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Battle Royale Console Game Performance Analysis (Case Study: East Jakarta, Indonesia)

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ABSTRACT

Battle Royale (BR) genre games are still played and have massive players around the globe. They are characterized by survival and exploration elements, featuring last-man-standing gameplay that motivates players to be the final contestant in the game. This BR can now be played on single platforms and cross-platform. Apex Legends is a free-to-play hero shooter where competitors from across the frontier join forces to battle for glory, fame, and fortune. Apex Legends can be played on PlayStation, Xbox, Steam, and Switch. This research aims to understand the data captured by the game Apex Legends, played on the PlayStation 5 console and displayed on a 4K television. This data was then analyzed to measure the correlation with game performance during gameplay. This research used a quantitative method, primary data, and descriptive measurements. From the findings, it can be concluded that the FPS for this game performed well since it was still near 60 FPS (59.81) with a standard deviation of 1.07. IO could not be analyzed for network performance since no official parameters for this IO were found on the official web during the research. However, Packet Loss and Choke performed well, with an average of 0 and a standard deviation of around 0. The ping value is enormous, with a significant standard deviation gap; this can happen because the server distance is longer to Tokyo from Jakarta than Singapore. Even though the latency was high, gamers still found the matches enjoyable.
Keywords: *battle royale, game, network performance, screen performance.*

INTISARI

Permainan bergenre BR masih dimainkan dan memiliki pemain dalam jumlah besar di seluruh dunia. Mereka dicirikan oleh elemen bertahan hidup dan eksplorasi, menampilkan *gameplay last-man-standing* yang memotivasi pemain untuk menjadi kontestan terakhir dalam permainan tersebut. BR kini bisa dimainkan di platform tunggal dan lintas platform. Apex Legends adalah permainan penembak pahlawan gratis di mana para pesaing dari seluruh perbatasan bergabung untuk bertarung demi kejayaan, ketenaran, dan kekayaan. Apex Legends dapat dimainkan di PlayStation, Xbox, Steam, dan Switch. Penelitian ini bertujuan untuk memahami data yang ditangkap oleh permainan Apex Legends, dimainkan di konsol PlayStation 5 dan ditampilkan di televisi 4K. Data ini kemudian dianalisis untuk mengukur korelasinya dengan performa game selama bermain game. Penelitian ini menggunakan metode kuantitatif, data primer, dan pengukuran deskriptif. Dari temuan tersebut dapat disimpulkan bahwa FPS permainan ini memiliki performa yang baik karena masih mendekati 60 FPS (59,81) dengan standar deviasi 1,07. IO tidak dapat dianalisis kinerja jaringannya karena tidak ada parameter resmi untuk IO ini yang ditemukan di web resmi selama penelitian. Namun, *Packet Loss* dan *Choke* berkinerja baik, dengan rata-rata 0 dan standar deviasi sekitar 0. Nilai *ping*-nya sangat besar, dengan kesenjangan standar deviasi yang besar; hal ini bisa terjadi karena jarak server dari Jakarta ke Tokyo lebih jauh dibandingkan Singapura. Meskipun latensinya tinggi, para pemain tetap menganggap pertandingan itu menyenangkan.
Kata kunci: battle royale, game, performa jaringan, performa layar.

INTRODUCTION

BR genre games are still played, and massive numbers of players around the globe are playing them, and it is an immensely popular competitive mode in these games (Rosenbusch et al., 2020). They are characterized by survival and exploration elements, featuring last-man-standing

gameplay that motivates players to be the final contestant in the game (Fernandez de Henestrosa et al., 2023). This Battle Royale can now be played on single platforms and cross-platform (Yu, 2022).

Apex Legends is a free-to-play hero shooter where competitors from across the frontier join forces to battle for glory, fame, and fortune. Apex Legends can be played on PlayStation, Xbox, Steam, and Switch (Arts, 2024). Figure 1 shows the Apex Legends screenshot on the PlayStation 5 console:

Figure 1. Game Screenshot

Similar research about BR with some differences has been done in the past (Wandy & Bhakti, 2021). Most similar games with BR put performance indicators on the screen during the game. These indicators may relate to the network performance or screen performance, which usually shows on top of the screen. This feature can be shown or hidden. The screen performances usually show the Frame-per-second (FPS) metric, which indicates fluid gameplay. In Apex Legends, most players strive for a standard frame rate of about 60 FPS (EA Help, 2022b).

Multiple indicators may directly impact the gameplay of the network performances. The time it takes for game data to travel from the platform to the data centers and back is measured in ping (latency). The quantity, or percentage, of packets that cannot complete their round trip to and from the data centers is known as packet loss. A combination of low packet loss and good ping results in good game performance (EA Help, 2022a). A more accurate gaming experience can be achieved by switching to a nearby data center and monitoring the computer's performance (EA Help, 2022a).

This research aims to understand the data captured by the game Apex Legends, played on the PlayStation 5 console and displayed on a 4K television. This data was then analyzed to measure the correlation with game performance during gameplay.

METHODOLOGY

This research used a quantitative method, primary data, and descriptive measurements. The game played for this research was Apex Legends v3.0.37.23, and this game was played on Season 18: Resurrection. During the research period, the gamer level on this game was 270. Following Figure 2 shows the research flow:

Figure 2. Research Flow

There were five stages for this research, and they were Literature Review, Network Testing and Server Selection, Game Parameters Standardizations, Game Performance Data Acquisitions, and Data Analysis, that was explained in the following subsections:

Literature Review

Some literature was used from previous research related to games. Literature from national and international journals taken from the last five years was also used to provide more relevant

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resources for this research. Some official websites related to games, battle royales, and their performance were also included in(Bhakti & Wandy, 2020) this research.

Network Testing and Server Selection

A PlayStation 5 console is connected directly to a modem through a Cat-6 straight cable. A landline fiber optic with an IndiHome residential standard subscription is used daily (IndiHome by Telkomsel, 2024). Network Testing was done once a day for seven days using a feature provided on the PlayStation 5 console; it was different from the previous research (Bhakti & Wandy, 2020). This was to test the connection from the PlayStation console to the PlayStation Network server using an existing fiber-optic landline subscription. Following Figure 3 shows how the network testing happened:

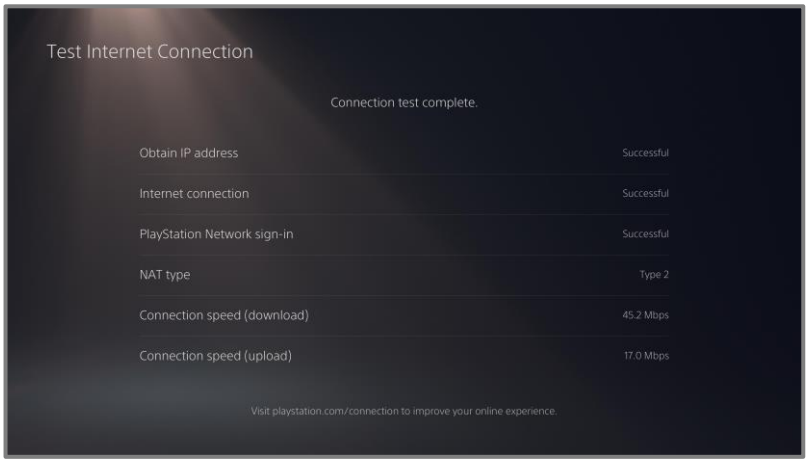

Figure 3. Connection Test Screenshot

The data center picked during this research was Tokyo 1, with a Ping result of around 106 ms and a Packet Loss of 0%, as shown in the following Figure. Other data centers had better Ping, and this Tokyo 1 server was chosen because it was easier to find players to play the game than other data center locations. The following Figure 4 shows how the Tokyo 1 server was chosen:

Figure 4. Data Centers Screenshot

Game Parameters Standardizations

Some parameters must be standardized during the game matches to minimize differences. The character used during the 30 matches was Skirmishers. Character skin is used the same for the entire match. The game modes were set to Trios. Following Figure 5 shows the character used during the match:

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Figure 5. Character Used during Research Processes Screenshot

Game Performance Data Acquisitions

A box in the top-right corner of the screen showed the information for FPS, IO, Loss, Choke, Ping, and Game ID numbers during a match. Following Figure 6 shows the example of data in a screenshot format:

Figure 6. Potential Data from the Game Screenshot

The gamers played 30 matches. Every match took three screenshots, one at the beginning and two in the middle of the game.

Data Analysis

All the screenshots taken were in JPG format and put in a folder. There were 90 rows of data from 90 screenshots from the 30 matches. The FPS, IO, Loss, and Choke data were analyzed in a spreadsheet. The console connection test was also analyzed using only seven rows of data. These 2 data were later put on a table with average and standard deviation for analysis.

RESULT AND DISCUSSION

Console connection test data was gathered from the screenshot and then written on a spreadsheet for analysis. Following Table 1 shows how the Internet connection speed from the console:

Table 1. Console Connection Test Screenshot

Test	NAT Type	Download (Mbps)	Upload (Mbps)
Day 1	2	50.0	17.2
Day 2	2	50.0	16.8

Day 3	2	26.6	17.2
Day 4	2	5.8	2.4
Day 5	2	53.0	8.2
Day 6	2	48.8	17.1
Day 7	2	45.2	17.0
Average		39.9 ± 16.14	13.7 ± 5.54

From here, we have found that the average download speed was 39.9 Mbps with a standard deviation of 16.14 Mbps, which is a huge gap. This is because, on days 3 and 4 of testing, there was high bandwidth usage to be shared with other devices. For upload, the average was 13.7 Mbps, with a standard deviation of 5.54 Mbps. For these uploads, days 4 and 5 of testing found higher bandwidth usage; even on day 5, the download speed was still high.

For the performance result analysis, the data was gathered from the 90 screenshots from 30 matches. Then, the data was copied into a spreadsheet for easier analysis. Following Table 2 shows the result:

Table 2. Performance Result Analysis

	Average	Min	Max
FPS	59.81 ± 1.07	59	68
IO	52.06 ± 27.49 / 7.52 ± 1.05	7 / 6	117 / 10
Packet Loss (%)	0.00 ± 0.00 / 0.01 ± 0.11	0 / 0	0 / 1
Choke	0.00 ± 0.00 / 0.00 ± 0.00	0 / 0	0 / 0
Ping (ms)	195.92 ± 94.15	85	394

Table 1 shows that the FPS has an average of 59.81 fps and a standard deviation of 1.07 fps, which is still acceptable. The definition for IO parameters has not yet been officially found on the Apex Legends website. Still, it has 52.06 with a standard deviation of 27.49 for download and an average of 7.52 with a standard deviation of 1.05 for upload.

Then, Packet Loss for download has an average of 0.00% with a standard deviation of 0.00%, which means this is very good. It has an average of 0.01% for upload with a standard deviation of 0.11%, which is still acceptable for this game genre.

The network choke was all good, with an average of 0.00% and a standard deviation of 0.00% for download and upload. This is very good for gaming. The ping average is 195.92 ms with a standard deviation of 94.15 ms. Even though this ping value is huge, according to the gamers, the matches were still suitable for playing.

CONCLUSIONS

From the findings, it can be concluded that the FPS for this game performed well since it was still near 60 FPS (59.81) with a standard deviation of 1.07. IO could not be analyzed for network performance since no official parameters for this IO were found on the official web during the research. However, Packet Loss and Choke performed well, with an average of 0 and a standard deviation of around 0. The ping value is enormous, with a significant standard deviation gap; this can happen because the server distance is longer from Jakarta than Singapore. Even though the latency was high, gamers still found the matches enjoyable.

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