We welcome the opportunity to comment on the working papers and focus our comments on the connectivity services which are essential enablers for development of a successful and innovative cloud gaming market.

Investigation terms of reference

The investigation terms of reference cover "*the distribution of cloud gaming services through app stores on mobile devices (and the supply of related ancillary goods and services)*". Connectivity falls within this scope as the means by which cloud gaming services can be accessed by customers both in the home and on the go (fixed and mobile networks). In relation to the investigation terms of reference, connectivity is an ancillary good or service. CGSP will be of the view that connectivity is necessary infrastructure to deliver their services. Additionally, 5G network slicing connectivity has been implemented by Apple and Google as App Store functionality[1] with both companies determining the available app slicing categories and mapping these to their own specific app stores[2].

Connectivity is a key component of cloud gaming

The cloud gaming value chain consists of content, service, connectivity and device.

Consensus is that connectivity via 5G, 5G network slicing and Multi-access Edge Compute (MEC)[3], will be a primary enabler[4] for mobile based cloud gaming. The extract below from an STL report[5] illustrates the differing requirements of connectivity depending on the type of gaming being undertaken. Cloud gaming has the highest quality and latency requirements.

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[1] The App Store terms found on the app developer programmes set proposed Apple and Google frameworks for 5G network slicing
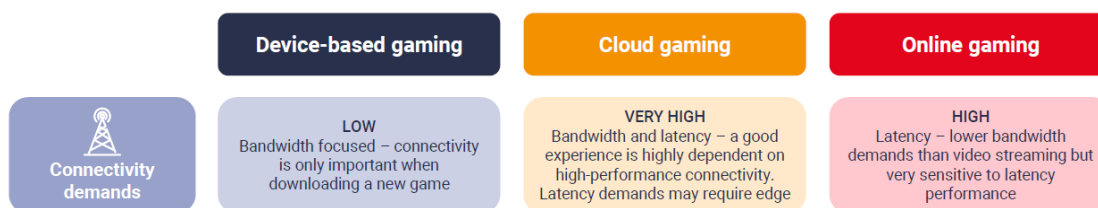5G Network Slicing App Category | Apple Developer Documentation
Enhance your apps with 5G | Connectivity | Android Developers
[2] And potentially to the entirety of the operating system. It is not clear if a rival app store could set differentiated categories or engage with MNOs/CPaaS in the way 3GPP and Camera establish.
[3] Vodafone Business Multi-access Edge Computing (MEC) | Cloud & Edge
[4] Vodafone Business Multi-access Edge Computing (MEC) | Cloud & Edge
[5] Analysts we use, amongst others for our market intelligence Telecoms Consultants & Research Firm | STL Partners

Device-based gaming	Cloud gaming	Online gaming
Connectivity demands	**LOW** Bandwidth focused – connectivity is only important when downloading a new game	**VERY HIGH** Bandwidth and latency – a good experience is highly dependent on high-performance connectivity. Latency demands may require edge	**HIGH** Latency – lower bandwidth demands than video streaming but very sensitive to latency performance

Extraction page 21 STL report Consumer digital services playbook - gaming

The 5G network enables the transfer of greater volumes of data necessary for high quality video playback, delivered at faster speeds with real time potential and as such will increase the potential for gaming from smart devices and on the move. In support of changing connectivity needs, 5G network slicing is being developed by mobile network operators (MNO). This is the segmentation of connectivity into a range of quality / service options to meet the needs to better suit different types of applications. A high quality, low latency "gaming" 5G network slice is a prospective 5G slicing proposition which would greatly improve the service quality of gaming on portable devices. Mobile connectivity providers would make the 5G "gaming quality" network slice available, without discrimination or degrading of standard network traffic, to gaming accessed via Native apps or Web Apps.[6] In August 2023, Vodafone and Ericsson trialled a 5G SA network slice for cloud gaming at Coventry University. The trial noted a 270% increase in download and upload performance, a 25% decrease in latency, 57% less jitter, and smoother graphics rendering against an existing public mobile network.

The working paper raises connectivity at paragraphs 2.9 and at 2.25/6 of the working paper the CMA sets out that one respondent commented

"(a) The game experience relies on the quality of the internet connection between the user and the server (where a poor internet connection could cause the game to lag). (b) During times of high usage, a user might have to queue for access to a cloud gaming server."

"game streaming would play an important role in the future of the gaming industry. This party stated it expected a shift towards streaming, including on mobile devices, in the next 3–5 years on the basis of (i) a spread of low-latency internet connectivity," and

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[6] Replicated from our response to the issues statement

"the CGSP stated that 'the success of a gaming product depends for the most part on its ability to offer (i) consumers a high-quality gaming experience,"

With 5G, and in particular, with 5G network slicing these connectivity issues can be overcome. The CGSP can request and pay for a 5G network slice that meets the requirements of the game or action being undertaken. The slice can be "ordered" directly from the MNO or through a CPaaS partner (making the CGSP agnostic to the end users' network). The engagement between the device, the network and the CGSP can inform the end user if the game can be played at a given time, at the required quality, at their present location (5G coverage, 5G standalone service availability, network status free or congested). This keeps the end user consumer informed and maintains the reputation of the CGSP's game as a quality proposition where the user can await the preferred conditions of the CGSP or potentially accept to proceed with alternative network quality.

Industry standards for 5G

The vision for 5G network slicing by the mobile sector is set out in the 3GPP standards[7]. MNOs will add relevant network APIs to translate the 3GPP standards into a consumable product catalogue for both CPaaS operators or for direct use by Enterprises/App developers. Industry has come together to simplify the availability of network quality services for Enterprises/App developers when reaching end users dispersed across a variety of network operators[8]. When MMOs launch 5G network slicing APIs, CGSP will require the ability to access and engage with them. Technically this means that it is possible for the CGSP and the MNO/CPaaS to have a real time 2-way communication to verify and give approval for applications, end users, and network availability at the user's present location. This direct Application to MNO engagement delivers optimal quality of service across the value chain.

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[7] TS 23.501
https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3144

TS 23.502
https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3145

[8] GSMA | Edge Store and Compute - Networks
 GitHub - camaraproject/NetworkSliceBooking: Repository to describe, develop, document and test the Network Slice Booking API APIBacklog/documentation/SupportingDocuments/DedicatedNetworks API Introduction.pdf at 258ee6589291de47b2f246b36c1f295baa55ced0 · camaraproject/APIBacklog · GitHub

- 3GPP standards set a greater number of slicing categories alongside the 3GPP standards having the capability for further innovation of categories by MNOs.

- Real time engagement between the CGSP, user and the MNO/CPaaS is required to enable dynamic slicing, whereby an application /game has variable needs accommodated during a connectivity session, for example, different requirements for particular levels of a game. This requires connectivity to be independent and open.

- For MNOs/CPaaS to drive connectivity innovation service revenues from 5G Slicing B2B2C is critical, requiring direct engagement between the CGSP and the MNO/CPaaS from the App and user device.

There is a requirement for the CGSP and the MNO/CPaaS to be able to directly communicate to agree connectivity at the requested quality is available, to control the device modem and to record and authenticate for payment.

Full 5G geographic coverage of the 5G bandwidth and full geographical reach of the 5G core (5G standalone/ advanced 5G)

MNOs need confidence that they will be able to monetise innovation in 5G networks, in order, to support 5G network installation across the breadth of the UK, and to support the quality and functionality of the network over time. Connectivity over the gaming slices could be charged for either by a direct commercial arrangement between a gaming company and the slice service provider or by the connectivity provider via end users tariffing. It is expected that the B2B2C model (the commercial arrangement being between the CGSP and the MNO) of contracting for 5G network slicing will be preferred by CGSP as this provides the CGSP optimal service control. For the connectivity service to function in a B2B2C mobile authentication messaging and network conveyance messaging between the mobile operator, the consumer and the CGSP need to be free flowing.

Remedies for this market investigation need to include connectivity

End user consumers will benefit where CGSPs are able to deploy the full capability of 5G network slicing. Consumers will experience the highest available quality of network service appropriate to the game they

are engaging with. Consumers will benefit from innovation by the CGSP, and wider ecosystem innovation including MNOs and CPaaS connectivity service providers. The CMA needs to ensure that connectivity is available without barriers to CGSPs.

The CMA has identified various potential remedies to address the adverse effects on competition found in the cloud gaming services market. However, those remedies will fail to fully address the competition problems unless the CMA also ensures the necessary access to the closely related connectivity market.

It is crucial, therefore, that that package of remedies considered by the CMA should include measures that enable the necessary commercial arrangements between CGSPs and connectivity providers, so that they can agree suitable terms for the provision of connectivity to the benefit of the users of cloud game services and thus help to further spur on the development of the cloud gaming services market.