3GPP TSG SA4 Meeting #111-e ***S4-201454***

Online meeting, November 11 – 20, 2020

**Agenda item:** 8.7

**Source:** KPN N.V.

**Title:** FS\_EMSA**:** Update on theEdge Caching for Video Streaming use case

**Document for** Discussion and Agreement

# 1 Introduction

This contribution adds an update to the “Feasibility and Industry Practices” section for the “Caching Downlink Streaming Content” use case from the previous TR ( TR 26.803 v0.2.1).

# 2 Update on Caching Downlink Streaming Content use case

## 5.2.1 Caching Downlink Streaming Content

|  |
| --- |
| **Use Case Name** |
| Caching downlink streaming content |
| **Description** |
| A Mobile Network Operator that deploys a downlink streaming service or supports the delivery of media content from a third-party service wants to offer that content in the highest possible quality to all of its users. The MNO also notices that video streaming already accounts for a large part of the traffic on the backhaul network. For these reasons, the MNO wants to offload (part of the) content hosting from the CDN to caches near or within its network. Users of the service may access the content from the edge, allowing them to select higher quality renditions of the content (e.g., DASH representations) and play it back without interruptions. The MNO may improve the hit ratios of the cache by employing intelligent caching. Furthermore, to ensure that clients access the content from the optimal edge, the network operator may want to direct clients to this edge. |
| **Categorization** |
| **Type: CDN**  **Delivery: Download, Live Streaming, On Demand Streaming**  **Device: Phone, tablet, HMD, TV** |
| **Preconditions** |
| End user devices should be able to stream, decode, and display the video streams. Modern smartphones already have these capabilities. |
| **Requirements in terms of Capabilities and QoS/QoE Considerations** |
| The capabilities of edge nodes are similar to regular CDN nodes distributing video content, although at smaller scale. This means that edge nodes should have storage and HTTP serving capabilities, and UEs should have high-bandwidth connectivity to edge nodes. Higher video quality, less playback interruptions, and shorter loading times improve the QoE. |
| **Feasibility and Industry Practices** |
| CDNs are a well-known and well-established technology. Mobile CDN is receiving the attention of various third-party CDN operators due to the increase of mobile users and the increased prevalence of applications and services that target mobile users. A recent report "Mobile CDN Market" (<https://www.transparencymarketresearch.com/mobile-cdn-market.html>) lists different CDN operators operating a Mobile CDN, including: Cloudflare, Fastly, Akamai Technologies, Amazon Web Services and Ericsson. Cloudflare explains its reasons for supporting Mobile CDN: <https://www.cloudflare.com/performance/accelerate-mobile-experiences/>.  This use case allows an MNO to offer services to third-party CDN providers or to improve the performance of its own Operator CDN (if the MNO offers CDN service itself) by enabling distributed CDN cache instances to run as Edge Application Servers (EAS).  This use case relies on the network being able to select an edge cache that is closest to the UE client, as well as performing cache re-selection during mobility of the UE client. The architecture to support this is being worked on by SA2 in the Release 17 study item on enhancement of support for edge computing in 5GC under key issue 1 (‘Discovery of Edge Application Server’) and key issue 2 (‘Edge relocation’). |
| **Nominal Cost Analysis** |
| Using edge computing for video content caching is the next step in distributing video delivery. It will allow MNOs and streaming services to further scale up and serve more users, while reducing load on the backhaul network. As in a regular CDN node, a node at the edge can be used by many users at the same time and servers scale horizontally. MNOs can use existing facilities at PoPs or points further in the network with serving capabilities. |
| **Benefits and Impact** |
| The major benefit is expected for MNOs and service providers, who are able to serve more users with high quality video while significantly reducing the load on the backhaul network, thus improving the efficiency of the network infrastructure. End-users are expected to benefit as it will increase the access to content in a high video quality, also enabling demanding streaming applications including VR, and delivering those applications with shorter loading times and with fewer interruptions. |
| **Potential Technical Requirements** |
| * It should be possible for edge caches to be operated either by the MNO or by a third-party service such as a 5GMSd Application Provider. * It should be possible for the network to steer clients to a certain edge or CDN. * It should be possible for (third-party) services to specify caching directives. * It should be possible for DASH clients to send hints (e.g., about anticipated upcoming requests) to the network enabling intelligent caching on the edge. * It should be possible for the network to send hints to clients regarding the delivery of content from the edge (e.g., about availability or bandwidth). |
| **Potential Standardization Status and Needs** |
| TBD |

# 3 Conclusions and proposal

We propose to add these changes to the future revision of the EMSA Technical Report (TR).