**3GPP TSG-S4 Meeting #114-e *S4-210832r01***

**e-meeting, 19 - 28 May 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **PSEUDO CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **26.805** | **CR** | **-** | **rev** | **-** | **Current version:** | **0.1.1** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:*** | FS\_NPN4AVProd: Utilizing Available Capacity in Multi-Camera Scenarios | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Sony Europe B.V. | | | | | | | | | |
| ***Source to TSG:*** | - | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_NPN4AVPROD | | | | |  | ***Date:*** | | | 2021-05-25 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Release 17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Provide text to partly address the following objectives of the SID:  “- To identify relevant QoS requirements for media production workflows, including required bit rates, loss rates, formats, latencies and jitter, and to identify their impact on the relevant KPIs for media production workflows (reliability, mean-time-between failure, service-level agreements, etc.).  - To identify relevant 5G System features like NPNs, Network Slicing, QoS classes, network event reporting and assistance, etc. that are useful for media production, and to clarify their usage for media production.” | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Document a gap between desired bitrates vs. realistically available capacity, for multi-camera media production scenarios. Document a potential solution. | | | | | | | | |
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| ***Consequences if not approved:*** | | An important gap is not documented in the technical report | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.261: "Service requirements for the 5G system".

[3] 3GPP TS 22.263: "Service requirements for Video, Imaging and Audio for Professional Applications (VIAPA)".

[4] 3GPP TS 22.827: "Study on Audio-Visual Service Production".

[5] M.P. Sharabayko, M.A. Sharabayko, J. Dube, JS. Kim, JW. Kim: "The SRT Protocol", draft-sharabayko-mops-srt-01

[6] VSF: "Reliable Internet Stream Transport (RIST) Activity Group", https://www.videoservicesforum.org/RIST.shtml

[7] VSF TR 06-1: "Reliable Internet Stream Transport (RIST) Protocol Specification – Simple Profile", <https://vsf.tv/download/technical_recommendations/VSF_TR-06-1_2018_10_17.pdf>

[8] VSF TR 06-2, "Reliable Internet Stream Transport (RIST) Protocol Specification – Main Profile", [https://www.vsf.tv/download/technical\_recommendations/VSF\_TR-06-2\_2020\_03\_24.pdf](https://protect2.fireeye.com/v1/url?k=cc406e56-93db577d-cc402ecd-866038973a15-a3187c63f11b10f6&q=1&e=1f3c54ba-abd4-4509-b7b2-0816901e7741&u=https%3A%2F%2Fwww.vsf.tv%2Fdownload%2Ftechnical_recommendations%2FVSF_TR-06-2_2020_03_24.pdf)

[9] NewTek: "NDI Encoding/Decoding", <https://support.newtek.com/hc/en-us/articles/218109667-NDI-Encoding-Decoding>

[10] NewTek: "NDI Network Bandwidth, <https://support.newtek.com/hc/en-us/articles/217662708-NDI-Network-Bandwidth>

[11] David Aleksandersen: "What is NDI® (Network Device Interface)?", <https://newsandviews.dataton.com/what-is-ndi-network-device-interface>

[12] Kieran Kunhya and Ciro Noronha: "RIST and SRT: What’s the difference?", <https://www.tvbeurope.com/ip-migration/rist-and-srt-whats-the-difference>

[13] Tofik Sonono: "Interoperable Retransmission Protocols with Low Latency and Constrained Delay: A Performance Evaluation of RIST and SRT", Masters Thesis, KTH Stockholm, 2019, http://kth.diva-portal.org/smash/get/diva2:1335907/FULLTEXT01.pdf

[14] EBU: "Minimum User Requirements to Build and Manage an IP-Based Media Facility", 15 July 2020, <https://tech.ebu.ch/files/live/sites/tech/files/shared/tech/tech3371.pdf>.

[15] AMWA: "NMOS Overview", <https://www.amwa.tv/nmos-overview>.

[16] EBU: "The Technology Pyramid For Media Nodes", https://tech.ebu.ch/publications/technology\_pyramid\_for\_media\_nodes.

[17] EBU: "Technology Pyramid Media Node Maturity Checklist", September 2021, <https://tech.ebu.ch/publications/technology-pyramid-media-node-maturity-checklist?rec=1>.

[18] AMWA: "NMOS Technical Overview", <https://specs.amwa.tv/nmos/branches/main/docs/2.0._Technical_Overview.html>.

[19] AMWA: "Networked Media Systems – the Big Picture",  
<https://static.amwa.tv/networked-media-systems-big-picture-2021-03-05.pdf>.

[20] AMWA: "NMOS specification repository", <https://specs.amwa.tv/nmos>.

[21] SMPTE 2110

[22] 3GPP TR 26.925: “Typical traffic characteristics of media services on 3GPP networks”

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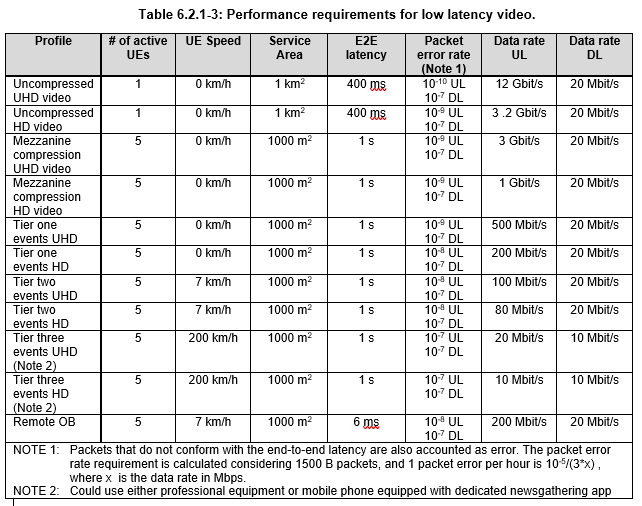
### 6.2.5 Potential issues

#### 6.2.2.3 Utilizing Available Capacity in Multi-Camera Scenarios

**QoS requirements - bitrate**

Usual fiber-based studio setups use 3-24 Gbit/s per camera (uncompressed, see [22]). A 5G cellular setup is obviously limited in uplink capacity compared to that. Considering this, SA1 produced a table in [3] containing also somewhat lower numbers, assuming various degrees of compression:

Table 6.2.2.3-1: reproduced from [3] table 6.2.1-3



[Editor’s note: the following sentence assumes the table 5.3-1 contributed in S4-210823 is added to the TR:]

Further, Table 5.3‑1 in the present document shows a range of bitrates for different event types.

**Observation 1**: The data rate requirements per camera in [3] span a range of more than 1000 times, from 10 Mbit/s to 12 Gbit/s, depending on the profile/scenario

**Observation 2**: The overall uplink capacity of a 5G system with realistic amount of radio spectrum and realistic ratio between downlink and uplink time resources, is in the same order of magnitude as the required/desired data rate for a *single* camera for tier 2 and tier 1 events

**Conclusion 1**: For multi-camera scenarios, there is a need to dynamically control media rates such that not all cameras use the maximum rate all the time

**Conclusion 2**: For multi-camera scenarios, there is a desire from the producer’s point of view to see all cameras in pristine quality but in case of increased cell load, there is also a need to quickly reduce media rates to avoid data loss on important camera feeds. Specifically, within a group of cameras that are used for the same live programme, there is need for reducing the rate for lower-prioritized cameras in order to protect the camera that is currently “live” (production camera) and the camera that is next to go “live” (according to the producer’s wishes).

See clause 7.1 for candidate solutions to this issue.

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# 7 Candidate Solutions

< this section should describe, how identified 5G features are used in context of media production>

## 7.1 Issue #1: Utilizing Available Capacity in Multi-Camera Scenarios

As high-lighted in 6.2.2.3, there is in several scenarios a need to dynamically and proactively control media rates such that not all cameras use the maximum rate all the time. Specifically, within a group of cameras that are used for the same live programme, there is need for reducing the rate for lower-prioritized cameras in order to protect the camera that is currently “live” (production camera) and the camera that is next to go “live” (according to the producer’s wishes). This should be done proactively, considering the radio conditions and load in the network, to avoid loss of quality on important feeds.

**Potential solutions**

Firstly, uplink streaming protocols (which may be specified outside 3GPP and may be proprietary, see clause 4) need to support dynamic media rate changes.

Network assistance could then help applications to adjust the rate more proactively, considering the knowledge in the RAN. To this end, the NA node needs to be aware of which cameras should be regarded as a group (within which to distribute the capacity) and their priorities within the group.

**Separation of protocols**

It is assumed that the media rates of the cameras are controlled using already existing, separate protocols at the application layer (may be specified outside 3GPP and may be proprietary). But the network assistance can provide recommendations about what media rates are suitable considering 3GPP network conditions at a certain time.

NOTE: This is similar to the separation of protocols SA4 specified for downlink streaming with DASH and network assistance. The network assistance can, where available, be used to guide the player to request the appropriate bitrate using the DASH protocol. Yet the original DASH protocol is 100% separated from the NA protocol.

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