

CMA investigation

Mobile browsers and cloud gaming



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1.0 Cloud gaming over mobile networks.

Cloud gaming is revolutionising the consumption of video games, promising significant growth and reshaping content distribution in the gaming industry. This technology allows gamers to play on any device with an internet connection, providing an affordable and accessible way to enjoy games anywhere. It has the potential to greatly expand the reach of the gaming industry.

The gaming industry consists of major players involved in game development, publishing, and distribution, along with a broader ecosystem that supports game consumption and creation. This sector is experiencing rapid growth, driven by increasing consumer demand for mobile games and the rising number of 5G smartphone users. The expansion of 5G technology significantly enlarges the market potential for new cloud-based gaming services. Innovations in cloud computing and hardware, including AR, VR, and XR devices, as well as powerful cloud data centers, are creating new gaming opportunities.

A key factor in the success of cloud gaming, particularly over mobile networks, is meeting stringent performance requirements. For a high-quality gaming experience, it is essential to achieve mobile network performance with latency between 20-40ms with bandwidth greater than 20-25Mbps. As advanced gaming experiences like augmented reality (AR), virtual reality (VR), and extended reality (XR) become more popular, they will demand even faster speeds and lower latency, possibly under 10ms.

2.0 Differentiated connectivity with 5G networks and API exposure.

The rollout of 5G networks is critical in supporting these requirements, and mobile network operators (MNOs) are increasingly investing in 5G infrastructure to offer premium, differentiated connectivity. This expansion is further supported by developments in API exposure and standards driven by organisations such as the GSMA¹ and the CAMARA alliance², opening up new business opportunities in the gaming sector.

Differentiated connectivity with predictable performance is made possible by 5G Standalone (5GSA) network capabilities such as network slicing, radio resource partitioning and enhanced traffic scheduling. The capability to program these features end-to-end, accommodating different performance needs for both consumer and enterprise applications, establishes a 5G innovation platform. This platform is designed to be user-friendly for application service providers (ASPs), allowing them to understand, utilise, and invest in tailored mobile network requirements. These performance levels could be offered as subscription services or accessed through an API, enabling new business models. The 5G innovation platform, combining predictable performance with network APIs, will empower ASPs to create applications that will deliver enhanced performance on mobile devices for the gaming industry.

To streamline the utilisation of the 5G innovation platform by ASPs and foster the development of new innovative services, wireless data transmission performance classes can be categorised into four distinct types as described in figure 1. Based on this, ASPs can readily allocate traffic flows to the appropriate performance class by answering two simple questions: First, does the application require the transmission of a fixed amount of data, or can it be adapted to the available throughput? Second, is immediate reception of the traffic essential, or can it be buffered? The answers determine the allocation of traffic flow to the respective performance classes. Offering services that meet the

¹ GSMA [Open Gateway](#)

² CAMARA alliance – [The global Telco API alliance](#)



needs of different customer segments, by delivering the right levels of network performance at a premium can foster profitable growth for MNOs. The provisioning of services with different performance levels to ASPs and their applications can be applied to cloud gaming as shown in figure 1 below, via streaming smartphone games rendered in the cloud, which would benefit from enhanced network performance.

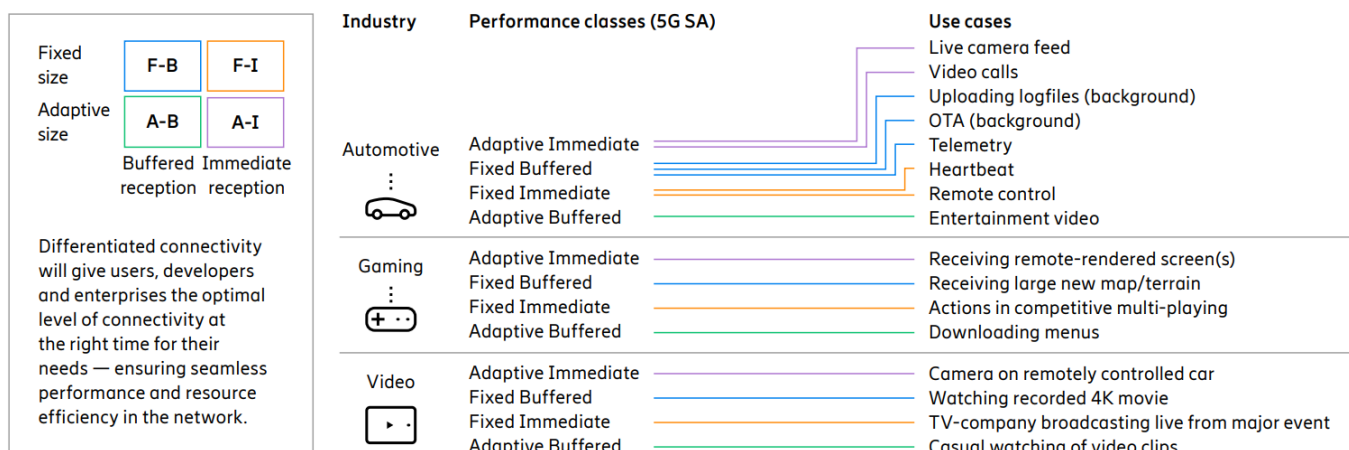


Figure 1: Automotive, gaming and video use cases mapped into four performance classes.

In figure 1, performance classes are categorised into four types based on how data is sent (fixed or adaptive) and consumed (immediately processed or buffered before use).

Performance levels provide a framework to differentiate capabilities and characteristics within classes. As an example, "Adaptive Buffered" requires >2 Mbps 98% of the time, while "Fixed Immediate" needs <90 ms 95% of the time.

Differentiated performance classes and levels enable MNOs to provide customised quality of service to various businesses and industries, either directly or through ASPs. This in turn enables MNOs to move away from a best efforts network and pricing models. The 5G innovation platform enhances service flexibility, enabling faster delivery of secure, isolated, and customised services that meet specific Service Level Agreements (SLAs). By efficiently managing and utilising network resources, network slicing allows MNOs to offer differentiated services at scale. It's key that MNOs can effectively negotiate performance levels with applications and consumers, ensuring alignment with their performance needs.

The User Equipment Route Selection Policy (URSP) is a feature in 5G networks that allows for more sophisticated and flexible handling of data traffic from user devices, commonly known as User Equipment (UE). It defines policies that enables the routing of different types of data traffic through the network based on various criteria, such as the type of service, application requirements, or user preferences. The Core network will provision URSP rules and QoS profiles to enable differentiated connectivity for eligible subscribers. In this way, the MNO can ensure that a differentiated service experience is delivered according to subscriptions and business rules.

Based on the service capabilities selected by the user, corresponding URSP information is sent to the device and linked to the service access point (AP) it should use. For instance, if a subscriber opts for a specialised gaming connectivity plan, new URSP rules are provisioned to the device from the policy node. These rules will then mark the gaming traffic with NSSAI (Network Slice Selection Assistance Information), identifying it as gaming traffic.



It is important to ensure that MNOs have the ability to map URSP categories on UEs to their defined performance classes. The decision on the allocation of a performance class for a particular app is based on the agreement between the MNO and the Application. The device facilitates the allocation of a performance class via the URSP. Figure 2 shows an example of how MNOs may choose to allocate URSPs to performance classes.

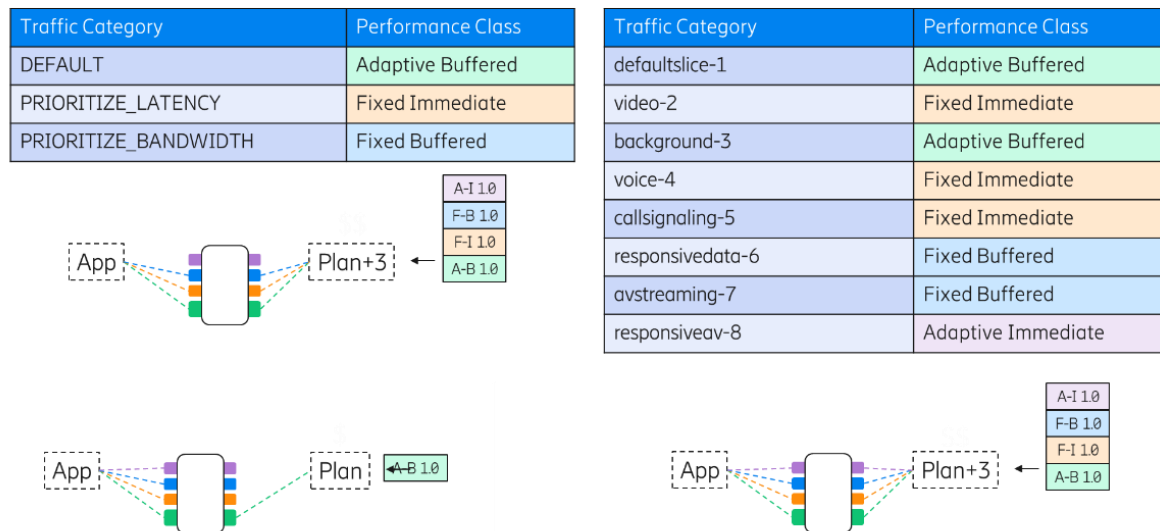


Figure 2: URSP Performance class mapping for iOS and Android operating systems.

MNOs are poised to expand their revenue streams in the future by capitalising on the growing demand for network slicing. This in turn will encourage network investment. UEs/Operating System (OS) providers are expected to facilitate the allocation of network slices and MNOs will have the opportunity to offer these tailored connectivity services directly to app developers and users.

In this future landscape, MNOs could charge app developers and users for access to premium network slices, which will guarantee enhanced performance and reliability for their applications. Various pricing models, such as subscriptions or pay-per-use fees, could be employed based on the level of service provided, creating a new revenue stream for MNOs. This, in turn, will support the specific Quality of Service (QoS) requirements in the cloud gaming market when using mobile devices.

Collaboration between MNOs and UEs/OS providers is essential, as these partnerships will enable the efficient distribution and optimisation of network slices. By embracing these opportunities, MNOs will not only enhance their profitability but also drive the broader adoption and success of network slicing technology, positioning themselves as key players in the future of digital services.

It is important that UEs/OS providers do not unduly restrict MNOs pricing strategies or hinder their ability to offer premium services to app developers and users. Furthermore, regulators should promote transparency and fair competition to maintain a balanced ecosystem. This will encourage investment in network advancements, safeguard consumer choice, and foster innovation within the digital services market.