TS.62 UE Requirements Related to Network Slicing using URSP.

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1 Introduction

1.1 Overview

The 3GPP specifications introduced UE Route Selection Policy (URSP) to support the establishment and use of an appropriate PDU Session associated with an appropriate network slice when an entity within the UE (e.g., application, operating system, modem, etc.) requests a network connection. Network slices provide end-to-end logical networks to different industries/users allowing customization, dedication, and isolation of network resources. A URSP rule can be characterized by a set of match criteria such as Data Network Name (DNN), application identifier, Fully Qualified Domain Name (FQDN), IP address/prefix, and Connection Capabilities component types of a Traffic Descriptor as defined in references [1] to [4]. The UE evaluates URSP rules to find a matching URSP rule when a network connection is requested. If a match is found, the UE then forwards the associated traffic via a network slice per the Route Selection Descriptor (RSD) in the matching URSP rule. This process is specified in 3GPP specifications [2] and [4].

However, there are some issues that need to be better addressed and relevant procedures standardized to ease the deployment of network slices using URSP. These issues include requirements for transferring application information corresponding to Traffic Descriptor components to the URSP rule matching logic within a UE, requirements on the security of URSP traffic descriptors, and the requirements on protecting data privacy and security pertaining to URSP traffic descriptors.

This specification is meant to help the mobile industry to design, develop, and implement network slicing using URSP in 5G UE.

This specification defines the normative baseline for UE requirements to address the issues mentioned above.

This specification contains normative and informative sections. Unless otherwise specified, all sections are normative.

1.2 Scope

The scope of this specification is to define UE requirements related to network slicing using URSP. The specification also covers the applicability of these requirements to different UE types.

1.3 Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [5] [6] when, and only when, they appear in all capitals, as shown here.

Term	Description
URSP rule matching logic	Logic that determines which URSP rule(s), if any, match an application (applicable for an application), as specified in 3GPP TS 24.526 [4]

Table 1 Definitions

1.4 Abbreviations.

Term	Description
DNN	Data Network Name
FQDN	Fully Qualified Domain Name
IP	Internet Protocol
MCU	Micro Controller Unit
TD	Traffic Descriptor
UE	User Equipment
URSP	UE Route Selection Policy

Table 2 Abbreviations

1.5 References

Requirements shall be based on the exact versions as indicated below. However, if the manufacturers use a later release and/or version this should be indicated. The GSMA will take efforts to continually align with other SDOs for timely information about release plans.

Ref	Doc Number	Title
[1]	3GPP TS 23.501	System architecture for the 5G System (5GS); Stage 2
[2]	3GPP TS 23.503	Policy and Charging Control Framework for the 5G System; Stage 2
[3]	3GPP TS 24.501	Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3
[4]	3GPP TS 24.526	User Equipment (UE) policies for 5G System (5GS); Stage 3
[5]	RFC 2119	“Key words for use in RFCs to Indicate Requirement Levels”, S. Bradner, March 1997. Available at http://www.ietf.org/rfc/rfc2119.txt
[6]	RFC 8174	“Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words”, B. Leiba, May 2017. Available at https://www.rfc-editor.org/info/rfc8174
[7]	GSMA PRD NG.135	E2E Network Slicing Requirements

Table 3 References

2 UE architectures (informative)

For comprehensive information on URSP definition and its usage, the reader should refer to 3GPP specifications [1], [2], and [4].

There can be different architectures employed by different UEs for hosting application and managing connectivity. For example, a smartphone is likely to have an architecture where applications are hosted by an operating system (OS), which then communicates with the modem for network connectivity. On the other hand, for example, an IoT device may only have a modem for network connectivity. There can also be a device which has an OS and a modem but the OS does not host any applications. Figure 1 illustrates these UE architectures.

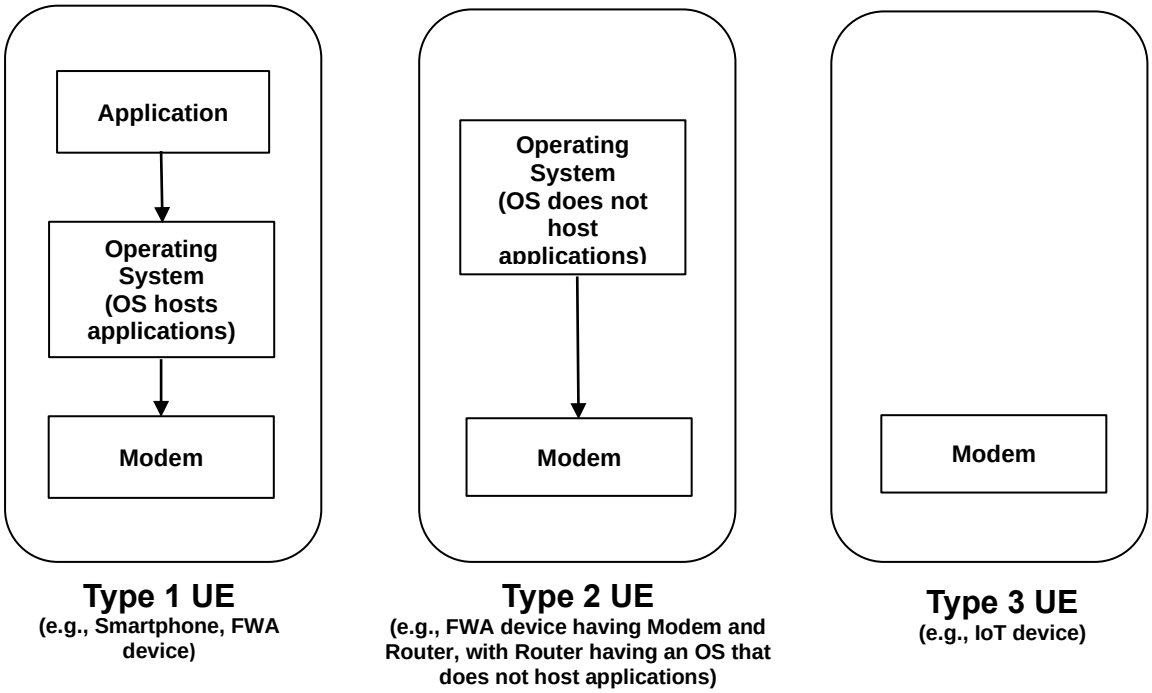

Figure 1: Different types of UE architectures

These UE types (UE architectures) are further categorized by where the URSP rule matching logic resides. If the URSP rule matching logic resides in the modem, the UE is referred to as “Modem-Centric” UE (for example, “Modem-Centric Type 1 UE”). On the other hand, if the URSP rule matching logic resides in the OS, the UE is referred to as “OS-Centric” UE (for example, “OS-Centric Type 1 UE”). Note that Type 3 UE can only be a Modem-Centric UE.

3 Requirements related to network slicing using URSP.

The UE requirements defined in this section apply to the types of UEs defined in Section 2. This includes UEs with Modem-Centric and OS-Centric architectures.

Each UE requirement has a “Minimum Applicability” to specify the UE types, as defined in Section 2, to which it primarily applies. Not implementing a requirement in a UE that is specified under “Minimum Applicability” of that requirement can result in an incomplete network slicing support.

In addition, if a requirement is implemented in a UE that is not specified under “Minimum Applicability” of that requirement, it could cause ambiguities or conflicts with other requirements that the UE implements. The UE would then have to handle such ambiguities and conflicts appropriately.

An assumption about the URSP rule matching logic: it is assumed that the UE supports either the Modem-Centric architecture or the OS-Centric architecture as defined in Section 2.

3.1 UE requirements

The requirements listed in this section are applicable to UEs that can realize network slicing without specific requirements for OS and modem.

3.1.1 5G UE requirements

TS62_3.1.1_REQ_001	The UE SHALL be able to receive URSP rules from the network as per the 3GPP specifications [3] and [4].
TS62_3.1.1_REQ_002	The UE SHALL implement the URSP rule matching logic.
TS62_3.1.1_REQ_003	In the API for requesting network connection, the UE/OS SHALL allow applications to request access to any of the traffic categories supported by the UE/OS and defined in GSMA PRD NG.135 [7].
TS62_3.1.1_REQ_004	When evaluating a URSP rule to determine whether it matches an application, the UE/OS SHALL infer, whenever possible, the application information corresponding to the Traffic Descriptor components of the URSP rule based on the connection request, if not provided by the application.
TS62_3.1.1_REQ_005	In the API for requesting network connection, the UE/OS SHALL allow the application to optionally provide information corresponding to DNN, Connection Capabilities, Destination FQDN or non-IP Traffic Descriptor component types specified in [4]. Note: Details of how the application provides this information is up to the UE/OS.

Editor’s note: The requirement TS62_3.1.1_REQ_003 may need updating when 3GPP have completed their work related to traffic categories.

3.1.2 Security requirements

TS62_3.1.2_REQ_001	The UE/OS SHALL ensure that an application requesting access to a traffic category is qualified to access it. Note: The qualification rule and process are UE/OS-specific and are outside the scope of this document.
TS62_3.1.2_REQ_002	The UE/OS SHOULD provide a means for the user to allow and disallow access, per application, to traffic categories other than the Internet and IMS traffic categories. Note 1: The means by which the UE/OS provides the choice to the user is UE/OS-specific. Note 2: The user control, if provided, shall not affect the availability of IMS based services and emergency calls.
TS62_3.1.2_REQ_003	When a URSP rule with "Application descriptors" TD component, as defined in [2], is being evaluated for applicability, the UE/OS SHALL ensure that the application information being matched against that TD component is associated with the application that requested the network connection.

Editor's note: The requirement TS62_3.1.2_REQ_001 *may need updating when 3GPP have completed their work related to traffic categories.*

3.2 Requirements for Modem-Centric UE

The requirements listed in this section are applicable to Modem-Centric UEs that need specific requirements for OS and modem to realize network slicing.

3.2.1 5G OS requirements

TS62_3.2.1_REQ_001	In the API for requesting network connection, the OS SHALL allow applications to request access to any of the traffic categories supported by the OS and defined in GSMA PRD NG.135 [7]. **Minimum Applicability**: Modem-Centric Type 1 UE
TS62_3.2.1_REQ_002	When evaluating a URSP rule to determine whether it matches an application, the OS SHALL infer, whenever possible, the application information corresponding to the Traffic Descriptor components of the URSP rule based on the connection request, if not provided by the application. **Minimum Applicability**: Modem-Centric Type 1 UE
TS62_3.2.1_REQ_003	When an application requests a network connection, the OS SHALL pass the available application information corresponding to traffic descriptor components to the modem. **Minimum Applicability**: Modem-Centric Type 1 UE
TS62_3.2.1_REQ_004	When the OS requests a network connection, it SHALL pass the available information corresponding to traffic descriptor components to the modem. **Minimum Applicability**: Modem-Centric Type 2 UE Note: How the OS determines the information corresponding to traffic descriptor components in Modem-Centric Type 2 UE is up to implementation.
TS62_3.2.1_REQ_005	In the API for requesting network connection, the OS SHALL allow the application to optionally provide information corresponding to DNN, Connection Capabilities, Destination FQDN or Non-IP Traffic Descriptor component types specified in [4]. **Minimum Applicability**: Modem-Centric Type 1 UE, Modem-Centric Type 2 UE Note: Details of how the application provides this information is OS-specific.

3.2.2 5G modem requirements

TS62_3.2.2_REQ_001	The modem SHALL implement the URSP rule matching logic. **Minimum Applicability**: Modem-Centric Type 1 UE, Modem-Centric Type 2 UE, Modem-Centric Type 3 UE.
TS62_3.2.2_REQ_002	The modem SHALL be able to receive URSP rules from the network as per the 3GPP specifications [3] and [4]. **Minimum Applicability**: Modem-Centric Type 1 UE, Modem-Centric Type 2 UE, Type 3UE
TS62_3.2.2_REQ_003	The modem SHALL be able to receive information corresponding to traffic descriptor components from the OS/MCU. **Minimum Applicability**: Modem-Centric Type 1, Modem-Centric Type 2, Modem-Centric Type 3 UE

3.2.3 Security requirements

TS62_3.2.3_REQ_001	The OS SHALL ensure that an application requesting access to a traffic category is qualified to access it. **Minimum Applicability**: Modem-Centric Type 1 UE Note: The qualification rule and process are OS-specific and are outside the scope of this document.
TS62_3.2.3_REQ_002	The UE/OS SHOULD provide a means for the user to allow and disallow access, per application, to traffic categories other than the Internet and IMS traffic categories. **Minimum Applicability**: Modem-Centric Type 1 UE Note 1: The means by which the UE/OS provides the choice to the user is UE/OS-specific.Note 2: The user control, if provided, shall not affect the availability of IMS based services and emergency calls.
TS62_3.2.3_REQ_003	When a URSP rule with "Application descriptors" TD component as defined in [2] is being evaluated for applicability, the OS SHALL ensure that the application information being matched against that TD component is associated with the application that requested the network connection. **Minimum Applicability**: Modem-Centric Type 1 UE

3.3 Requirements for OS-Centric UE

The requirements listed in this section are applicable to OS-Centric UEs that need specific requirements for OS and modem to realize network slicing.

3.3.1 5G OS requirements

TS62_3.3.1_REQ_001	In the API for requesting network connection, the OS SHALL allow applications to request access to any of the traffic categories supported by the OS and defined in GSMA PRD NG.135 [7]. **Minimum Applicability**: OS-Centric Type 1 UE
TS62_3.3.1_REQ_002	The OS SHALL implement the URSP rule matching logic. **Minimum Applicability**: OS-Centric Type 1 UE, OS-Centric Type 2 UE.
TS62_3.3.1_REQ_003	When evaluating a URSP rule to determine whether it matches an application, the OS SHALL infer, whenever possible, the application information corresponding to the Traffic Descriptor components of the URSP rule based on the connection request, if not provided by the application. **Minimum Applicability**: OS-Centric Type 1 UE
TS62_3.3.1_REQ_004	The URSP rule matching logic in the OS SHALL be able to receive URSP rules from the Modem. **Minimum Applicability**: OS-Centric Type 1 UE, OS-Centric Type 2 UE
TS62_3.3.1_REQ_005	In the API for requesting network connection, the OS SHALL allow the application to optionally provide information corresponding to DNN, Connection Capabilities or Destination FQDN Traffic Descriptor component types specified in [4]. **Minimum Applicability**: OS-Centric Type 1 UE, OS-Centric Type 2 UE Note: Details of how the application provides this information is OS-specific.

Editor's note: The requirement TS62_3.3.1_REQ_001 *may need updating when 3GPP have completed their work related to traffic categories.*

3.3.2 5G modem requirements

TS62_3.3.2_REQ_001	The modem SHALL be able to receive URSP rules from the network as per the 3GPP specifications [3] and [4]. **Minimum Applicability**: OS-Centric Type 1 UE, OS-Centric Type 2 UE, Type 3 UE
TS62_3.3.2_REQ_002	The modem SHALL pass URSP rules received from the network to the OS. **Minimum Applicability**: OS-Centric Type 1 UE, OS-Centric Type 2 UE

3.3.3 Security requirements

TS62_3.3.3_REQ_001	The OS SHALL ensure that an application requesting access to a traffic category is qualified to access it. **Minimum Applicability**: OS-Centric Type 1 UE Note: The qualification rule and process are OS-specific and is outside the scope of this document.
TS62_3.3.3_REQ_002	The UE/OS SHOULD provide a means for the user to allow and disallow access, per application, to traffic categories other than the Internet and IMS traffic categories. **Minimum Applicability**: OS-Centric Type 1 UE Note 1: The means by which the UE/OS provides the choice to the user is UE/OS-specific. Note 2: The user control, if provided, shall not affect the availability of IMS based services and emergency calls.
TS62_3.3.3_REQ_003	When a URSP rule with "Application descriptors" TD component as defined in [2] is being evaluated for applicability, the OS SHALL ensure that the application information being matched against that TD component is associated with the application that requested the network connection. **Minimum Applicability**: OS-Centric Type 1 UE

3.4 Requirements on data privacy and security

Entities involved in implementing or operating URSP should be aware that data items passed between systems can, in certain circumstances, qualify as personal data. Responsibility for the management of personal data and compliance with any necessary legislation lies with implementing and operating organisations, according to each organisation’s respective legal status with respect to the data processes.

TS62_3.4_REQ_001	To the extent the processing of information in relation to configuring or operating URSP involves processing of personal data, such processing operations SHALL comply with applicable data protection laws or regulations.

Annex A Document Management

A.1 Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
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A.2 Other Information

Type	Description
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Editor / Company	Shuzhen Chen / China Telecom

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