**3GPP TSG-CT WG1 Meeting #131-eC1-21abcd**

**Electronic meeting, 19 – 27 Aug 2021 (was C1-214576)**

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| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **24.193** | **CR** | **0046** | **rev** | **3** | **Current version:** | **17.1.0** |  |
|  |
| *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 |  | Core Network | **X** |

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|  |
| ***Title:***  |  |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon, Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | ATSSS\_Ph2 |  | ***Date:*** | 2021-08-23 |
|  |  |  |  |  |
| ***Category:*** | **C** |  | ***Release:*** | Rel-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 canbe 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:*** | TS 23.501 v17.3.1 has been updated with the introducion of provision of threshold values, including maximum RTT and/or packet loss rate when the steering mode is of load balancing or priority based type. Hence, TS 24.193 needs to be updated to define the stage 3 details of the new requirements. |
|  |  |
| ***Summary of change:*** | Threshold values are possible to be provided in an ATTSS rule. The threshold values are applicable to both the UE and the UPF only if the steering mode is load balancing or priority based. |
|  |  |
| ***Consequences if not approved:*** | Lack of stage 3 for stage 2 requirements on threshold values. |
|  |  |
| ***Clauses affected:*** | 6.1.3.1, 6.1.3.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 23.501... CR2811 |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\* \* \* First Change \* \* \* \*

#### 6.1.3.1 Definition of ATSSS rules

The ATSSS rules are defined in 3GPP TS 23.501 [2] and is set of one or more ATSSS rules, where a rule is composed of:

a) an ATSSS rule ID identifying the individual ATSSS rule;

b) an ATSSS rule operation identifying whether the ATSSS rule is added to or deleted from the set of ATSSS rules;

c) a precedence value of the ATSSS rule identifying the precedence of the ATSSS rule;

d) a traffic descriptor matching a service data flow (SDF); and

e) an access selection descriptor including:

1) a steering functionality:

A) MPTCP, the UE steers the SDF by using the MPTCP functionality; or

B) ATSSS-LL functionality, the UE steers the SDF by using the ATSSS-LL functionality;

NOTE 1: If the included steering functionality is not supported by the UE, the UE ignores this ATSSS rule, and proceeds with the evaluation of the ATSSS rule with the next smallest precedence, if available.

2) a steering mode:

A) active-standby, the UE steers the SDF by using the active access if the active access is available. If the active access is not available and the standby access is available, the UE steers the SDF by using the standby access;

B) smallest delay, the UE steers the SDF by using the access network with the smallest RTT. If there is only one access available, the UE steers the SDF by using the available access. This steering mode is only applicable to non-GBR SDF;

C) load balancing, the UE steers the SDF across both the 3GPP access and the non-3GPP access with a given precentage if both accesses are available. If there is only one access available, the UE steers the SDF by using the available access. This steering mode is only applicable to non-GBR SDF; or

D) priority based, the UE steers the SDF over the access with high priority unless the access with high priority is congested or unavailable, when the UE steers the SDF over both the access with high priority and the access with low priority. This steering mode is only applicable to non-GBR SDF;

3) a steering mode indicator:

A) autonomous load-balance indicator (ALB), this indicator is only applicable to load balancing steering mode. The UE may ignore the information provided in the steering mode information (i.e. percentages of the SDF traffic transmitted over 3GPP access and non-3GPP access) and the UE may autonomously determine its own percentages for traffic splitting, in a way that maximizes the aggregated bandwidth in the uplink direction. The UPF may apply a similar behaviour in the downlink direction; and

NOTE 2: The UE is expected to determine its own percentages for traffic splitting by performing measurements across both the 3GPP access and the non-3GPP access.

4) threshold values include one maximum RTT value or one maximum packet loss rate value or both. The threshold values are only used when the steering mode is defined as load balancing or priority based, otherwise they are ignored. If the steering mode is defined as load balancing or priority based, then the UE and the UPF use the provided threshold values on both 3GPP access and non-3GPP access as follows:

A) for the load balancing steering mode,

i) if the maximum RTT value or the maximum packet loss rate value of the MA PDU session in an access exceeds the indicated value, the UE and the UPF reduce the amount of traffic sent over that access and they send traffic over the other access; and

ii) if both the maximum RTT value and the maximum packet loss rate value of the MA PDU session for both accesses do not exceed the provided threshold values, the UE and the UPF steer the SDF traffic across both the 3GPP access and non-3GPP access as indicated by the steering information of the ATSSS rule; and

B) for the priority based steering mode, the UE and the UPF use the maximum RTT value or the maximum packet loss rate value or both to detect when an access of an MA PDU session is congested. If the maximum RTT value or the maximum packet loss rate value in an access of the MA PDU session exceeds the indicated value, the UE and the UPF may send some traffic over the other access, i.e. the UE splits the SDF traffic over both the access with high priority and the access with low priority.

\* \* \* Next Change \* \* \* \*

#### 6.1.3.2 Encoding of ATSSS rules

The ATSSS rules are encoded as shown in figure 6.1.3.2-1, figure 6.1.3.2-2 and figure 6.1.3.2-3 and table 6.1.3.2-1.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| ATSSS rule 1 | octet 4octet s |
| ATSSS rule 2 | octet s+1octet t |
| … | octet t+1octet u |
| ATSSS rule n | octet u+1octet a |

Figure 6.1.3.2-1: ATSSS parameter contents including one or more ATSSS rules

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Length of ATSSS rule | octet 4octet 5 |
| ATSSS rule ID | octet 6 |
| ATSSS rule operation | octet 7 |
| Precedence value of ATSSS rule | octet 8 |
| Length of traffic descriptor | octet 9octet 10 |
| Traffic descriptor | octet 11octet f |
| Access selection descriptor | octet f+1octet s\* |

Figure 6.1.3.2-2: ATSSS rule

|  |  |
| --- | --- |
| Length of access selection descriptor | octet f+1 |
| Steering functionality | octet f+2 |
| Steering mode | octet f+3 |
| Steering mode information | octet f+4\* |
| Steering mode indicator | octet f+5\* |
| Threshold values | octet f+6\*octet s\* |

Figure 6.1.3.2-3: Access selection descriptor

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0Spare | 0Spare | 0Spare | 0Spare | 0Spare | 0Spare | 0Spare | ALB | octet f+5\* |

Figure 6.1.3.2-4: Steering mode indicator

|  |  |
| --- | --- |
| Length of threshold values | octet f+6\* |
| Maximum RTT value | octet f+7\*octet f+8\* |
| Maximum packet loss rate | octet s\* |

Figure 6.1.3.2-5: Threshold values

Table 6.1.3.2-1: ATSSS parameter contents including an ATSSS rule

|  |
| --- |
| ATSSS rule ID (octet 6) |
| The ATSSS rule ID specifies the identity of the individual ATSSS rule on which the ATSSS rule operation in octet 7 is applied. |
|  |
| ATSSS rule operation (octet 7) |
| The ATSSS rule operation is encoded as follows: |
| Bits |
|  |
| **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | Add or replace ATSSS rule |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | Delete ATSSS rule |
| All other values are spare. |
|  |
| If "Add or replace ATSSS rule" is indicated, the ATSSS rule with identity as indicated in ATSSS rule ID and contents as indicated in the following octets of the ATSSS rule parameter is added to the set of ATSSS rules. If an ATSSS rule with the same ATSSS rule ID does not exist in the set of ATSSS rules, a new rule is created and added. If an ATSSS rule with the same ATSSS rule ID exists in the set of ATSSS rules, the old rule is replaced with the new ATSSS rule. If "Delete ATSSS rule" is indicated, the ATSSS rule with identity as indicated in the ATSSS rule ID parameter is deleted from the set of ATSSS set of rules and octets a+5 and onwards of the ATSSS rule parameter are ignored. If no ATSSS rule with identity as indicated in the ATSSS rule ID parameter exists in the set of ATSSS rules, the Delete ATSSS rule operation is successful without changes to the set of ATSSS rules. |
|  |
| Precedence value of an ATSSS rule (octet 8) |
| The precedence value of an ATSSS rule field shall be used to specify the precedence of the ATSSS rule among all ATSSS rules. This field shall include the binary encoded value of the precedence value in the range from 0 to 255 (decimal). The higher the value of the precedence value field, the lower the precedence of the ATSSS rule is. |
| The traffic descriptor length field (octets 9 to 10) indicates length of the traffic descriptor field. |
|  |
| Traffic descriptor (octets 11 to f) |
| The traffic descriptor field is, as defined in table 5.2.1 in 3GPP TS 24.526 [5], of variable size and contains a variable number (at least one) of traffic descriptor components (NOTE 3). Each traffic descriptor component shall be encoded as a sequence of one octet traffic descriptor component type identifier and a traffic descriptor component value field. The traffic descriptor component type identifier shall be transmitted first. |
|  |
| Traffic descriptor component type identifierBits |
| **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | Match-all type |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |  | OS Id + OS App Id type (NOTE 1) |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |  | IPv4 remote address type |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |  | IPv6 remote address/prefix length type |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |  | Protocol identifier/next header type |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |  | Single remote port type |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |  | Remote port range type |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |  | IP 3 tuple type |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |  | Security parameter index type |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |  | Type of service/traffic class type |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  | Flow label type |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | Destination MAC address type |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  | 802.1Q C-TAG VID type |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |  | 802.1Q S-TAG VID type |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |  | 802.1Q C-TAG PCP/DEI type |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |  | 802.1Q S-TAG PCP/DEI type |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |  | Ethertype type |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |  | DNN type |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |  | Destination FQDN |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |  | Regular expression |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |  | OS App Id type |
| All other values are spare. If received they shall be interpreted as unknown. |
|  |
| Length of access selection descriptor (octet f+1) |
| Bits |
| **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  | If the steering mode is smallest delay |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |  | If the steering mode is not smallest delay and steering mode indicator is not included |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |  | If the steering mode is not smallest delay and steering mode indicator is included |
| All other values are spare. |
|  |
| Steering functionality (octet f+2) |
| The steering functionality field shall be encoded by one octet (octet f+2) as follows |
| Bits |
| **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | UE's supported steering functionality (NOTE 2) |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | MPTCP functionality |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  | ATSSS-LL functionality |
| All other values are spare.If the UE does not support the received encoded steering functionality in the ATSSS rule, the UE shall ignore the ATSSS rule. |
|  |
| Steering mode (octet f+3) |
| The steering mode descriptor field shall be encoded by one octet (octet f+3) as follows: |
| Bits |
| **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | Active-standby |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | Smallest delay |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  | Load balancing |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |  | Priority based |
| All other values are spare. |
|  |
| Steering mode information (octet f+4) |
| If the steering mode is defined as active-standby, octet f+4 shall be defined as follows: |
| Bits |
| **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | Active 3GPP and no standby |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | Active 3GPP and non-3GPP standby |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  | Active non-3GPP and no standby |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |  | Active non-3GPP and 3GPP standby |
| All other values are spare. |
|  |
| If the steering mode is defined as smallest delay, octet f+4 shall not be encoded. |
|  |
| If the steering mode is defined as load balancing, octet f+4 shall be encoded to show the percentage of the SDF traffic transmitted over 3GPP access and non-3GPP access as follows: |
| Bits |
| **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | 100% over 3GPP and 0% over non-3GPP |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | 90% over 3GPP and 10% over non-3GPP |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  | 80% over 3GPP and 20% over non-3GPP |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |  | 70% over 3GPP and 30% over non-3GPP |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |  | 60% over 3GPP and 40% over non-3GPP |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |  | 50% over 3GPP and 50% over non-3GPP |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |  | 40% over 3GPP and 60% over non-3GPP |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |  | 30% over 3GPP and 70% over non-3GPP |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |  | 20% over 3GPP and 80% over non-3GPP |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |  | 10% over 3GPP and 90% over non-3GPP |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |  | 0% over 3GPP and 100% over non-3GPP |
| All other values are spare |
|  |
| If the steering mode is defined as priority-based, octet f+4 shall be encoded as: |
| Bits |
| **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | 3GPP is high priority access |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | non-3GPP is high priority access |
| All other values are spare. |
|  |
| Steering mode indicator (octet f+5) |
| The steering mode indicator provides information to adjust the traffic steering. The following indicators exist (NOTE 4). |
|  |
| ALB (autonomous load balance indicator) (octet s, bit 1) is set as follows: |
| Bit |
| **1** |  |
| 0 | Autonomous load-balance indicator is off |
| 1 | Autonomous load-balance indicator is on |
|  |
| Maximum RTT value (octets f+7 to f+8) |
| If the steering mode is defined as load balancing or priority based (octet f+3), the maximum RTT value field indicates binary encoded value of the maximum RTT in miliseconds (NOTE 5). |
|  |
| Maximum packet loss rate (octet s) |
| If the steering mode is defined as load balancing or priority based (octet f+3), the maximum packet loss rate field indicates the allowed percentage of packet rate lost as follows (NOTE 5): |
| Bits |
| **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  | 0% packet loss rate |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | 1% packet loss rate |
|  |  |  |  | to |  |  |  |  |  |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |  | 100% packet loss rate |
| All other values are spare (NOTE 6). |
|  |
| NOTE 1: For "OS Id + OS App Id type", the traffic descriptor component value field does not specify the OS version number or the version number of the application. |
| NOTE 2: This value shall be set by the SMF if the UE supports only one steering functionality. The SMF knows the UE's supported steering functionality during the MA PDU session establishment. |
| NOTE 3: Traffic descriptor components of an ATSSS rule are not required to be the same as the traffic descriptor components, defined in table 5.2.1 in 3GPP TS 24.526 [5]. |
| NOTE 4: If the value is received for a steering mode other than load balancing, it shall be ignored. |
| NOTE 5: If the value is received for a steering mode other than load balancing or priority based, it shall be ignored. |
| NOTE 6: In this release of the specification if received, it shall be interpreted as value 100. |