

ETSI TS 124 526 V15.3.0 (2019-07)



5G;
User Equipment (UE) policies for 5G System (5GS);
Stage 3
(3GPP TS 24.526 version 15.3.0 Release 15)

*ITeH STANDARD PREVIEW
(standard: ite:ai)
Full text of standards: https://standards.iteh.ai/catalog/standards/sist/3e710297-be00-4e5d-b964-4e16e8e31dcb/etsi-ts-124-526-v15-3-0-2019-07*



ReferenceRTS/TSGC-0124526vf30

Keywords5G

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Foreword

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1 Scope

The present document defines UE policies for 5G System (5GS) as specified in 3GPP TS 23.503 [2] including:

- UE route selection policy; and
- Access network discovery and selection policy.

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 23.503: " Policy and Charging Control Framework for the 5G System; Stage 2".
- [3] 3GPP TS 24.502: "Access to the 3GPP 5G Core Network (5GCN) via Non-3GPP Access Networks (N3AN); Stage 3".
- [4] 3GPP TS 23.003: "Numbering, addressing and identification".
- [5] 3GPP TS 25.331: "Radio Resource Control (RRC); Protocol Specification".
- [6] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol specification".
- [7] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".
- [8] IEEE Std 802.11™-2012: "Information Technology- Telecommunications and information exchange between systems-Local and metropolitan area networks-Specific requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".
- [9] Wi-Fi Alliance: "Hotspot 2.0 (Release 2) Technical Specification, version 1.0.0", 2014-08-08.
- [10] ITU-T Recommendation E.212: "The international identification plan for public networks and subscriptions", 2016-09-23.
- [11] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".
- [12] IETF RFC 1035: "Domain names - implementation and specification".
- [13] ISO 8601:2004: "Data elements and interchange formats -- Information interchange -- Representation of dates and times".
- [14] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".
- [15] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".
- [16] IETF RFC 4122: "A Universally Unique Identifier (UUID) URN Namespace".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.501 [15] apply:

non-seamless non-3GPP offload

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.503 [2] apply:

UE local configuration

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.501 [11] apply:

5GMM-IDLE mode

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

5GCN	5G Core Network
5GS	5G System
ANDSP	Access Network Discovery and Selection Policy
DNN	Data Network Name
ePDG	evolved Packet Data Gateway
FQDN	Fully Qualified Domain Name
H-PCF	A PCF in the HPLMN
IMS	IP Multimedia Subsystem
LADN	Local Area Data Network
MCC	Mobile Country Code
ME	Mobile Equipment
MMS	Multimedia Messaging Service
MNC	Mobile Network Code
N3AN	Non-3GPP Access Network
N3IWF	Non-3GPP InterWorking Function
OS	Operating System
PCF	Policy Control Function
S-NSSAI	Single Network Slice Selection Assistance Information
SSC	Session and Service Continuity
SUPI	Subscriber Permanent Identifier
SUPL	Secure User Plane Location
URSP	UE Route Selection Policy
USIM	User Services Identity Module
V-PCF	A PCF in the VPLMN
WLANSP	WLAN Selection Policy

4 Descriptions of UE policies for 5GS

4.1 Overview

The UE policies for 5GS include:

- UE route selection policy (URSP) (see subclause 4.2); and

- Access network discovery and selection policy(ANDSP)(see subclause 4.3).

The UE policies can be delivered from the PCF to the UE. The UE policy delivery procedure is specified in 3GPP TS 24.501 [11].

The UE policies can also be pre-configured in the UE. The pre-configured policy shall be applied by the UE only when the UE has not received the same type of policy from the PCF. The implementation of pre-configured UE policies is out of scope of this specification.

4.2 UE route selection policy (URSP)

4.2.1 General

The URSP is defined in 3GPP TS 23.503 [2] and is a set of one or more URSP rules, where a URSP rule is composed of:

- a) a precedence value of the URSP rule identifying the precedence of the URSP rule among all the existing URSP rules;
- b) a traffic descriptor, including either:
 - 1) match-all traffic descriptor; or
 - 2) at least one of the following components:
 - A) one or more application identifiers;
 - B) one or more IP 3 tuples as defined in 3GPP TS 23.503 [2] i.e. the destination IP address, the destination port number, and the protocol in use above the IP;
 - C) one or more non-IP descriptors, i.e. destination information of non-IP traffic;
 - D) one or more DNNs;
 - E) one or more connection capabilities; and
 - F) one or more domain descriptors, i.e. destination FQDN(s); and
- c) one or more route selection descriptors each consisting of a precedence value of the route selection descriptor and either
 - 1) at least one of the followings:
 - A) SSC mode;
 - B) one or more S-NSSAIs;
 - C) one or more DNNs;
 - D) PDU session type; and
 - E) preferred access type; or
 - 2) non-seamless non-3GPP offload indication.

Only one URSP rule in the URSP can be a default URSP rule and the default URSP rule shall contain a match all traffic descriptor. If a default URSP rule and one or more non-default URSP rules are included in the URSP, any non-default URSP rule shall have lower precedence value than (i.e. shall be prioritised over) the default URSP rule.

If a traffic descriptor lists one or more application identifiers together with one or more connection capabilities, the UE shall consider that the application identifiers identify the applications requesting access to the connection capabilities.

NOTE 1: The connection capabilities requested by the applications are OS dependent. The connection capability identifiers defined in table 5.2.1 are OS independent. It is based on the UE implementation how the UE matches the connection capabilities requested by the applications to the connection capability identifiers in table 5.2.1.

NOTE 2: If the UE has multiple concurrently active OS, the traffic descriptor can list as many multiple OS Ids.

If one or more DNNs are included in the traffic descriptor of a URSP rule, the route selection descriptor of the URSP rule shall not include any DNN.

NOTE 3: It is recommended to avoid the combination of more than two components in the traffic descriptor.

4.2.2 Association between an application and either a PDU session or non-seamless non-3GPP offload

When the upper layers request information of the PDU session via which to send a PDU of an application, information on the non-3GPP access outside of a PDU session shall be provided to the upper layers, without evaluating the URSP rules, if due to UE local configuration non-seamless non-3GPP offload is requested. Otherwise, the UE shall proceed in the following order:

- a) the UE shall evaluate the URSP rules, except the default URSP rule, with a traffic descriptor matching the application information in increasing order of their precedence values, if any. If the traffic descriptor contains more than one component, all of them shall be matched.

If the UE finds the traffic descriptor in a non-default URSP rule matching the application information, and:

I) if there is one or more PDU sessions:

- 1) matching at least one of the route selection descriptors of the URSP rule; and
- 2) established without requesting any parameter not included in the matching route selection descriptor of the URSP rule,

the UE shall provide information on the PDU session that matches the route selection descriptor of the lowest precedence value to the upper layers;

NOTE 1: It is up to the UE implementation which PDU session to select if there exist multiple PDU sessions matching the same route selection descriptor of the lowest precedence value.

II) otherwise:

- 1) the UE shall select a route selection descriptor with the next smallest precedence value which has not yet been evaluated;
- 2) if:
 - i) the selected route selection descriptor contains a non-seamless non-3GPP offload indication:
 - A) if the information on the non-3GPP access outside of a PDU session is available, it shall be provided to the upper layers and the UE shall stop selecting a route selection descriptor matching the application information.
 - B) if the information about the non-3GPP access outside of a PDU session is not available, or non-3GPP access is not available the UE shall proceed to step 4); or
 - ii) the selected route selection descriptor does not contain a non-seamless non-3GPP offload indication, the URSP handling layer requests the UE NAS layer to establish a PDU session providing at least one of the following PDU session attributes:
 - A) SSC mode if there is a SSC mode in the route selection descriptor;

NOTE 2: The SSC mode 3 is only used when the PDU session type is IPv4, IPv6 or IPv4v6.

- B) one S-NSSAI if the S-NSSAI is in the route selection descriptor; and the S-NSSAI is in the allowed NSSAI

Otherwise, the S-NSSAI shall not be used as a PDU session attribute for establishing a PDU session;

NOTE 3: If there are multiple S-NSSAIs in the route selection descriptor, an S-NSSAI is chosen among the S-NSSAIs based on UE implementation.

C) one DNN, if the DNN in the route selection descriptor; and if the DNN is an LADN DNN and the UE is in the service area of that LADN;

NOTE 4: If one or more DNNs are included in the traffic descriptor of a URSP rule, the existing DNNs in the route selection descriptor for the application are ignored.

NOTE 5: If there is no DNN in the traffic descriptor and there are multiple DNNs in the route selection descriptor, a DNN is chosen based on UE implementation.

D) PDU session type if the PDU session type is in the route selection descriptor; and

E) preferred access type if the preferred access type is in the route selection descriptor.

The UE NAS layer indicates the result of the PDU session establishment. Upon successful completion of the PDU session establishment, the UE NAS layer shall additionally indicate the attributes of the established PDU session (e.g. PDU session identity, SSC mode, S-NSSAI, DNN, PDU session type, access type, PDU address) to the URSP handling layer, and shall provide information (e.g. PDU address) of the successfully established PDU session to the upper layers. The UE shall stop selecting a route selection descriptor matching the application information. If the PDU session establishment is unsuccessful, the UE shall proceed to step 3);

- 3) Based on the rejection cause and if there is another value which can be used for the rejected component in the same route selection descriptor, the UE shall select another combination of values in the currently selected route selection descriptor by using this value of the rejected component and proceed to step 2), otherwise the UE shall proceed to step 4); and
 - 4) if there is any route selection descriptor which has not yet been evaluated, the UE shall proceed to step 1). If all route selection descriptors for the matching non-default URSP rule have been evaluated and there is one or more non-default matching URSP rule which has not yet been evaluated, the UE shall proceed to step a). If all non-default matching URSP rules have been evaluated, the UE shall inform the upper layers of the failure.
- b) if no non-default matching URSP rule can be found and if UE local configuration for the application is available, the UE shall perform the association of the application to a PDU session accordingly. If no matching PDU session exists, the UE NAS layer shall attempt to establish a PDU session using UE local configuration.

NOTE 6: Any missing information in the UE local configuration needed to build the PDU session establishment request can be the appropriate corresponding component from the default URSP rule with the "match-all" traffic descriptor.

If the PDU session establishment is successful, the UE NAS layer shall provide information (e.g. PDU address) of the successfully established PDU session to the upper layers. Otherwise, the UE shall go to step c);

- c) if no non-default matching URSP rule can be found and if either UE local configuration for the application is not available or the PDU session establishment based on UE local configuration for the application was unsuccessful, the UE shall perform the association of the application to a PDU session or to non-seamless non-3GPP offload according to the default URSP rule with the "match-all" traffic descriptor, if any. If the association is unsuccessful, the UE shall inform the upper layers of the failure.

The HPLMN may pre-configure the UE with URSP or may provide URSP to the UE by signalling as described in annex D of 3GPP TS 24.501 [11]. The pre-configured URSP and the signalled URSP shall be stored in a non-volatile memory in the ME together with the SUPI from the USIM. If the UE has both pre-configured URSP and signalled URSP, the UE shall only use the signalled URSP. The pre-configured URSP shall be stored until a new URSP is configured by HPLMN or the USIM is removed. The signalled URSP may be modified by the procedures defined in annex D of 3GPP TS 24.501 [11] and shall be stored until USIM is removed. The URSP can only be used if the SUPI from the USIM matches the SUPI stored in the non-volatile memory of the ME. If the SUPI from the USIM does not match the SUPI stored in the non-volatile memory of the ME, the UE shall delete the URSP.

The UE may re-evaluate the URSP rules, to check if the change of the association of an application to a PDU session is needed, when:

NOTE 7: The time when the UE performs the re-evaluation is up to UE implementation. It is recommended that the UE performs the re-evaluation in a timely manner.

- a) the UE performs periodic URSP rules re-evaluation based on UE implementation;
- b) the UE NAS layer indicates that an existing PDU session used for routing traffic of an application based on a URSP rule is released;
- c) the URSP is updated by the PCF;
- d) the UE NAS layer indicates that the UE performs inter-system change from S1 mode to N1 mode;
- e) the UE NAS layer indicates that the UE is successfully registered in N1 mode over 3GPP access or non-3GPP access;
- f) the UE establishes or releases a connection to a WLAN access and transmission of a PDU of the application via non-3GPP access outside of a PDU session becomes available/unavailable;
- g) the allowed NSSAI is changed; or
- h) the LADN information is changed.

If the re-evaluation leads to a change of the association of an application to a PDU session, the UE may enforce such change immediately or when UE returns to 5GMM-IDLE mode.

NOTE 8: The time when the UE enforces the change of the association of an application to a PDU Session is up to UE implementation. It is recommended that the UE performs the enforcement in a timely manner.

The URSP handling layer may request the UE NAS layer to release an existing PDU session after the re-evaluation.

4.2.3 Unknown or unexpected URSP rules

If the network provides URSP rules including any new component in the traffic descriptor or in the route selection descriptor which is not recognized by the UE, such URSP rules are unknown or unexpected to the UE. In this case, the UE shall ignore the unknown or unexpected URSP rules when evaluating the URSP rules to associate an application either with a PDU session or with non-seamless non-3GPP offload.

4.3 Access network discovery and selection policy (ANDSP)

4.3.1 Overview

The ANDSP is used to control UE behaviour related to access network discovery and selection over non-3GPP access network.

ANDSP consists of:

- WLAN Selection Policy (WLANSF) which is described in subclause 4.3.2.; and
- non-3GPP access network (N3AN) node configuration information which is described in subclause 4.3.3.

4.3.2 WLAN selection policy (WLANSF)

4.3.2.1 General

The WLANSF is used to control UE behaviour related to selection and reselection of a WLAN.

The WLANSF consists of zero or more WLANSF rules.

Each WLANSF rule consists of:

- rule identifier;
- one or more groups of WLAN selection criteria;
- validity area;
- zero or more time of day;
- rule priority;
- roaming.

Each group of WLAN selection criteria contains:

- criteria priority;
- home network indication;
- preferred roaming partner list;
- min backhaul threshold;
- maximum BSS load value;
- required proto port tuple;
- SP exclusion list; and
- preferred SSID list.

The priority of a selection criteria is encoded in the criteria priority field. The WLAN priority defined in the preferred SSID list (see figure 5.3.2.4c) represents the priority of the WLAN matching the selection criteria.

The validity of the WLANSF rule can be restricted by validity conditions. The validity of the WLANSF rule takes into account validity area, roaming, and time of day where each condition shall match in order to make the WLANSF rule valid.

Each validity area consists of:

- 3GPP location;
- WLAN location; and
- Geo location.

Each time of day consists of:

- time start;
- time stop;
- date start;
- date stop; and
- day of week.

The WLANSF rule is considered valid if none of the validity conditions exist or all validity conditions match.

There can be multiple valid WLANSF rules at the same time. In addition to validity conditions and selection criteria, there is a rule priority that shall be set for each WLANSF rule. The rule priority is encoded in the rule priority field, and it enables the UE to determine which WLANSF rule, out of potentially several valid WLANSF rules, it should consider as active. A WLANSF rule is active if it is valid and has highest rule priority out of the valid WLANSF rules. At any point in time, there shall be at most one active WLANSF rule. A WLAN that matches a selection criteria of the active WLANSF rule is considered as matching the selection criteria.

If the UE is roaming and WLANSF rules from both HPLMN and VPLMN are available, visited WLANSF rules shall take precedence.