**3GPP TSG-WG SA2 Meeting #143E e-meeting S2-210xxxx**

**Feb 24th – March 9th, 2021; Elbonia (revision of S2-20xx)**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **23.501** | **CR** |  | **rev** | **-** | **Current version:** | **16.7.0** |  |
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| *For* [***HELP***](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:***  | Load-Balancing steering mode extension  |
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| ***Source to WG:*** | Huawei, Nokia, Nokia Shanghai Bell, Lenovo, Motorola Motorola, Ericsson |
| ***Source to TSG:*** | S2 |
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| ***Work item code:*** | eATSSS\_Ph2 |  | ***Date:*** | 2021-01-21 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***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)* |
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| ***Reason for change:*** | There is the following agreement in TR 23.700:1) For the Load-Balancing steering mode:- The network may not provide pre-defined split percentages, in which case the UE and the UPF can freely and independently decide how to split the traffic across the two accesses.NOTE 1: The above bullet covers the "autonomous" steering mode defined in Solution #2. Whether and how to provide an initial weight factors for two accesses are to be decided during normative work.Considering that weight factors are mandatory in case of load-balancing steering mode in Rel-16, and the weight factors might be useful at the initial stage when the link performance measurement has not been started, then the UE and UPF can apply this intitial weight factors as default to split the SDF across both accesses, it is proposed to introduce an autonomous operation together with the load-balancing steering mode. If the UE does not support this autonomous operation, e.g. for the Rel-16 UE, or the UE does not want to decide the traffic splitting weight factor by itself, the UE can split the traffic based on the percentage of the SDF across both accesses provided by the network side, as defined in Rel-16. |
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| ***Summary of change:*** | Defines an autonomous operation for load-balancing steering mode. |
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| ***Consequences if not approved:*** | The UE and UPF cannot split the traffic to maximize the throughput/bandwidth. |
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| ***Clauses affected:*** | 5.32.8 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*FIRST CHANGE*

### 5.32.8 ATSSS Rules

As specified in clause 5.32.3, after the establishment of a MA PDU Session, the UE receives a prioritized list of ATSSS rules from the SMF. The structure of an ATSSS rule is specified in Table 5.32.8-1.

Table 5.32.8-1: Structure of ATSSS Rule

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Information name | Description | Category | SMF permitted to modify in a PDU context | Scope |
| Rule Precedence | Determines the order in which the ATSSS rule is evaluated in the UE. | Mandatory(NOTE 1) | Yes | PDU context |
| **Traffic Descriptor** | *This part defines the Traffic descriptor components for the ATSSS rule.* | Mandatory(NOTE 2) |  |  |
| Application descriptors | One or more application identities that identify the application(s) generating the traffic (NOTE 3). | Optional | Yes | PDU context |
| IP descriptors(NOTE 4) | One or more 5-tuples that identify the destination of IP traffic. | Optional | Yes | PDU context |
| Non-IP descriptors(NOTE 4) | One or more descriptors that identify the destination of non-IP traffic, i.e. of Ethernet traffic. | Optional | Yes | PDU context |
| **Access Selection Descriptor** | *This part defines the Access Selection Descriptor components for the ATSSS rule.* | Mandatory |  |  |
| Steering Mode | Identifies the steering mode that should be applied for the matching traffic, and associated parameters. | Mandatory | Yes | PDU context |
| Steering Functionality | Identifies whether the MPTCP functionality or the ATSSS-LL functionality should be applied for the matching traffic. | Optional(NOTE 5) | Yes | PDU context |
| NOTE 1: Each ATSSS rule has a different precedence value from the other ATSSS rules.NOTE 2: At least one of the Traffic Descriptor components is present.NOTE 3: An application identity consists of an OSId and an OSAppId.NOTE 4: An ATSSS rule cannot contain both IP descriptors and Non-IP descriptors.NOTE 5: If the UE supports only one Steering Functionality, this component is omitted. |

The UE evaluates the ATSSS rules in priority order.

Each ATSSS rule contains a Traffic Descriptor (containing one or more components described in Table 5.32.8-1) that determines when the rule is applicable. An ATSSS rule is determined to be applicable when every component in the Traffic Descriptor matches the considered service data flow (SDF).

Depending on the type of the MA PDU Session, the Traffic Descriptor may contain the following components (the details of the Traffic Descriptor generation are described in clause 5.32.3):

- For IPv4, or IPv6, or IPv4v6 type: Application descriptors and/or IP descriptors.

- For Ethernet type: Application descriptors and/or Non-IP descriptors.

One ATSSS rule with a "match all" Traffic Descriptor may be provided, which matches all SDFs. When provided, it shall have the least Rule Precedence value, so it shall be the last one evaluated by the UE.

NOTE 1: The format of the "match all" Traffic descriptor of an ATSSS rule is defined in stage-3.

Each ATSSS rule contains an Access Selection Descriptor that contains the following components:

- A Steering Mode, which determines how the traffic of the matching SDF should be distributed across 3GPP and non-3GPP accesses. The following Steering Modes are supported:

- Active-Standby: It is used to steer a SDF on one access (the Active access), when this access is available, and to switch the SDF to the available other access (the Standby access), when Active access becomes unavailable. When the Active access becomes available again, the SDF is switched back to this access. If the Standby access is not defined, then the SDF is only allowed on the Active access and cannot be transferred on another access.

- Smallest Delay: It is used to steer a SDF to the access that is determined to have the smallest Round-Trip Time (RTT). As defined in clause 5.32.5, measurements may be obtained by the UE and UPF to determine the RTT over 3GPP access and over non-3GPP access. In addition, if one access becomes unavailable, all SDF traffic is switched to the other available access. It can only be used for the Non-GBR SDF.

- Load-Balancing: It is used to split a SDF across both accesses if both accesses are available. It contains the percentage of the SDF traffic that should be sent over 3GPP access and over non-3GPP access. Load-Balancing is only applicable to Non-GBR SDF. In addition, if one access becomes unavailable, all SDF traffic is switched to the other available access, as if the percentage of the SDF traffic transported via the available access was 100%.

 It may also contain an indication on whether autonomous operation of the Load-Balancing steering mode is allowed. If allowed, the UE and UPF may autonomously and independently determine their own percentages for traffic splitting, in a way that maximizes the aggregated bandwidth in the uplink and downlink direction respectively. In this case, the percentages of the SDF traffic provided by the network are treated as default percentages. The UE and UPF may apply either the default percentages or their own percentages for uplink and downlink traffic splitting.

- Priority-based: It is used to steer all the traffic of an SDF to the high priority access, until this access is determined to be congested. In this case, the traffic of the SDF is sent also to the low priority access, i.e. the SDF traffic is split over the two accesses. In addition, when the high priority access becomes unavailable, all SDF traffic is switched to the low priority access. How UE and UPF determine when a congestion occurs on an access is implementation dependent. It can only be used for the Non-GBR SDF.

- A Steering Functionality, which identifies whether the MPTCP functionality or the ATSSS-LL functionality should be used to steer the traffic of the matching SDF. This is used when the UE supports multiple functionalities for ATSSS, as specified in clause 5.32.6 ("Support of Steering Functions").

NOTE 2: There is no need to update the ATSSS rules when one access becomes unavailable or available.

As an example, the following ATSSS rules could be provided to UE:

a) "Traffic Descriptor: UDP, DestAddr 1.2.3.4", "Steering Mode: Active-Standby, Active=3GPP, Standby=non-3GPP":

- This rule means "steer UDP traffic with destination IP address 1.2.3.4 to the active access (3GPP), if available. If the active access is not available, use the standby access (non-3GPP)".

b) "Traffic Descriptor: TCP, DestPort 8080", "Steering Mode: Smallest Delay":

- This rule means "steer TCP traffic with destination port 8080 to the access with the smallest delay". The UE needs to measure the RTT over both accesses, in order to determine which access has the smallest delay.

c) "Traffic Descriptor: Application-1", "Steering Mode: Load-Balancing, 3GPP=20%, non-3GPP=80%", "Steering Functionality: MPTCP":

- This rule means "send 20% of the traffic of Application-1 to 3GPP access and 80% to non-3GPP access by using the MPTCP functionality".

*END OF CHANGES*