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URSP storage in USIM

Ly Thanh Phan
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URSP: UE Route Selection Policy

CR to 23.503 agreed at SA2#135:

6.6.2.2 Configuration and Provision of URSP

- The UE may be provisioned with URSP rules by PCF of the HPLMN. When the UE is roaming, the PCF in the HPLMN may update the URSP rule in the UE. In addition, the UE may be also pre-configured with URSP rules (e.g. by the operator).
- Only the URSP rules provisioned by the PCF is used by the UE, if both URSP rules provisioned by the PCF and pre-configured URSP rules are present. If no URSP rule is provisioned by the PCF, and the UE has pre-configured rules configured in both the USIM and ME, then only the pre-configured URSP rules configured in the USIM is used.

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4.2.2 UE access selection and PDU Session selection related policy (UE policy) control requirements

The 5GC shall be able to provide policy information from the PCF to the UE. Such policy information includes:

- Access Network Discovery & Selection Policy (ANDSP): It is used by the UE for selecting non-3GPP accesses network.

- **UE Route Selection Policy** (URSP): This policy is used by the UE to determine how to route outgoing traffic. **Traffic can be routed to an established PDU Session, can be offloaded to non-3GPP access outside a PDU Session, or can trigger the establishment of a new PDU Session**

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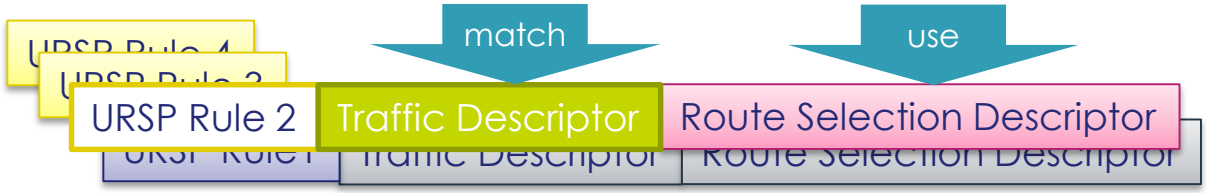
6.6.2.3 UE procedure for associating applications to PDU Sessions based on URSP



- For every newly detected application the UE evaluates the URSP rules in the order of Rule Precedence and determines if the application is matching the Traffic descriptor of any URSP rule.
- When a URSP rule is determined to be applicable for a given application (see clause 6.6.2.1), the UE shall select a Route Selection Descriptor within this URSP rule in the order of the Route Selection Descriptor Precedence.
- When a valid Route Selection Descriptor is found, the UE determines if there is an existing PDU Session that matches all components in the selected Route Selection Descriptor [...]
- When a matching PDU Session exists the UE associates the application to the existing PDU Session, i.e. route the traffic of the detected application on this PDU Session [...]
- If none of the existing PDU Sessions matches, the UE tries to establish a new PDU Session using the values specified by the selected Route Selection Descriptor [...]

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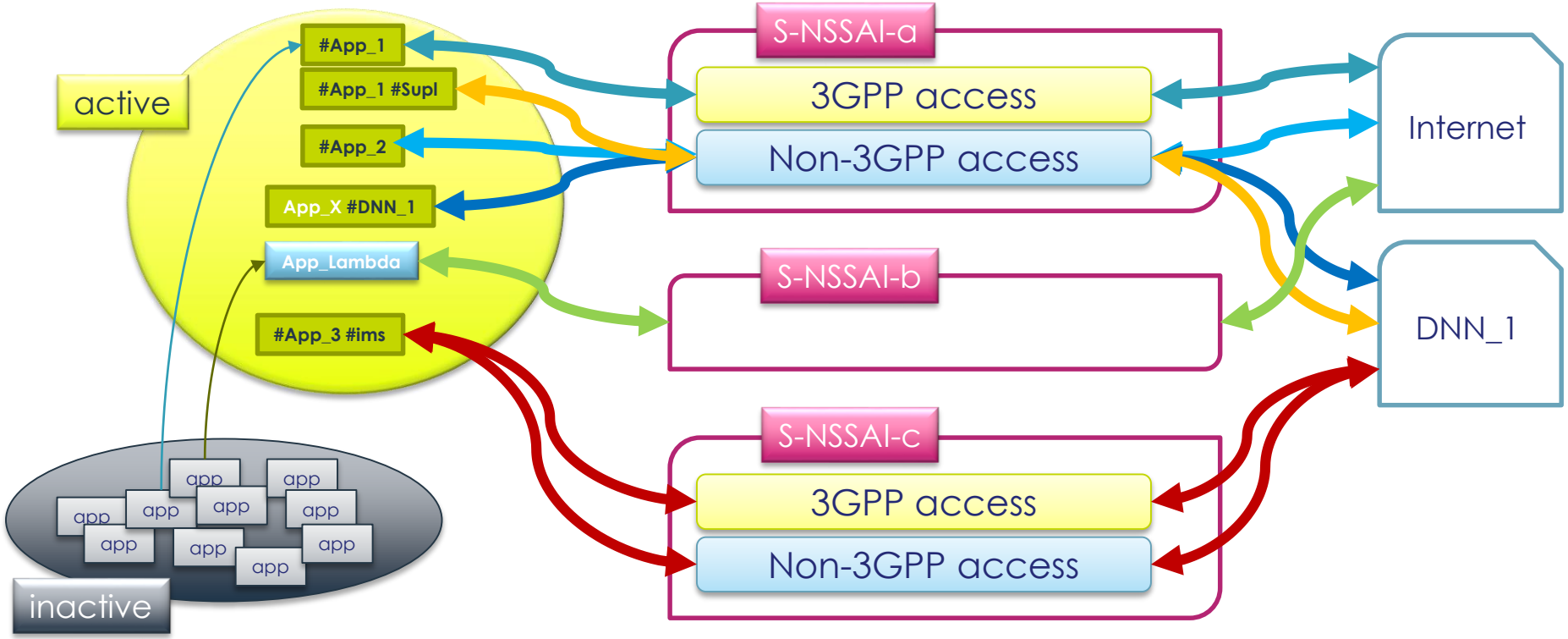
URSP: UE Routing Selection Policy



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TS 23.503 Table A-1: Example of URSP rules (1/3)

Example URSP rules		Comments
Rule Precedence =1 **Traffic Descriptor: Application Identifiers=App1**	Route Selection Descriptor Precedence=1 Network Slice Selection: S-NSSAI-a SSC Mode Selection: SSC Mode 3 DNN Selection: internet Access Type preference: 3GPP access	This URSP rule associates the traffic of application "App1" with S-NSSAI-a, SSC Mode 3, 3GPP access and the "internet" DNN. It enforces the following routing policy: The traffic of App1 should be transferred on a PDU session supporting S-NSSAI-a, SSC Mode 3 and DNN=internet over 3GPP access. If this PDU session is not established, the UE shall attempt to establish a PDU session with S-NSSAI-a, SSC Mode 3 and the "internet" DNN over 3GPP access.
Rule Precedence =2 **Traffic Descriptor: Application Identifiers=App2**	Route Selection Descriptor Precedence =1 Network Slice Selection: S-NSSAI-a Access Type preference: Non-3GPP access	This URSP rule associates the traffic of application "App2" with S-NSSAI-a and Non-3GPP access. It enforces the following routing policy: The traffic of application App2 should be transferred on. a PDU session supporting S-NSSAI-a using a Non-3GPP access. If this PDU session is not established, the UE shall attempt to establish a PDU session with S-NSSAI-a over Access Type=non-3GPP access.
	Route Selection Descriptor Precedence =2 Non-seamless Offload indication: Permitted (WLAN SSID-a)	If the PDU session cannot be established, the traffic of App2 shall be directly offloaded to WLAN, if the UE is connected to a WLAN with SSID-a (based on the 2nd RSD)

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Table A-1: Example of URSP rules (2/3)

Example URSP rules		Comments
Rule Precedence =3 **Traffic Descriptor: DNN=DNN_1**	Route Selection Descriptor Precedence =1 Network Slice Selection: S-NSSAI-a Access Type preference: Non-3GPP access	This URSP rule associates the traffic of applications that are configured to use DNN_1 with DNN_1, S-NSSAI-a over Non-3GPP access. It enforces the following routing policy: The traffic of application(s) that are configured to use DNN_1 should be transferred on a PDU session supporting S-NSSAI-a over Non-3GPP access. If this PDU session is not established, the UE shall attempt to establish the PDU session with S-NSSAI-a over Non-3GPP access.
Rule Precedence =4 **Traffic Descriptor: Application Identifiers=App1** **Connection Capabilities="internet", "supl"**	Route Selection Descriptor Precedence =1 Network Slice Selection: S-NSSAI-a DNN Selection: DNN_1 Access Type preference: Non-3GPP access	This URSP rule associates the application "App1" and the Connection Capabilities "internet" and "supl" with DNN_1, S-NSSAI-a over Non-3GPP access. It enforces the following routing policy: When the "App1" requests a network connection with Connection Capability "internet" or "supl", the UE establishes (if not already established) a PDU session with DNN_1 and S-NSSAI-a over Non-3GPP access. After that, the UE routes the traffic of "App1" over this PDU session.

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Table A-1: Example of URSP rules (3/3)

Example URSP rules		Comments
Rule Precedence =5 **Traffic Descriptor: Application Identifiers=App3** **Connection Capabilities="ims"**	Route Selection Descriptor Precedence =1 Network Slice Selection: S-NSSAI-c DNN Selection: DNN_1 Access Type preference: Multi-Access	This URSP rule associates the application "App3" and the Connection Capability "ims" with DNN_1, S-NSSAI-c and multi-access connectivity. It enforces the following routing policy: When the "App3" requests a network connection with Connection Capability "ims", the UE establishes (if not already established) a MA PDU Session with DNN_1 and S-NSSAI-c. After that, the UE routes the traffic of "App3" over this MA PDU Session by using the received ATSSS rules.
Rule Precedence = lowest priority **Traffic Descriptor: ***	Route Selection Descriptor Precedence =1 Network Slice Selection: S-NSSAI-b SSC Mode Selection: SSC Mode 3 DNN Selection: internet	This URSP rule associates all traffic not matching any prior rule a PDU Session with S-NSSAI-b, SSC Mode 3 and the "internet" DNN. It enforces the following routing policy: All traffic not matching any prior rule should be transferred on a PDU session supporting S-NSSAI-b, SSC Mode 3 and DNN=internet with no access network preference.

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Table 6.6.2.1-2: UE Route Selection Policy Rule

Information name	Description	Category	PCF permitted to modify in a UE context	Scope
Rule Precedence	Determines the order the URSP rule is enforced in the UE.	Mandatory (NOTE 1)	Yes	**UE context**
Traffic descriptor	**This part defines the Traffic descriptor components for the URSP rule.**	**Mandatory (NOTE 3)**		
Application descriptors	It consists of OSId and OSAppId(s). (NOTE 2)	Optional	Yes	**UE context**
IP descriptors (NOTE 5)	Destination IP 3 tuple(s) (IP address or IPv6 network prefix, port number, protocol ID of the protocol above IP).	Optional	Yes	**UE context**
Domain descriptors	Destination FQDN(s)	Optional	Yes	**UE context**
Non-IP descriptors (NOTE 5)	Descriptor(s) for destination information of non-IP traffic	Optional	Yes	**UE context**
DNN	This is matched against the DNN information provided by the application.	Optional	Yes	**UE context**
Connection Capabilities	This is matched against the information provided by a UE application when it requests a network connection with certain capabilities. (NOTE 4)	Optional	Yes	**UE context**
List of Route Selection Descriptors	**A list of Route Selection Descriptors. The components of a Route Selection Descriptor are described in table 6.6.2.1-3.**	**Mandatory**		

Table 6.6.2.1-3: Route Selection Descriptor

Information name	Description	Category	PCF permitted to modify in URSP	Scope
Route Selection Descriptor Precedence	Determines the order in which the Route Selection Descriptors are to be applied.	Mandatory (NOTE 1)	Yes	**UE context**
Route selection components	**This part defines the route selection components**	**Mandatory (NOTE 2)**		
SSC Mode Selection	One single value of SSC mode. (NOTE 5)	Optional	Yes	**UE context**
Network Slice Selection	Either a single value or a list of values of S-NSSAI(s).	Optional (NOTE 3)	Yes	**UE context**
DNN Selection	Either a single value or a list of values of DNN(s).	Optional	Yes	**UE context**
PDU Session Type Selection	One single value of PDU Session Type	Optional (NOTE 8)	Yes	**UE context**
Non-Seamless Offload indication	Indicates if the traffic of the matching application is to be offloaded to non-3GPP access outside of a PDU Session.	Optional (NOTE 4)	Yes	**UE context**
Access Type preference	Indicates the preferred Access Type (3GPP or non-3GPP or Multi-Access) when the UE establishes a PDU Session for the matching application.	Optional	Yes	**UE context**
Route Selection Validation Criteria (NOTE 6)	**This part defines the Route Validation Criteria components**	**Optional**		
Time Window	The time window when the matching traffic is allowed. The RSD is not considered to be valid if the current time is not in the time window.	Optional	Yes	**UE context**
Location Criteria	The UE location where the matching traffic is allowed. The RSD rule is not considered to be valid if the UE location does not match the location criteria.	Optional	Yes	**UE context**

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URSP Stored in USIM

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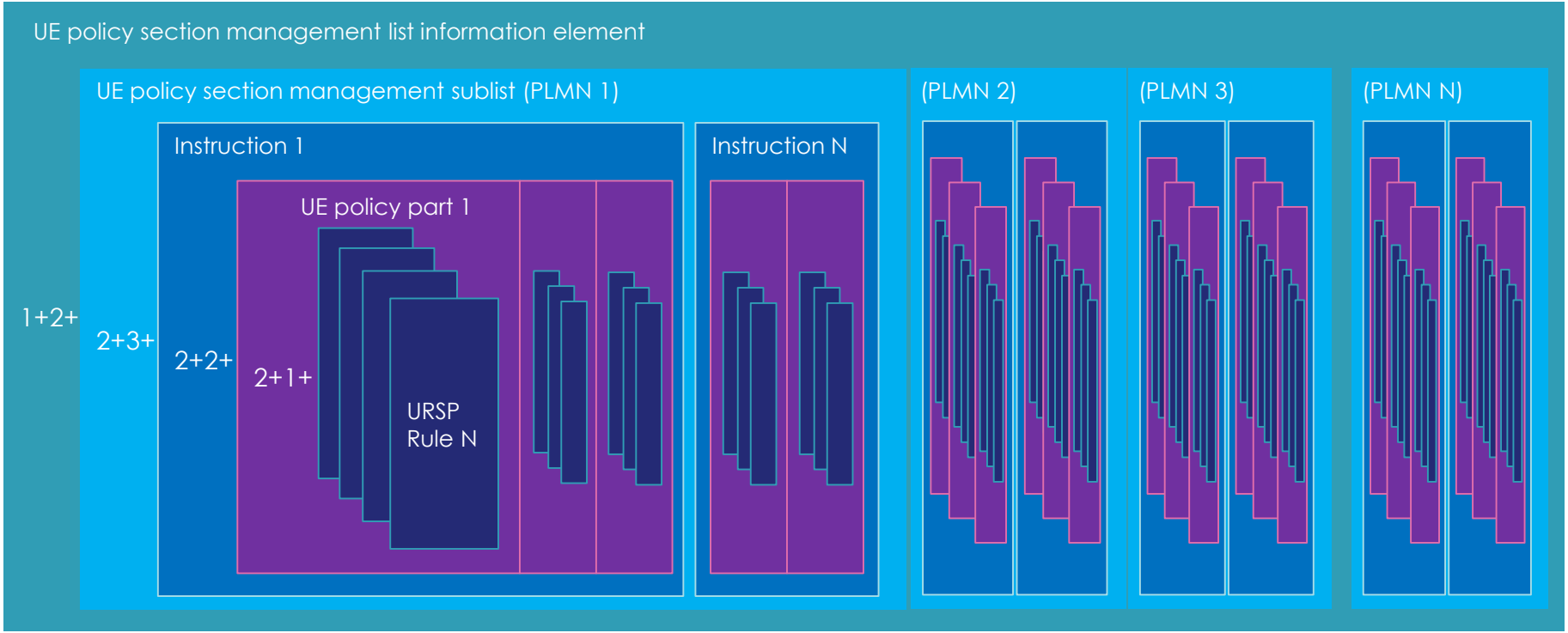
Sizing of UE policy section management list (from PCF)



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Simplification URSP storage in USIM

- URSP rule set are per PLMN
- UE Policy Section Code (UPSC) is removed
- UE Policy Part Type (URSP) is removed
- Use of 2-byte for length of the rule set
- URSP Rule coding as defined in TS 24.526

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UE policy section management list IEI TS 24.501 / TS 24.526

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TS 24.501: D.6.2 UE policy section management list

The UE policy section management list information element has a minimum length of 12 octets and a maximum length of 65534 octets.

8	7	6	5	4	3	2	1	
UE policy section management list IEI								octet 1
Length of UE policy section management list contents								octet 2 octet 3
UE policy section management list contents								octet 4 octet z

Figure D.6.2.1: UE policy section management list information element

8	7	6	5	4	3	2	1	
UE policy section management sublist (PLMN 1)								octet 4 octet a
UE policy section management sublist (PLMN 2)								octet a+1 octet b
…								octet b+1 … octet c
UE policy section management sublist (PLMN N)								octet c+1 octet z

Figure D.6.2.2: UE policy section management list contents

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UE policy section management sublist

8	7	6	5	4	3	2	1	
Length of UE policy section management sublist								octet d octet d+1
				MCC digit 1				octet d+2
MCC digit 2								
				MCC digit 3				octet d+3
MNC digit 3								
				MNC digit 1				octet d+4
MNC digit 2								
UE policy section management sublist contents								octet d+5 octet y

Figure D.6.2.3: UE policy section management sublist

8	7	6	5	4	3	2	1	
Instruction 1								octet d+5 octet e
Instruction 2								octet e+1 octet f
…								octet f+1 … octet g
Instruction N								octet g+1 octet e

Figure D.6.2.4: UE policy section management sublist contents

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Instruction and UE Policy section contents

8	7	6	5	4	3	2	1	
Instruction contents length								octet d+5 octet d+6
UPSC								octet d+7 octet d+8
UE policy section contents								octet d+9 octet k

Figure D.6.2.5: Instruction

8	7	6	5	4	3	2	1	
UE policy part 1								octet l octet m
UE policy part 2								octet m+1 octet n
…								octet n+1 … octet o
UE policy part N								octet o+1 octet p

Figure D.6.2.6: UE policy section contents

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UE policy part

8	7	6	5	4	3	2	1	
UE policy part contents length								octet q octet q+1
0	0	0	0	UE policy part type				octet q+2
Spare								
UE policy part contents								octet q+3 octet r

Figure D.6.2.7: UE policy part (TS 24.501)

8	7	6	5	4	3	2	1	
URSP rule 1								octet q+3 octet s
URSP rule 2								octet s+1* octet t*
…								octet t+1* octet u*
URSP rule n								octet u+1* octet r*

Figure 5.2.1: UE policy part contents including one or more URSP rules (TS 24.526)

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TS 24.526 URSP Rule

8	7	6	5	4	3	2	1	
Length of URSP rule								octet v octet v+1
Precedence value of URSP rule								octet v+2
Length of traffic descriptor								octet v+3 octet v+4
Traffic descriptor {(Type, Value),[(Type,Value),…]}								octet v+5 octet w
Length of route selection descriptor list								octet w+1 octet w+2
Route selection descriptor list								octet w+3 octet x

Figure 5.2.2: URSP rule

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Figure 5.2.3: Route selection descriptor

8	7	6	5	4	3	2	1	
Route selection descriptor 1								octet w+3 octet y
Route selection descriptor 2								octet y+1* octet z*
…								octet z+1* octet a*
Route selection descriptor m								octet a+1* octet x*

Figure 5.2.3: Route selection descriptor list

8	7	6	5	4	3	2	1	
Length of route selection descriptor								octet b octet b+1
Precedence value of route selection descriptor								octet b+2
Length of route selection descriptor contents								octet b+3 octet b+4
Route selection descriptor contents								octet b+5 octet c

Figure 5.2.4: Route selection descriptor

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Traffic Descriptor Components

Traffic descriptor component type identifier

Bits 8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 1	Match-all type (Type-1byte) (no other components)
0 0 0 0 1 0 0 0	OS Id + OS App Id type (Type-1b, OSId-16bytes, Length-1b, Value-X bytes)
0 0 0 1 0 0 0 0	IPv4 remote address type (Type-1b, Value-4b)
0 0 1 0 0 0 0 1	IPv6 remote address/prefix length type (Type-1b,Value-17bytes)
0 0 1 1 0 0 0 0	Protocol identifier/next header type (Type-1b, Value-1b)
0 1 0 1 0 0 0 0	Single remote port type (Type-1b, Value-2b)
0 1 0 1 0 0 0 1	Remote port range type (Type-1b, Value-4b)
0 1 1 0 0 0 0 0	Security parameter index type (Type-1b, Value-4b)
0 1 1 1 0 0 0 0	Type of service/traffic class type (Type-1b, Value-2b)
1 0 0 0 0 0 0 0	Flow label type (Type-1b, Value-3b)
1 0 0 0 0 0 0 1	Destination MAC address type (Type-1b, Value-6b)
1 0 0 0 0 0 1 1	802.1Q C-TAG VID type (Type-1b, Value-2b)
1 0 0 0 0 1 0 0	802.1Q S-TAG VID type (Type-1b, Value-2b)
1 0 0 0 0 1 0 1	802.1Q C-TAG PCP/DEI type (Type-1b, Value-1b)
1 0 0 0 0 1 1 0	802.1Q S-TAG PCP/DEI type (Type-1b, Value-1b)
1 0 0 0 0 1 1 1	Ethertype type (Type-1b, Value-2b)
1 0 0 0 1 0 0 0	DNN type (Type-1b, Length-1b, Value-X bytes)
1 0 0 1 0 0 0 0	Connection capabilities type (Type-1b, num-capa-1b, Value-4 bytes max)
1 0 0 1 0 0 0 1	Destination FQDN (Type-1b, Length-1b, Value-X bytes)
1 0 1 0 0 0 0 0	OS App Id type (Type-1b, Length-1b, Value-X bytes)

All other values are spare. If received they shall be interpreted as unknown.

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Route selection descriptor components

Route selection descriptor component type identifier

Bits 8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 1	SSC mode type (Type-1byte,Value-1b)
0 0 0 0 0 0 1 0	S-NSSAI type (Type-1b, Length-1b, Value-X bytes)
0 0 0 0 0 1 0 0	DNN type (Type-1b,Length-1b, APN-X bytes)
0 0 0 0 1 0 0 0	PDU session type type (Type-1b,Value-1b)
0 0 0 1 0 0 0 0	Preferred access type type (NOTE 2) (Type-1b,Value-1b)
0 0 0 1 0 0 0 1	Multi-access preference type (NOTE 2) (Type-1b)
1 0 0 0 0 0 0 0	Time window type (Type-1b, Value-16b)
0 1 0 0 0 0 0 0	Location criteria type
0 0 1 0 0 0 0 0	Non-seamless non-3GPP offload indication type (Type-1b, no other RSD)

All other values are spare. If received they shall be interpreted as unknown.

For "location criteria type", the route selection descriptor component value field may contain one or more types of location area and is encoded as shown in Figure 5.2.5 and Table 5.2.2.

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