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Use cases of Application-aware Networking (APN) in Game Acceleration

Abstract

With the development of the Internet, game industry has risen rapidly, from handheld game consoles to PC games and mobile games. The types of games are diversified, while the number of game users is increasing year by year. The game market is maturing quickly.

Nowadays, the scale of game users is large and they belong to the easy-to-consume groups. Among all the games, those require frequent interactions and involve video streaming usually have highly demanding requirements on the network in terms of guaranteed network latency and reliability. Therefore, from the aspect of ensuring better gaming experience, it is desirable of differentiating the particular gaming application flows and providing high-priority network services for those demanding gamers.

This document describes the game acceleration scenarios using Application-aware Networking (APN) technology. In these scenarios, APN can identify the specific requirements of particular gaming applications, steer the flows to the game processors close to the users, and provide SLA guaranteed network services such as low latency and high reliability.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

Status of This Memo

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This Internet-Draft will expire on 11 June 2022.

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1. Introduction

Online games usually refer to games which use the access terminal PC or smart terminal as the game platform, the Internet as the data transmission medium, the game operator server as the processor, and through the WAN network transmission (e.g. mobile Internet), in which a single user or multiple users simultaneously participate to realize the operation of the game characters or scenes.

The number of online game players is large in China, about more than 700 million. Gamers usually pursue very high quality of experience(QoE). At present, most gamers are willing to spend extra money to get a better user experience.

The UDP protocol has good real-time performance and its network overhead is also small, through which high communication rate can be

reached. So the UDP protocol is mainly used in the real-time game interaction process. Even if the operator uses DPI, it will not recognize UDP packets.

Application-aware networking (APN) [I-D.li-apn-framework] enables the network to be aware of the applications' requirements in a fine granularity, and then either steer the corresponding traffic onto the appropriate network path that can satisfy the requirements or establish an exclusive network path which would not be influenced by other applications' traffic flow.

2. Usage Scenarios of APN in Game Acceleration

This section presents two typical game acceleration scenarios with APN to meet the service requirements and ensure user experience.

2.1. APN for Steering into Dedicated Game Acceleration Channel

Generally speaking, the network latency requirement of games is less than 30ms. For competitive games, the latency requirement is less than 10ms. According to the statistics of the domestic Steam platform in China (from 2018 Game Industry External Market Observation Report by Tencent PC game platform), overseas games account for a high proportion in TOP10 online games. The traditional way to provide services is to connect with foreign operators through the operators international business network and directly access the game servers. In this case, the latency will generally exceed 200ms. So in order to give users a better game experience, operators need to provide solutions to reduce latency for the gamers oversea.

The games which are operated by domestic agents usually connect through a third-party acceleration server forming a dedicated acceleration channel to access the game servers in the Data Center, as shown in the Figure 1.

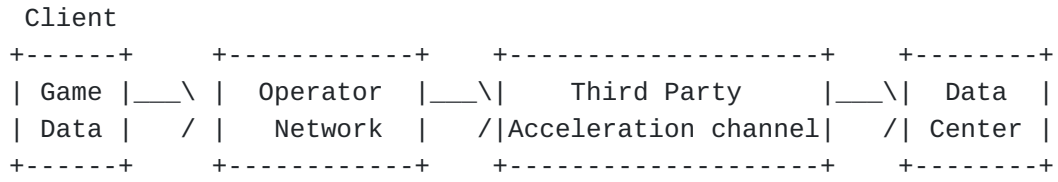

Figure 1: Figure 1.A Third-party Acceleration Channel for Games

If the operator provides services directly, in order to reduce the end-to-end latency, the operator's export gateway (Game Acceleration Router) is connected to the International POP to directly access the game servers in the Data Center,as shown in the Figure 2. In this

way, users can achieve quick access from domestic to the game servers overseas.

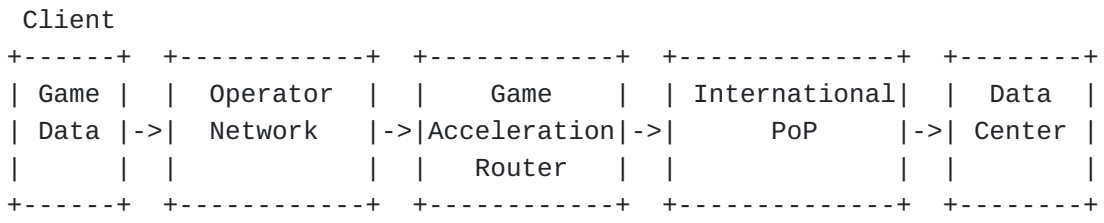

Figure 2: Figure 2.The Operator Acceleration Channel for Games

As shown in the Figure 3, with APN, according to the application-aware information carried in the packets, the game data can be differentiated and steered at the App-aware process Head-end into the dedicated game acceleration channel to achieve the desired low latency.

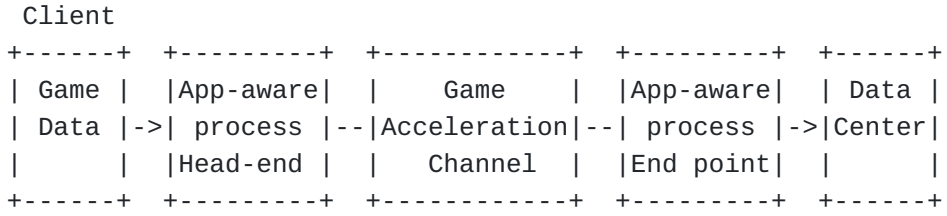

Figure 3: Figure 3.APN for Steering into Dedicated Game Acceleration Channel

Head-end node in the APN identifies the data flow of games (maybe one or more games), and steers it into a dedicated game acceleration path according to its SLA requirements.

Midpoint in the APN forwards game data stream along the path.

The end point in the APN receives the game data stream and steers it to the data center for processing the users control instruction or to the user for playing.

The whole process requires APN not only to identify the game traffic but also to provide customized network services for it, in order to achieve better gaming experience.

2.2. Fine-granularity Interactive Action Game Acceleration

In some interactive action games, some flows are more important than others since the packets in these flows are carrying action control instructions. These flows have even lower latency requirement.

With APN technology, these important data flows could be further indicated by adding corresponding information in the application-aware information. According to this information, operators can provide paying users a game acceleration tunnel with ultra-low latency to guarantee the gaming experience of the users.

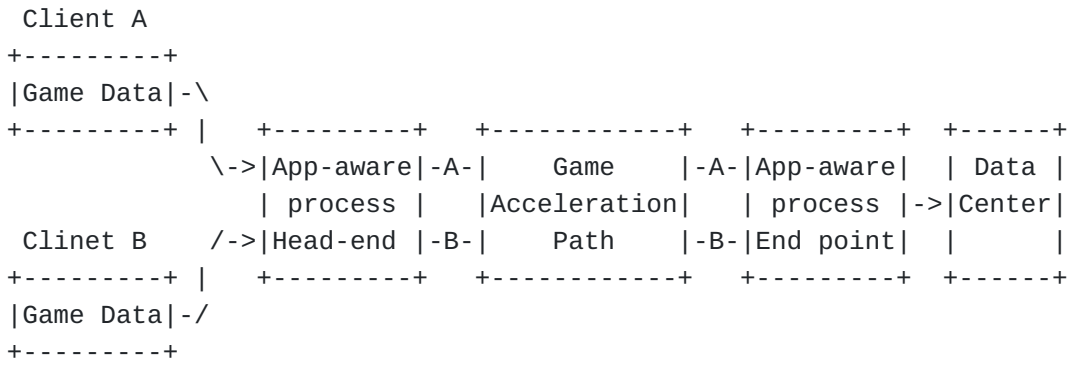

Figure 4: Figure 4.Game Acceleration with APN

As shown in the Figure 4, Client A and B are playing an interactive action game. The head-end node in the APN identifies the data flow of an important scene in an action game sent by Client A, and steers it into a specific game acceleration path according to its SLA requirements.

Midpoint in the APN forwards game data stream along the path and provides network services enabled by APN.

The end point in the APN receives the game data stream and steers into the gaming server in the Data center, while the game server processes the game data and encapsulates the information for identifying the game data stream of the important action scene at the head end node, which forwards it to a dedicated game acceleration path to the involved gamer Client B.

During the game, different transmission paths are used to distinguish service effects. In this way, highly customized and guaranteed services can be provided.

3. Game Acceleration Business Model

With the 5G era evolving, the emerging gaming mode will inject new vitality into the game market.

VR, AR and other emerging technologies are widely used in the game field, which provide new human-computer interaction method, improve the immersive and realistic sense, and reshape the expression form and development direction of game products. Based on cloud computing, cloud games emerge. At present, there are 120 million domestic users of cloud games in China, and the number of users continues to increase.

Cloud game deploys game applications in data centers, and realizes the functions including the logical process of game command control, video rendering and other tasks that have high requirements for chips, and the tasks of game acceleration. In this way, the terminal is a video player. Users can get a good game experience without the support of high-end system and chips.

At present, in most cases, with centralized deployment, the network transmission distance is too long, which is a huge challenge to the network load, so the latency demand can't be met.

For cloud games, operators and OTT vendors can cooperate with each other and adopt on-demand edge computing deployment methods. The edge data center sends the game video stream information to the terminal, and receives the user's control instruction information for processing. Users can make corresponding operation instructions according to the received video stream information, and get quick response.

At the same time, APN technology is needed to ensure deterministic latency of multi-party network of multiple players. The whole process requires APN not only to identify the cloud game traffic and provide customized network services for it, but also to ensure the deterministic latency of multi-user in the same game and provide better gaming experience.

For online games, as mentioned above, operators cooperate with the game agents, by choosing or creating a corresponding network path based on the application information carried in the APN packets, ensuring the corresponding SLA through SR acceleration tunnel, to provide highly customized and flexible services for applications and improve the quality of experience of users.

Operators and OTTs cooperate with each other to achieve mutual benefit and win-win, so as to better provide customers with highly customized services and great QoE.

4. Security Considerations

The security consideration can refer to the [I-D.li-apn-framework].

5. IANA Considerations

There are no IANA considerations in this document.

6. Normative References

[I-D.li-apn-framework]
Li, Z., Peng, S., Voyer, D., Li, C., Liu, P., Cao, C., Mishra, G., Ebisawa, K., Previdi, S., and J. N. Guichard, "Application-aware Networking (APN) Framework", Work in Progress, Internet-Draft, draft-li-apn-framework-04, 25 October 2021, <https://www.ietf.org/archive/id/draft-li-apn-framework-04.txt>.

[I-D.li-apn-problem-statement-usecases]
Li, Z., Peng, S., Voyer, D., Xie, C., Liu, P., Qin, Z., Mishra, G., Ebisawa, K., Previdi, S., and J. N. Guichard, "Problem Statement and Use Cases of Application-aware Networking (APN)", Work in Progress, Internet-Draft, draft-li-apn-problem-statement-usecases-04, 16 June 2021, <https://www.ietf.org/archive/id/draft-li-apn-problem-statement-usecases-04.txt>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

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