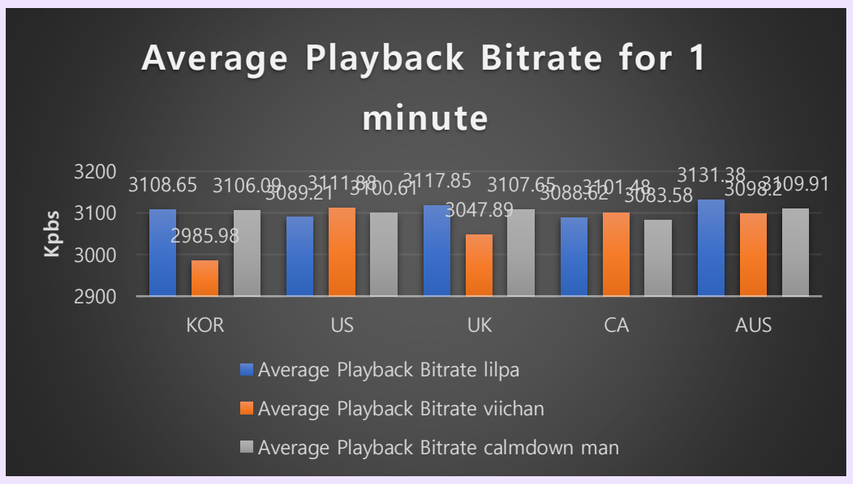

Figure 7: Average Playback Bitrate for 1 minute

Conclusion

A. Twitch Server Allocation and Geographic Impact

- Twitch aims to provide streamers with optimal broadcasting quality by allocating close servers to their geographical location, ensuring the best possible regional streaming experience.

B. The Impact of Region Change through VPN

- Twitch's allocation of the best servers to each regional streamer means that setting a virtual location through VPN has a detrimental impact on the broadcasting environment.

C. Correlation between viewer location and performance

- unlike streamers, viewers receive almost optimum service regardless of their locations.

Regerences

[1] J. Deng, G. Tyson, F. Cuadrado, and S. Uhlig, “Internet Scale User-Generated Live Video Streaming: The Twitch Case.” Accessed: Nov. 26, 2023. [Online]. Available: https://www.eecs.qmul.ac.uk/~tysong/files/PAM17.pdf
[2] “TwitchTest | r1ch.net,” *R1ch.net*, 2015. https://r1ch.net/projects/twitchtest (accessed Mar. 20, 2019).

Twitch video stats analyzer github link:
https://github.com/zkzkfot/Twitch-Video-Stats-Analyzer.git